Research Projects' Update

PB99-134124

Spring 1998

New York State
Energy Research and Development Authority

The New York State Energy Research and Development Authority (NYSERDA) is a public benefit corporation created in 1975 by the New York State Legislature.

NYSERDA has major programs in energy and environmental research, radioactive and hazardous waste management, tax-exempt bond financing, energy analysis and planning, and energy efficiency grants. Its responsibilities include:

- Conducting a multifaceted energy and environmental research and development program to meet New York State's diverse needs;
- Helping industries, schools, hospitals, and not-for-profits implement energy efficiency measures;
- Providing objective, credible, and useful energy analysis to guide decisions made by major energy stakeholders in the private and public sectors;
- Managing the Western New York Nuclear Service Center at West Valley, including: (1) overseeing the State's interests and share of costs at the West Valley Demonstration Project, a federal/State radioactive waste clean-up effort, and (2) managing wastes and maintaining facilities at the shut-down State-Licensed Disposal Area;
- Participating in the Malta Rocket Fuel Area "Superfund" site clean-up and managing facilities at the site on behalf of the State;
- Coordinating the State's activities on nuclear matters, and designing, constructing, and operating State facilities for disposal of low-level radioactive waste, once siting and technology decisions are made by the State; and
- Financing energy-related projects, reducing costs for ratepayers.

NYSERDA derives its basic research revenues from an assessment levied on the intrastate sales of New York State's investor-owned electric and gas utilities. Additional research dollars come from limited corporate funds and a voluntary annual contribution by the New York Power Authority. More than 245 of NYSERDA's research projects help the State's businesses and municipalities with their energy and environmental problems. Since 1990, NYSERDA has successfully developed and brought into use more than 60 innovative, energy-efficient, and environmentally acceptable products and services. These contributions to the State's economic growth and environmental protection are made at a cost of less than $1 per New York resident per year.

Federally funded, the Energy Efficiency Services program is working with more than 220 businesses, schools, and municipalities to identify existing technologies and equipment to reduce their energy costs.

For more information, contact the Technical Communications unit, NYSERDA, Corporate Plaza West, 286 Washington Avenue Extension, Albany, New York 12203-6399; (518) 862-1090, ext. 3250; or on the World Wide Web at http://www.nyserda.org/

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This Update reflects the status of research projects on March 31, 1998. The project descriptions are organized within NYSERDA's Research and Development program areas: Industry, Buildings, Energy Resources, Transportation, and Environment.

All projects described in the Research Projects' Update are managed by NYSERDA's technical staff, often in cooperation with private industry, utilities, academic institutions, and the federal government.

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NEW YORK STATE
ENERGY RESEARCH AND DEVELOPMENT AUTHORITY

RESEARCH PROJECTS' UPDATE
Project status as of March 31, 1998

PREFACE

New York State imports most of its energy because it lacks abundant conventional energy resources. State energy policy, based on avoiding supply disruptions, economic liabilities, and adverse environmental impacts, depends on a viable energy research and development (R&D) program.

The New York State Energy Research and Development Authority (NYSERDA) is a public benefit corporation created by the State Legislature in 1975 as the entity primarily responsible for planning and conducting energy R&D programs. NYSERDA manages a comprehensive energy research program to help secure the State's future energy supplies, while protecting environmental values and promoting economic growth.
NYSERDA's mission is:

> *To use innovation and technology to solve some of New York's most difficult energy and environmental problems in ways that improve the State's economy. We place a premium on objective analysis, as well as collaboration, reaching out to solicit multiple perspectives and share information. We are committed to public service, striving to be a model of what taxpayers want their government to be: effective, flexible, responsive, and frugal.*

NYSERDA is governed by a 13-member Board of Directors. Ex officio members include the Chairs of the Public Service Commission (PSC) and the New York Power Authority (NYPA), and the Commissioners of the Departments of Environmental Conservation (DEC) and Transportation (DOT). Members appointed by the Governor with the advice and consent of the State Senate are two electric and gas utility executives, an environmentalist, a scientist, an economist, a consumer representative, and three public members. The Governor appoints the Chair and Chief Executive Officer. The President of NYSERDA is Chief Operating Officer. The Governor approves all official actions of the board of directors.

NYSERDA's R&D program emphasizes:

- Promoting energy efficiency to encourage economic development;
- Expanding use of New York State's own renewable energy resources; and
- Reducing or mitigating adverse environmental effects associated with energy production and use.

THE R&D PROGRAM

NYSERDA's R&D program has five major areas: Industry, Buildings, Energy Resources, Transportation, and Environment. NYSERDA organizes projects within these five major areas based on energy use and supply, and end-use sectors. As a result, cross-cutting issues such as waste management, energy products, and renewable energy technologies, among others, are addressed in several areas of the R&D program.

While projects span the entire basic-to-applied research continuum, R&D of technologies and services with potential for timely commercialization and application in New York State are emphasized. The strategies are to adapt federal and other public and private research results for application in New York State and to identify and fill research gaps to meet the State's energy, environmental, and economic needs. Working with New York contractors on energy-related growth opportunities is part of NYSERDA's effort to produce maximum benefits for the State's citizens and businesses.

The R&D program is funded by an assessment on the intrastate gas and electricity sales of the State's investor-owned utilities. Supplemental funding is provided by an annual contribution from NYPA and from limited NYSERDA corporate funds. Co-funding comes from a variety of partners, including State and national research organizations such as the Empire State Electric Energy Research Corporation (ESEERCO), the New York Gas Group (NYGAS), the Electric Power Research Institute (EPRI), the Gas Research Institute (GRI), the National Renewable Energy Laboratory (NREL), utilities, universities, industrial firms, private engineering and scientific firms, local governments, and State and federal agencies. Co-funding leverages every dollar NYSERDA spends into another three dollars and helps ensure that the technologies will be used.

Further information about NYSERDA's R&D programs may be obtained by writing or calling the New York State Energy Research and Development Authority, Corporate Plaza West, 286 Washington Avenue Extension, Albany, NY 12203-6399; (518) 862-1090 ext. 3250; fax: (518) 862-1091; e-mail tgc@nyserda.org; http://www.nyserda.org.

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INTRODUCTION

This Update reflects the status of research projects on March 31, 1998.

The project descriptions are organized within NYSERDA's R&D program areas:

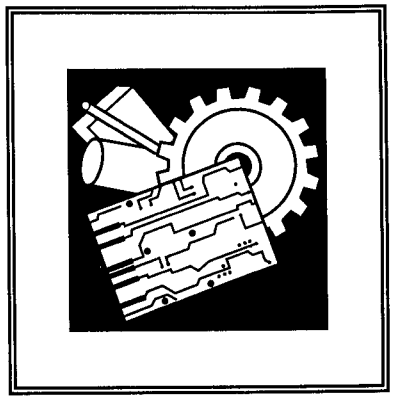
- Industry
- Buildings
- Energy Resources
- Transportation
- Environment

Descriptions of projects completed between the period April 1, 1997, and March 31, 1998, including technology-transfer activities, are at the end of each subprogram section.

All projects described in the Research Projects' Update are managed by NYSERDA's technical staff, often in cooperation with private industry, utilities, academic institutions, and the federal government. The technical merits of proposals, the caliber of the proposed contractors, and the relevance of the projects to New York State's energy needs are thoroughly evaluated before any project receives final approval.

Federal litigation has made Petroleum Overcharge funds available to states, including New York, to provide restitution to overcharged petroleum customers. Since 1987, NYSERDA has been involved in several programs funded with these monies.

INDUSTRY



Benefits and Rationale

A healthy manufacturing sector is critical to the State's economy and quality of life for its citizens. Approximately 14,000 manufacturing firms employ about 900,000 people. The competitiveness of New York manufactured goods depends on the cost content of energy, materials, and labor inputs. Energy prices for New York's industrial sector are 36% higher than the U.S. average. In many New York industries, waste management and environmental compliance costs can be as significant as energy costs. Although New York State has a highly educated and productive industrial workforce, the labor cost content of total manufacturing output is about 44% higher in New York than the U.S. average. This is because hourly labor rates are higher in New York than in many other states, and New York's industrial sector tends to be dominated by labor-intensive finished products manufacturers, rather than basic commodity industries, such as mining, petrochemical, or primary steel, all industries which are more dependent on resources and capital than labor. Nevertheless, New York State has a large and diverse industrial base that includes major concentrations of industrial groups (*e.g.*, paper, food processing, ceramics, metals), that depend on large amounts of energy to manufacture products and treat or process the resulting wastes. Many of these industries also include processes that produce large amounts of thermal energy which go unused; nearly 20% of total industrial energy consumption now escapes as waste heat, but is economically recoverable with existing technologies.

The development and application of innovative energy- and environmentally-efficient technologies help to reduce both energy and waste-related manufacturing costs, while increasing labor productivity. These improvements reduce the State's vulnerability to energy price volatility and oil supply interruption, increase environmental quality and foster economic growth. Moreover, in 1996, the industrial sector contributed over 7.5% of New York's CO_2 emissions. Therefore, improving the efficiency of the industrial sector can translate into greenhouse gas reductions.

Most of the energy used by industry is in the manufacturing process, rather than space heating, lights, or vehicle use. Therefore, improving the efficiency of process energy use is the focus of the Industry R&D Program. The benefits of this focus are numerous:

- Many innovative process technologies in development can reduce energy demand.
- Productivity, product quality, and competitiveness will be enhanced with new process technology.
- New processes can reduce waste generation, enhance recycling, and minimize waste abatement and disposal costs.
- Many combustion and process technologies can replace those currently using oil.
- By lowering overall production costs, new processes can revitalize existing industry and help grow new ones.

New Product Development. The Industry program emphasizes interacting with small firms that are most vulnerable to competitive forces. While smaller companies tend to be innovative and are quick to respond to changing markets, these companies have limited internal R&D capacity and lack access to traditional sources of capital. NYSERDA helps these companies by reducing the risk of developing new energy-efficient, environmentally acceptable products. These innovative products are being sold in both domestic and international markets.

Demonstration of Innovative Technology. The Industry program supports engineering feasibility studies and hardware demonstrations of innovative energy-efficient technologies. Cost-shared demonstration projects are used to reduce risk and encourage manufacturers to adopt innovative process improvements that potentially offer greater energy and environmental efficiency and higher productivity.

Industrial Collaboration. Identifying and applying innovative solutions to energy and environmental problems common to many New York firms in the same industry is also emphasized in the Industry R&D Program. Over the past few years, the Industry program has brought together research consortia consisting of companies, regional economic development groups, industry trade groups, and technical universities to reduce program costs, ensure participation of the ultimate users, and increase the likelihood of technology transfer.

Individual project funding is based on such anticipated benefits as enhanced energy and environmental efficiency, new product sales and job growth, and process improvements that result in improved productivity and job retention or creation. On a year-to-year basis, actual project outcomes are compared to original expected benefits. These outcomes are taken into consideration in developing subsequent program plans and implementation strategies.

Relationship to SBC. The relationship of the Industrial program to implementation of the SBC will be to focus on innovative, end-use energy efficient technologies and systems applicable to New York manufacturers where the public benefit is compelling and near term private return is inadequate to spur R&D investment. Planned activities include demonstrations and technology transfer of cross-cutting electric efficiency improvements and electric related waste minimization initiatives offering significant environmental benefits.

Goals

- Improve energy productivity in the industrial sector.
- Develop energy-efficient and environmentally clean industrial products that can be manufactured in New York State.
- Deploy new manufacturing technology to revitalize the industrial base of the economy.
- Improve the industrial sector's fuel diversity.

To achieve these goals, the following strategies will be employed in all the project areas discussed in the following section:

- Identify the energy and environmental needs of specific industry sectors through workshops, scoping sessions, industrial associations, and cooperation with regional economic development groups.
- Provide technical and financial assistance to lower the risks of product development and process improvements for energy and environmental applications.
- Promote industrial collaboration to encourage cost-effective technology transfer and application of energy-efficient process improvements.
- Develop diffusion networks within industry groups for transfer of project results.

-> Electric-Resistance Heating of Volatile Organic Compound-Activated Carbon

Reduce energy requirements to remove and recover volatile organic compounds from carbon-bed pollution-control equipment.

BACKGROUND

Granular activated carbon (GAC), which is used extensively by industry to control or recover volatile organic compound (VOC) emissions, has to be regenerated for reuse. This regeneration represents the principal operating cost for GAC. The conventional approach to regenerating and desorbing GAC is to use steam or inert gases, both resulting in greater energy use and higher operating costs. The contractor, Foster-Miller, Inc. (FMI) of Waltham, MA, has developed a novel method of regenerating the GAC electrically, which overcomes both of these problems.

OBJECTIVES

To determine: (1) the technical feasibility of the electric-resistance heating process for solvent recovery, (2) the operating characteristics of the new process for regeneration compared to those of steam or inert gas regeneration, (3) the energy and cost savings potential of the new process, and (4) design information for a commercial-scale unit.

DESCRIPTION

FMI will test and evaluate the electric-resistance regeneration system on a pilot scale at Air Products and Chemicals, Inc. (Staten Island) using a side-stream flow from an existing landfill-gas-refining facility. The flow contains methane, carbon dioxide, and contaminant gases. The results of the pilot-scale facility will be compared to the performance of the existing refining units operated by Air Products.

BENEFITS

The contractor projects an $80-million market worldwide for the recovery of VOCs from carbon beds. In New York, there are hundreds of potential sites where the technology could be applied, saving millions of dollars. By lowering costs for environmental compliance, the technology can help retain jobs in New York.

SCHEDULE AND STATUS

The pilot scale design and fabrication is complete. Installation has been delayed by regulatory requirements that led to equipment changes. Installation is now scheduled for early summer 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$150,000	$20,000	$170,000
Con Edison	150,000	70,000	220,000
Air Products and Chemicals, Inc.	100,000	0	100,000
Foster Miller, Inc.	100,000	30,000	130,000
ESEERCO	100,000	40,000	140,000
TOTALS	$600,000	$160,000	$760,000

Contractor: Foster Miller, Inc.
Site: Fresh Kills Landfill, Staten Island, Richmond County
Contract Duration: 5/96 - 12/98
Key Words: assist business, environmental, industrial process, emissions control, VOCs
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4044-IABR-IA-97

-> Innovative Chrome-Plating Process Alternative

Demonstrate powder coatings for industrial components to avoid energy-intensive and environmentally hazardous chrome-plating.

BACKGROUND

Chrome-plating has been used for years to repair, resize, and enhance the mechanical properties of valuable industrial components. However, the chrome-plating process is energy-intensive and generates significant hazardous metal wastes. This project will demonstrate an alternative method for applying powder coatings made from tungsten carbide cobalt and nickel chromium silicon boron alloys using a new flame-spray technology.

OBJECTIVES

To enable the application of powder coatings instead of chrome-plating on a variety of industrial components (i.e., pumps, diesel engines, turbine nozzles, and piston rods), thus eliminating the release or expensive storage of chrome-plating wastes. Thermaltec International Corp. (TIC) will own and use this technology and others will be licensed to manufacture and sell it worldwide.

DESCRIPTION

In early tasks, powder materials will be tested to identify which is best-suited as a chrome-plating substitute. In later tasks, the unique spray equipment necessary to apply the powder will be designed and demonstrated. Specific tasks include: (1) selecting and testing the coating material; (2) designing, procuring and installing the equipment; (3) field-testing; (4) monitoring; (5) disseminating information; and (6) preparing the final report.

BENEFITS

Substituting powder coatings for chrome-plating would directly eliminate hazardous chrome-waste generation. Additional benefits include: reduced energy and labor costs associated with the coating process; enhanced coating durability and longer coating life; and reduced coating-material waste.

SCHEDULE AND STATUS

Material and equipment testing has been completed. Field testing and monitoring will continue into the fall of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$247,993	0	$247,993
Thermaltec International Corp.	247,993	0	247,993
TOTALS	$495,986	0	$495,986

Contractor: Thermaltec International Corp.
Site: East Farmingdale, Suffolk County
Contract Duration: 3/96 - 12/98
Key Words: product development, environmental, industrial process, materials, emissions control, coating
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Industrial Process Improvements
Contract No.: 4104-IABR-IA-95

-> Pigmented Ultraviolet Coatings for Metal

Develop pigmented ultraviolet curable coatings for metal.

BACKGROUND

Ultraviolet (UV) curing is an economical and energy-efficient method of eliminating volatile organic compounds (VOCs) in the graphic arts and coating industries by using 100% liquid systems that convert to a solid material under UV light. While such coatings have been used on porous substrates such as wood and some plastics, their lack of durable adhesion to metallic substrates, such as steel and aluminum, have precluded their use in more diverse applications. Strathmore Products, Inc., of Syracuse, NY, seeks to develop UV-curable coatings for metallic substrates.

OBJECTIVES

To: (1) develop two new pigmented UV-curable coating formulations (black and gray) suitable for coating metals, (2) test their operation in standard UV spray-coating equipment, and (3) compare their energy efficiency and performance attributes (adhesion, corrosion resistance and life expectancy) to currently available products.

DESCRIPTION

The contractor will develop pigmented UV-curable formulations, test their performance on metal samples, identify the best new applications compared to current practice, and publicize results.

BENEFITS

Anticipated benefits include increased productivity in the coating process (throughput/minute), reduced unit-production cost ($/unit), reduced energy use (Btu/unit) compared to current practice, and increased business opportunities for Strathmore Products, Inc.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$48,120	$48,120
Strathmore Products, Inc.	0	58,520	58,520
TOTALS	0	$106,640	$106,640

Contractor: Strathmore Products, Inc.
Site: Syracuse, Onondaga County
Contract Duration: 5/98 - 3/99
Key Words: process improvement, product development, lighting, electrotechnology
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4727-IABR-IA-98

-> Demonstrating Ultraviolet (UV)-Curing of Wood Products

Demonstrate use of vacuum coating and ultraviolet curing of broom handles, brush blocks, and moldings.

BACKGROUND

The wood-products industry has been important throughout New York State's history. Rising energy and labor costs, continuous demands for improved product quality, and the rising cost of environmental compliance have had severe consequences on this industry. The industry is facing stringent regulation of its use and release into the environment of volatile organic compounds (VOCs) or solvents stemming from coating operations. UV coatings have no VOCs in their formulations, thus preventing pollution at the outset.

OBJECTIVES

To undertake a field-demonstration and evaluation of a UV-curing system in a wood-product manufacturing facility (E and J Industries, Inc.). Utilities and trade associations will participate in technology-transfer activities.

DESCRIPTION

The contractor will: (1) procure, install, and maintain the UV-curing system at the test site; (2) provide employee training on system operation; and (3) monitor the system's energy consumption and performance characteristics, including production rates, coating quality, cost-effectiveness, payback period, and environmental impact.

BENEFITS

Compared to conventional infrared-cured coatings for wood products, UV-curing requires 30 to 80 percent less energy. Using UV coatings as a finish coat with a vacuum coater appears to be economical due to lower energy costs, reduced down-time for cleanup, and a faster production rate.

SCHEDULE AND STATUS

Equipment selection , procurement, and installation are complete. Start-up and debugging of equipment are under way. Employee training and monitoring have begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$120,000	0	$120,000
E and J Industries, Inc.	145,000	0	145,000
New York State Electric & Gas Corp.	30,000	0	30,000
Electric Power Research Institute	5,000	0	5,000
Makor USA Inc.	73,190	0	73,190
TOTALS	$373,190	0	$373,190

Contractor: E and J Industries, Inc.
Site: Woodridge, Sullivan County
Contract Duration: 6/96 - 12/98
Key Words: assist business, industrial process, electrotechnology, wood products, electrical
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4403-IABR-IA-97

-> Hot-Water Dry Kiln Demonstration

Demonstrate hot-water, low-temperature dry kiln at Jamestown furniture component manufacturer.

BACKGROUND

Most kilns used to dry furniture-grade hardwoods in North America are steam-heated and operate at temperatures near 212°F. These high temperatures provide relatively rapid drying, but can also weaken the wood's structure, decreasing its quality and value. Hot-water dry kilns operate at temperatures around 160°F. The lower temperatures dry the wood more slowly, but damage it less, increasing its quality and reducing waste. The lower temperatures also reduce heat loss, making hot-water kilns more energy-efficient than steam kilns. Hot-water kiln technology is widely used in Europe, but is new to North America, with none of these kilns in New York. Master Carvers, which purchases all of its wood stock pre-dried, is growing rapidly and finding it increasingly difficult to obtain sufficient quantities of quality stock. For Master Carvers to install hot-water kilns, Jamestown's district heating system will need to be extended by about 1,600 feet. A number of other Jamestown furniture manufacturers may want to use this new technology.

OBJECTIVES

To: (1) demonstrate a low-temperature, hot-water dry kiln, the first in the U.S., that will not only reduce energy costs by about 40% compared with a conventional steam-dry kiln, but also reduce wood waste; and (2) demonstrate conversion of a steam-based heating and manufacturing system to hot water, with associated energy savings of about 20%.

DESCRIPTION

An extension of the district heating loop will be installed to serve Master Carver and other nearby facilities. Master Carver will install one or more new hot-water dry kilns and convert its steam system to hot water. The new kilns will be monitored and their performance analyzed.

BENEFITS

Master Carver will benefit from the higher-quality wood stock produced by the more energy-efficient hot-water kilns. Statewide, the lumber-drying industry could benefit from adoption of the new hot-water kiln technology.

SCHEDULE AND STATUS

Piping design is under way. Construction is scheduled to start in May 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$200,000	$200,000
Jamestown Board of Public Utilities	0	325,000	325,000
Master Carvers of Jamestown, Ltd.	0	460,000	460,000
TOTALS	0	$985,000	$985,000

Contractor: Jamestown Board of Public Utilities
Site: Jamestown, Chautauqua County
Contract Duration: 4/98-10/00
Key Words: assist business, industrial, municipal, district heating, industrial process, gas, waste minimization
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Process Improvements/Energy Systems
Contract No.: 4725-IABR-IA-98

-> Demonstrating an Indirect-Fired, Controlled Atmospheric Kiln to Decoat Oily Scrap

Decoat oily scrap aluminum for secondary and primary aluminum industry.

BACKGROUND

Kilns that remove oil from scrap aluminum (called decoating) are energy- and emissions-intensive, with limited production capability. Flue-gas cleaning techniques to reduce emissions are not without problems. Problems with current decoating technology may be resolved using an indirect-fired, controlled atmospheric kiln. In this project, scrap first will be fed into a sealed rotating kiln and the scrap oils will be vaporized, not combusted, by a 1500°F counterflowing gas stream with low oxygen content. By preventing oil combustion from coming into contact with the scrap, metal loss through oxidation will be avoided. The gas stream then will be passed to an incinerator, apart from the scrap, to combust the gas and destroy the volatile organic compounds. Part of the gas will return to the kiln, completing the cycle. The heat released from the oil combustion will provide all the heat needed for the decoating process.

OBJECTIVES

To demonstrate the energy and environmental benefits of an innovative, indirect-fired, controlled atmospheric kiln to decoat oily scrap. This will be the first demonstration of this technology for the secondary and primary aluminum industry in the U.S., and the first application to high- and variable-oil-laden scrap.

DESCRIPTION

This project will characterize the scrap from Philip Services Corp. (formerly Roth Brothers), a secondary aluminum processor, and custom-design the system. The equipment will be tested first in the laboratory and then at Philip Services Corp. Energy use and emissions reductions, and production increases, will be documented and publicized.

BENEFITS

Compared to conventional equipment, this equipment could reduce energy use more than 50 percent, and almost eliminate volatile organic chemical emissions and dust formation. The production increase could be worth millions of dollars yearly.

SCHEDULE AND STATUS

Philip Services Corp. scrap has been characterized. Equipment design, fabrication, and installation are complete. Equipment testing and performance monitoring are under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$399,917	0	$399,917
Philip Services Corp.	417,444	0	417,444
Stein Atkinson Stordy, Ltd.	55,000	0	55,000
U.S. Department of Energy	303,556	$121,444	425,000
TOTALS	$1,175,917	$121,444	$1,297,361

Contractor: Philip Services Corp. (formerly Roth Brothers), Energy Research Company (Subcontractor)
Site: East Syracuse, Onondaga County
Contract Duration: 4/94 - 12/98
Key Words: assist business, environmental, industrial process, emissions control, EDGE, VOC, decoat oily scrap
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract Nos.: 3103-EEED-IEA-94

-> Natural-Gas-Fired Radiant U-Tube System

Develop and demonstrate natural-gas-fired radiant U-tube system for indirect materials heating.

BACKGROUND

This project seeks to develop and demonstrate a high-performance (HP) radiant U-tube system that will provide substantial energy, environmental, and economic benefits to heat treaters and other industrial furnace operators in New York State and worldwide. The demonstration will be carried out at General Heat Treating in East Syracuse, Onondaga County, and the U-tube will be manufactured by INEX, Inc. of Holland, Erie County. The Institute of Gas Technology (IGT) has extensive experience in developing and testing ceramic radiant tubes under contract to the Gas Research Institute.

OBJECTIVE

To develop and commercialize an HP silicon carbide (SiC) composite radiant U-tube system that combines two innovative technologies -- the INEX SiC composite U-tubes and the IGT/DIAMOND Uniform Heat Flux, High Efficiency, Low NO_x Burner (FIR burner) in a package that, compared to existing metal alloy U-tube systems, offers the following advantages:

* Increases production rate by more than 20%.
* Increases energy efficiency by more than 10%.
* Reduces furnace downtime by more than 75%.
* Reduces NO_x emissions by more than 50%.
* Increases production revenues for the heat treater by $55,400 for a typical 1,000,000 Btu/hr furnace using four U-tubes.

DESCRIPTION

Project tasks include design, fabrication, laboratory and field-testing, performance monitoring, technology transfer, and reporting.

BENEFITS

Based on marketing assumptions and the rate of tube replacements, IGT has estimated that the INEX HP U-tube will, in a few years, annually save in New York alone 250 billion Btu of natural gas, reducing No_x and CO_2 emissions by nearly 80 tons and 15,000 tons, respectively, while providing annual revenue gains of $7 million to the heat-treating industry. In addition, INEX sales could reach $30 million worldwide, with 10 new jobs created.

SCHEDULE AND STATUS

Design and fabrication have begun. Testing will occur in the summer and fall of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$50,000	$50,000
Gas Research Institute	0	63,153	63,153
NYGAS	0	63,153	63,153
Institute of Gas Technology	0	99,998	99,998
INEX	0	27,500	27,500
Diamond	0	26,300	26,300
General Heat Treating	0	15,600	15,600
TOTALS	0	$345,704	$345,704

Contractor: Institute of Gas Technology
Site: East Syracuse, Onondaga County
Contract Duration: 10/97 - 9/99
Key Words: product development, industrial process, demonstration, gas, heat recovery
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4603-IABR-IA-98

-> Microwave Processing Thin-Sheet Materials

Design, develop, and demonstrate microwave drying system and water- or powder-based emulsion system to process preimpregnated fiberglass cloth.

BACKGROUND

Preimpregnated glass cloth, or "prepreg," is the base material used in printed circuit board manufacturing. Prepreg is also an important component in high-strength composite materials used in the aerospace and transportation industries. During manufacturing, thin sheets of prepreg pass through an organic solvent in which an epoxy has been dissolved. The prepreg then passes through a tower that uses hot-air convection drying, where the solvent evaporates, leaving the epoxy. The epoxy allows the prepreg to be layered and laminated with copper to form the printed circuit boards. Using organic solvents in this process presents an environmental and health hazard. Additionally, the hot-air drying method is quite energy-intensive. IBM, an international leader in prepreg manufacturing, operates the largest domestic plant in Endicott, NY.

OBJECTIVE

To design, construct, and demonstrate a microwave application system to replace hot-air convection in the prepreg-drying process. Microwave drying will be demonstrated in conjunction with a water- or powder-based resin that ultimately may replace organic solvents in prepreg manufacturing.

DESCRIPTION

IBM and Cober Electronics will design the physical and control components of a microwave applicator capable of distributing microwaves evenly across a wide, thin sheet. A handling system also will be developed to extend this technology to processing, drying, and monitoring 63-inch-wide prepreg cloth rolls commonly used in industry. IBM and Virginia Polytechnic Institute will develop a water- or powder-based resin that is amenable to microwave drying. IBM also will work with Applied Poleramic, Inc. to design and develop an innovative prepreg-handling system compatible with the microwave drying technology and new resins.

BENEFITS

Prepreg-processing time will decrease by more than 50 percent, doubling output capacity. The efficiency of the microwave drying process is 60-65% compared to less than five percent for hot-air drying. For the same amount of prepreg, the microwave drying tower will consume 20 to 30 kW, compared to one MW for a hot-air drying tower. Eliminating solvent-based resins will produce significant environmental benefits. This process consumes 20 million lbs. of methyl ethyl ketone each year in the U.S. Five million lbs. of CO_2 each year are emitted into the atmosphere by a single treater tower from solvent-combustion. If successful and implemented full-scale at Endicott, solvent discharges will be eliminated.

SCHEDULE AND STATUS

IBM is in the process of transferring the technology to the microwave manufacturer and Endicott for in-process demonstrations. IBM has entered into a licensing agreement for non-microelectronic applications. The draft final report is being reviewed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$600,000	0	$600,000
IBM	1,822,887	0	1,822,887
Electric Power Research Institute	922,887	0	922,887
New York State Electric & Gas Corp.	300,000	0	300,000
TOTALS	$3,645,774	0	$3,645,774

Contractor: International Business Machines Corporation (IBM)
Site: Yorktown Heights, Westchester County, and Endicott, Broome County
Contract Duration: 11/93 - 7/98
Key Words: product development, environmental, industrial process, materials
Project Manager: Adele Ferranti (518) 862-1090, ext. 3206
Program: Industry
Subprogram: Process Improvements
Contract No.: 3132-EEED-IA-94

-> Develop and Demonstrate Innovative Direct-Fired Continuous Furnace

Develop and demonstrate novel, direct-fired furnace for forging industry.

BACKGROUND

Utica Corp. fabricates turbine blades for use in aircraft, power generation, and other mobile or stationary applications. In the past, Utica Corp. has used electric furnaces in its process that, while expensive to operate, have performed well in meeting their customers' quality specifications. Utica Corp. customers are pressuring the company to develop a gas process so it can remain price-competitive without sacrificing product quality. Other New York forging firms may also be able to use the technology developed in this project.

OBJECTIVES

To demonstrate the use of a direct-fired continuous furnace as a replacement for Utica Corp.'s electric furnaces for processing turbine alloys. The measurable objectives are to: (1) design and build the furnace, (2) conduct development testing, (3) cut electric load (230 kW per furnace), (4) reduce energy use to 1,060 Btu/lbm, (5) achieve environmental emissions standards, and (6) meet product-quality requirements.

DESCRIPTION

Project tasks include engineering evaluation, design, fabrication, developmental testing, performance monitoring, technology transfer, and reporting.

BENEFITS

This project may result in a major energy efficiency gain of 80-90%, with an energy cost reduction of 90% or more. The productivity gain could create an even larger positive impact for Utica Corp. Additional jobs are anticipated at Utica Corp and at O'Brien & Gere, the furnace vendor.

SCHEDULE AND STATUS

Engineering and design will begin in June 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$200,000	$200,000
Utica Corp.	0	217,909	217,909
Niagara Mohawk Power Corp.	0	40,000	40,000
O'Brien & Gere	0	26,667	26,667
TOTALS	0	$484,576	$484,576

Contractor: Energy Research Company
Site: Whitesboro, Oneida County; Staten Island, Richmond County; and Fayetteville, Onondaga County
Contract Duration: 6/98 - 12/99
Key Words: product development, industrial process, demonstration, gas, heat recovery
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4602-IABR-IA-98

-> Novel Refractory Coating for Recuperator Use in Metals-Processing Industry

Develop novel refractory coating for recuperator use in metals-processing industry.

BACKGROUND

Many metal-processing companies waste significant energy by discharging high-temperature flue gases into the atmosphere without any heat recovery. Often, corrosive flue gases do not allow the use of recuperators. The secondary aluminum industry, the near-term commercial target, is one such industry that has received considerable attention concerning flue-gas energy recovery. Typically, a secondary aluminum smelter will exhaust its flue gases at 2200°F wasting more than 50 percent of the total thermal input.

OBJECTIVE

To test a new refractory coating in a simulated recuperator that uses a portion of the flue gases from a secondary aluminum smelter. The proposed concept incorporates a unique ceramic material, never used in this application, to coat and protect an off-the-shelf radiant-tube metallic recuperator. A combustion-air temperature of 1000°F will be attained, which will result in an energy savings of 33 percent. A major attribute of this recuperator design is that it can be recoated in place, unlike others, thus providing longevity and economical operation. The technical objective is to have the coating last for the six-month test so that its projected life will be at least three years, without recoating, and longer with recoating. Also, the recuperator performance must achieve a 1000°F preheat temperature with no air-to-flue-gas leakage.

DESCRIPTION

Energy Research Company (ERCo) will be the prime contractor responsible for project management, data collection, technology transfer, and approval of all engineering decisions. Brookhaven National Laboratory developed the coating to be used in this program. Roth Bros., in East Syracuse, NY, is a secondary aluminum smelter and will be the host site for testing. O'Brien and Gere of Fayetteville, will fabricate the prototype recuperator. The project tasks include: (1) laboratory testing of coating material, (2) test-rig design, (3) fabrication and installation of test rig at Roth Bros., (4) six-month testing period, and (5) project management and reporting.

BENEFITS

The proposed concept may reduce furnace energy use by more than 30 percent, or about 900 Btu per pound of product. A production increase of more than 30 percent is achievable without increased emissions, with a payback of less than two years. In 1993, of the 3.4 million tons of scrap aluminum consumed in the U.S., about half was used by the 34 secondary aluminum plants similar to Roth Bros. Widespread use of this technology would result in a savings of 6 trillion Btu per year in the U.S. alone, or about $15 million per year if gas costs are assumed to be about $2.50 per MMBtu.

SCHEDULE AND STATUS

Equipment and materials have been purchased. Materials testing has generated good results. The test rig has been fabricated and installed at Roth Bros. Testing is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$239,000	0	$239,000
U.S. Department of Energy	214,861	0	214,861
ERCo	14,828	0	14,828
O'Brien and Gere	10,000	0	10,000
TOTALS	$478,689	0	$478,689

Contractor: Energy Research Company
Site: Staten Island, Richmond County, and East Syracuse, Onondaga County
Contract Duration: 2/97 - 12/98
Key Words: product development, industrial process, gas, heat recovery, emissions control
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4470-IABR-IA-97

-> Stack Melter Demonstration

Install innovative stack melter to both decrease energy consumption and increase productivity.

BACKGROUND

Lexington Die Casting uses two reverbatory furnaces to melt aluminum used for castings. The furnaces heat the aluminum feedstock radiatively, a very inefficient process, with only 19% of the energy supplied by the burners absorbed by the feedstock. A stack melter is a vertical cylinder where feedstock goes in at the top and hot flue gas is supplied by gas burners at the bottom. Because the stack melter forces the flue gas to pass through the feedstock, it consumes 60% less energy than a reverbatory furnace doing the same job.

OBJECTIVES

To: (1) reduce energy consumption and
(2) demonstrate this innovative technology to the metal-casting industry in New York State.

DESCRIPTION

A stack melter will be designed and constructed by O'Brien & Gere and installed at Lexington Die. The stack melter will supply molten aluminum to two existing furnaces. The performance of the new system will be monitored and compared to the existing system.

BENEFITS

The stack melter will benefit Lexington Die by reducing energy consumption by at least 47% or allowing Lexington Die to increase production by the same percentage without increasing energy use. New York State's die-casting industry will also benefit from the availability of the stack-melter technology.

SCHEDULE AND STATUS

This project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$200,000	$200,000
Lexington Die Casting	0	203,868	203,868
TOTALS	0	$403,868	$403,868

Contractor: Lexington Die Casting
Site: Lakewood, Chautauqua County
Contract Duration: 3/98-4/00
Key Words: assist business, industrial process, gas
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Process Improvements
Contract No.: 4726-IABR-IA-98

-> Demonstration of Ceramic Material for Furnaces

Demonstrate novel, energy-efficient, material for industrial furnaces.

BACKGROUND

SenCer Inc. is a small, start up, company that has developed energy-efficient composite materials for use in many energy-related applications, including furnace refractory material. These materials can withstand high temperatures and corrosive environments found in many of the State's energy-intensive industries, such as glass, ceramics, metals, and chemicals. In laboratory testing, these materials have performed well in meeting the quality specifications of their customers.

OBJECTIVES

To demonstrate the use of SenCer's refractory material in their own production furnaces. The measurable objectives are to: (1) design and build the furnaces, (2) conduct performance testing, (3) cut electric power consumption in the furnaces by 20%, (4) achieve environmental emissions standards, and (5) meet product quality requirements.

DESCRIPTION

Project tasks include design, fabrication, performance monitoring, technology transfer, and reporting.

BENEFITS

This project may result in a large energy-efficiency gain, (20-30%), in the SenCer furnaces, while demonstrating the durability of the material in difficult industrial environments. The project will also help SenCer develop markets for their new energy-related products and boost their production capacity.

SCHEDULE AND STATUS

Design and fabrication will begin in the spring of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$200,000	$200,000
SenCer Inc.	0	202,357	202,357
TOTALS	0	$402,357	$402,357

Contractor: SenCer Inc.
Site: Penn Yan, Yates County
Contract Duration: 4/98 - 8/99
Key Words: product development, industrial process, demonstration, insulation
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4722-IABR-IA-98

-> Demonstrating a Direct/Indirect Contact Steam-Atmosphere Dryer

Develop and demonstrate prototype superheated steam-atmosphere dryer for industrial applications.

BACKGROUND

In the United States, industrial drying accounts for approximately 1.5 quads of annual energy consumption. Tecogen, Inc. has designed a closed-loop, direct-contact, steam-atmosphere dryer based on an existing APV Crepaco dryer design. APV Crepaco is a New York State manufacturer that wants to add this innovative dryer to its product line. The dryer uses superheated steam atmosphere combined with recompression of the dryer's exhaust steam. The technology has the potential to reduce energy consumption and environmental emissions compared to other industrial dryers.

OBJECTIVE

To design, construct, and perform laboratory- and field-testing of a pilot (250 lb/hr) superheated steam-atmosphere drying system on sludge from an anaerobic digester or wastewater treatment facility. In subsequent project phases, similar equipment (scaled for the specific application) may be field-demonstrated on different industrial feedstocks in New York State.

DESCRIPTION

The contractor will: (1) conduct laboratory drying tests using feedstocks from several candidate test sites, (2) design and construct the prototype steam dryer, (3) test the prototype dryer on industrial products, (4) identify a demonstration site, (5) ship and install the dryer at the demonstration site, and (6) conduct a six-month demonstration to evaluate the energy savings and operational economics associated with the dryer.

BENEFITS

The superheated steam-drying process is energy-efficient because the latent heat of vaporization is not lost in the dryer exhaust, as it is with air-drying. This technology has the potential to reduce the energy required for drying by as much as 35-50% compared to the best state-of-the-art air-drying equipment. If the project is successful and the process is replicated throughout the State, the energy savings to New York businesses could total $28 million annually. Additionally, the superheated steam-drying equipment could be manufactured in the New York.

SCHEDULE AND STATUS

The prototype system has been demonstrated at the Village of Bergen's anaerobic digester site (NYSERDA Project No. 1906). The draft final report is being reviewed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$410,720	0	$410,720
U.S. Department of Energy	414,970	0	414,970
Niagara Mohawk Power Corp.	220,000	0	220,000
TOTALS	$1,045,690	0	$1,045,690

Contractor: Tecogen, Inc.
Site: Waltham, MA, and Village of Bergen, Genesee County
Contract Duration: 7/91 - 5/98
Key Words: product development, environmental, industrial, municipal, drying, steam
Project Manager: Adele Ferranti (518) 862-1090, ext. 3206
Program: Industry
Subprogram: Process Improvements
Contract No.: 1759L-EEED-IEA-92

-> Improved Manufacturing of Polycapillary Optics

Improve furnace and control designs by applying a greater understanding of physical mechanisms.

BACKGROUND

The manufacture of polycapillary optical lenses for x-ray and neutron transmission requires extremely precise thermal and mechanical control. To date, lens-making has mostly been an art, with limited understanding of the physical mechanisms involved in the critical shaping process. The percentage of material that reaches the necessary quality level for use is on the order of 1%. Process control improvements are needed to enable better product quality, faster production, shorter cycle time, lower rejection rate, reduced energy consumption, and the possibility of developing new designs.

OBJECTIVE

To reduce process operational costs by raising the reproducibility rate of acceptable product tenfold.

DESCRIPTION

The project will: (1) improve understanding of physical mechanisms inherent in the forming process, (2) develop new furnace design concepts and options, (3) validate and test furnace design concepts, and (4) optimize furnace control using numerical analysis.

BENEFITS

Reducing defects tenfold will produce cost savings of $100,000/yr. at current production rates. This savings will grow as volume grows. This project is expected to: (1) lower product cost, (2) increase product quality and (3) open potential markets for new product designs and applications.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$50,000	$50,000
X-Ray Optical Systems, Inc.	0	117,274	117,274
Synergetic Technologies, Inc.	0	25,000	25,000
TOTALS	0	$192,274	$192,274

Contractor: X-Ray Optical Systems, Inc.
Site: Albany, Albany County
Contract Duration: 3/98-10/99
Key Words: assist business, industrial process
Project Manager: Ed Kear, (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Process Improvements
Contract No.: 4723-IABR-IA-98

-> Dry Extrusion of Silicon Carbide Tubes

Develop an innovative dry extrusion process for manufacturing small-diameter ceramic tubes.

BACKGROUND

Silicon carbide (SiC) tubes are typically manufactured using binders and techniques originally developed for the production of oxide ceramic tubes. This water-based tube-extrusion method involves slow-drying and binder burn-out steps that require additional space, energy, and equipment. This process is used by oxide ceramic tube manufacturers because it leaves a very low carbon residue, but this is actually a disadvantage when the process is used to make SiC tubes. Binders and techniques used for making sand-core extrusions for the metal castings industry may be a more efficient method for forming SiC tubes.

OBJECTIVE

To: (1) design and build an extruder suitable for use with a wide range of SiC materials, and (2) develop extrusion mixes and extrusion machine parameters for producing tubes made of various forms of SiC.

DESCRIPTION

Tubes will be extruded using a variety of binders and the following materials: coarse-grain silicon nitride-bonded SiC, fine-grain porous silicon nitride-bonded SiC, coarse-grain nonporous reaction-bonded SiC, fine-grain nonporous reaction-bonded SiC, and sintered SiC. The green tubes will be examined for defects and some of the tubes will be fired and then reexamined for defects.

BENEFITS

By developing a more energy-efficient process, Inex would gain the ability to manufacture tubes of a smaller diameter than is currently possible, opening up new markets for its products. The projected sales increase for Inex is $500,000 per year.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$25,000	$25,000
Inex, Inc.	$28,000	44,270	72,270
Silicon Carbide Products, Inc.	0	1,500	1,500
Standard Ceramics, Inc.	0	1,500	1,500
TOTALS	$28,000	$72,270	$100,270

Contractor: Inex, Inc.
Site: Ransomville, Niagara County
Contract Duration: 3/98 - 11/98
Key Words: assist business, industrial process
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Process Improvements
Contract No.: 4728-IABR-IA-98

-> Microwave-Assisted Sintering of Ceramics

Investigate feasibility of using microwaves to rapidly heat greenware prior to sintering.

BACKGROUND

A growing body of theoretical and experimental evidence indicates that very rapid sintering of ceramic is possible and desirable. The greenware's low thermal conductivity, however, can lead to large thermal gradients and cracking when conventional surface-heating methods are used. Because most ceramic materials are semi-transparent to microwaves, a microwave kiln can be constructed that will heat the greenware rapidly and evenly without introducing thermal gradients. This technology has been demonstrated in bench-scale experiments. However, because a multikilowatt, full-scale microwave kiln would be more expensive than conventional systems, and electricity is more expensive than natural gas, it is not clear if microwave sintering would be cost-effective.

OBJECTIVES

To: (1) determine if microwave sintering is technically feasible with reasonable volumes using the mix of products currently produced by CETEK, (2) to reduce cycle time by 75%, and (3) determine if the process is cost-effective.

DESCRIPTION

Test samples will be prepared and sintered at a test facility such as Oak Ridge National Laboratory's High-Temperature Microwave Facility. Microwaves will be used to rapidly heat the samples to about 1,200°C, at which point conventional sintering technology (electric resistance) will be used to heat the samples to sintering temperatures. The process will be fully instrumented and the sintered samples will be analyzed. An economic analysis of the process will be performed.

BENEFITS

Microwave-assisted sintering is expected to reduce energy consumption by as much as 30%, while reducing cycle time by 75%. Product quality is expected to improve. This technology has wide applicability for the State's high-technology ceramics industry.

SCHEDULE AND STATUS

The project has just begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$30,000	$30,000
CETEK, Inc.	0	31,773	31,773
TOTALS	0	$61,773	$61,773

Contractor: CETEK, Inc.
Site: Poughkeepsie, Dutchess County
Contract Duration: 4/98-10/98
Key Words: assist business, electricity, industrial process, materials
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Process Improvements
Contract No.: 4729-IABR-IA-98

-> Cullett/Batch Preheater for Air- and Oxy-Fuel-Fired Glass Furnaces

Demonstrate technical and economic feasibility of cull' .batch preheating with oxy-fuel combustion.

BACKGROUND

Cullett/batch preheating allows for the capture of waste stack heat for use in preheating raw materials that will be melted in a glass furnace. Although cullet/batch preheating has been demonstrated with conventional preheated-air combustion technologies, a cullet/batch preheater system has never been integrated with an oxy-fuel combustion furnace in the glass industry or elsewhere.

OBJECTIVE

To investigate the technical and economic benefits associated with combining cullet/batch preheating and oxy-fuel combustion.

DESCRIPTION

This demonstration program consists of two overlapping phases. In the first phase, a cullet/batch preheater will be installed on a conventional regenerative furnace at a Corning plant. In the second phase, in conjunction with Praxair, the furnace will be converted to oxy-fuel firing and the integrated oxy-fuel/waste-heat-recovery system will ve demonstrated. Baseline performance data on the preheater will be collected and compared to overall performance of the integrated system.

BENEFITS

No_x emissions reductions of 90% have been realized by using oxy-fuel melting. Recovering the waste heat exhausted in oxy-fuel combustion and using it to preheat raw cullet and batch before they enter a glass furnace can reduce fuel and oxygen combustion by nearly 30%. If successful, this technology should reduce glass-production costs while achieving reductions in emission levels, thereby allowing New York and U.S. glass manufacturers to be more competitive in a worldwide market.

SCHEDULE AND STATUS

Final design modifications have been completed. Installation of the preheat technology is under way and the system should be operating by summer.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$399,919	0	$399,919
Gas Research Institute	200,000	0	200,000
NYGAS	200,000	0	200,00
Corning (in-kind)	143,250	0	143,250
Praxair (in-kind)	134,694	0	134,694
U.S. DOE	481,805		481,805
TOTALS	$1,559,668	0	$1,559,668

Contractor: Tecogen, Inc., a division of Thermo Power Corporation
Site: Waltham, MA, and Corning, Steuben County
Contract Duration: 4/93 - 1/99
Key Words: product development, environmental, industrial process, emissions control
Project Manager: Adele Ferranti (518) 826-1090, ext. 3206
Program: Industry
Subprogram: Process Improvements
Contract No.: 3002-EEED-IEA-94

-> Recovering Waste Heat by Preheating Oxygen with Flue Gas from an Oxy-Fuel-Fired Glass Furnace

Design, test, and demonstrate oxygen preheater that uses hot flue gases from oxy-fuel glass melter.

BACKGROUND

Glass melting is an energy-intensive process during which significant heat is lost in the flue gas. Oxy-fuel combustion for glass furnaces has seen rapid adoption in the U.S. due to reduced NO_x and particulate emissions and increased production capability. However, oxy-fuel melters have higher operating costs than air-fuel melters. Praxair, Inc. is sponsoring the development of an oxygen-preheater technology to preheat combustion oxygen with hot flue gases from the glass melter. Currently, there are no known commercial oxy-fuel melters that take advantage of this high-quality waste heat.

OBJECTIVE

To design, test, and field-demonstrate an oxygen preheater in conjunction with an existing oxy-fuel melter. Praxair will attempt to safely preheat at least 70 percent of the stoichiometric oxygen requirement for the furnace to 1200°F; demonstrate use of preheated oxygen with oxy-fuel burners, and minimize NO_x emissions.

DESCRIPTION

Working with Corning, Inc. and Xothermic, Inc. as subcontractors, Praxair will engineer, design, and test the oxy-fuel/oxygen-preheater system. The existing furnace's performance will be fully characterized to provide data for the oxygen-preheater design, operation with oxygen preheating, fuel and oxygen use, and furnace capacity. The oxygen-preheater system will be operated over a six-month period to document its performance and reliability and to determine fuel and oxygen savings. An economic analysis will be done for this unit, as well as for furnaces of various sizes.

BENEFITS

Oxy-fuel/oxygen-preheating technology will enable glass producers to reduce glass-production costs and air emissions, and save energy. Total glass production in the U.S. is about 22 million tons and consumes about 300 x 10^{12} Btu annually. Commercialization of oxygen-preheating technology will make the overall oxy-fuel process more economical for a significantly greater share of this market. This technology, combined with a batch/cullet preheating technology to be tested by Corning and Tecogen, will optimize energy recovery. If successful, the project will result in a new product for Praxair.

SCHEDULE AND STATUS

System components have been fabricated and are being installed at Corning's Fall Brook plant. Installation should be completed by summer.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$200,000	0	$200,000
Praxair, Inc.	130,828	0	130,828
Corning, Inc.	85,513	0	85,513
TOTALS	$416,341	0	$416,341

Contractor: Praxair, Inc.
Site: Fall Brook and Corning, Steuben County, and Tarrytown, Westchester County
Contract Duration: 1/96-12/98
Key Words: product development, environmental, industrial process, emissions control, heat recovery
Project Manager: Adele Ferranti (518) 862-1090, ext. 3206
Program: Industry
Subprogram: Industrial Process Improvements
Contract No.: 4242-IABR-IA-96

-> Gas Turbine Cogeneration with Oxygen Enhanced Heat Recovery

Develop low-NO_x burner to facilitate integration of gas turbine cogeneration system with existing steam boiler.

BACKGROUND

Industrial cogeneration systems typically consist of a gas turbine and a steam boiler. The turbine is used to generate electricity and the hot turbine exhaust is used to produce steam in a boiler. Most industrial facilities already have boilers to supply their existing steam loads. However, these boilers cannot typically be used in a gas turbine cogeneration system without major modifications. The added cost of installing new boilers decreases the applicability of the technology. Praxair has developed a technology whereby existing boilers are fitted with a new low-No_x burner designed to use oxygen-enriched, hot turbine exhaust as the combustion air supply. In this way, a gas turbine cogeneration system could be installed using an existing boiler.

OBJECTIVE

To develop and demonstrate a process to integrate gas turbines with existing industrial or power boilers to generate power at a low additional fuel cost and zero incremental No_x emissions.

DESCRIPTION

Tasks will include: (1) developing a low-No_x burner fired with gas turbine exhaust, and (2) performing a detailed technical and economic analysis of the process.

BENEFITS

The proposed system is expected to generate electricity at an incremental heat rate of 4,000-5,000 Btu/kWh. The technology will decrease the cost of installing cogeneration systems at locations with existing steam boilers. Significant reductions in energy costs are expected for those locations using cogeneration, and overall air emissions will decrease as a result of wider application of this technology.

SCHEDULE AND STATUS

This project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$49,932	$49,932
Praxair, Inc.	0	66,188	66,188
TOTALS	0	$116,120	$116,120

Contractor: Praxair, Inc.
Site: Tarrytown, Westchester County
Contract Duration: 3/98 - 1/99
Key Words: product development, environmental, gas, electric, industrial, heat recovery, cogeneration
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Process Improvements
Contract No.: 4721-IABR-IA-98

-> Field-Demonstration of Exhaust-Heat-Recovery System in an Industrial Bakery

Demonstrate use of direct-contact heat-recovery system with oven exhaust from wholesale bakery.

BACKGROUND

Bakeries represent one of the largest sectors of the New York State food-processing industry, and the largest in New York City in both jobs and energy use. High energy costs and product quality are both serious issues affecting the competitiveness of BakedRite and other industrial bakeries in the State. The heat-recovery system to be demonstrated in this project shows promise for improving both energy efficiency and product quality. Brooklyn Union and NYSERDA will demonstrate this technology at BakedRite, a wholesale bakery that employs about 250 people. Then, Brooklyn Union will sponsor an aggressive technology-transfer effort to encourage the adoption of this technology by other suitable commercial and industrial facilities in New York City.

OBJECTIVES

To demonstrate an exhaust-heat-recovery system at the BakedRite bakery in Brooklyn that will preheat ventilation and combustion air, as well as makeup water, for two oil-fired boilers used to control product moisture.

DESCRIPTION

Brooklyn Union will install, maintain, and monitor the performance of the exhaust-heat-recovery system. Heat will be recovered from the exhaust-flue gases of a tunnel-type bread oven using a direct-contact water heater/stack economizer manufactured by Sofame, Inc. under the name Percotherm. The exhaust-heat-recovery system will be tested for two years. A remote-control system will continuously monitor the operation and collect data to evaluate the performance of the heat-recovery system. This information will be used to determine the economic viability and energy savings resulting from the system's operation. Brooklyn Union's industrial marketing group will undertake tech- nology-transfer activities aimed at already-identified market segments (i.e., bakeries, multifamily housing, and other commercial facilities).

BENEFITS

Energy savings have been estimated at 3.2 billion Btu per year, for a cost savings of $8,000 to $10,000 per year. The technology will encourage switching to natural gas from oil because the heat-recovery system will only operate when the tunnel oven is burning natural gas. Another potential benefit to be investigated is the product-quality impact of reduced ambient-temperature fluctuations.

SCHEDULE AND STATUS

Procurement is completed. Installation is in progress, although extended construction delays have prevented the completion of installation.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$92,000	0	$92,000
Brooklyn Union	92,000	0	92,000
BakedRite	46,000	0	46,000
TOTALS	$230,000	0	$230,000

Contractor: Brooklyn Union
Site: Brooklyn, Kings County
Contract Duration: 5/96 - 6/99
Key Words: assist business, industrial process, gas, heat recovery
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4409-IABR-IA-97

-> Demonstration of Freeze-Concentration for New York State Dairy Products

Demonstrate production advantages and quality improvements of dairy products made from freeze-concentrated milk.

BACKGROUND

The current method of concentrating milk is a destructive process that requires heating the milk to 170 degrees. This breaks down the protein and results in products such as skim milk, which has a blue, watery taste and look. This affects the taste and quality of all dairy product derivatives, including cheeses, creams, salad dressings, frozen desserts, baked goods, and chocolates. The use of freeze-concentration results in a thicker, less altered processed milk that can then be used in all the food products mentioned above.

OBJECTIVE

To nurture freeze-concentration by the dairy industry in New York State. This will provide New York dairy producers and milk product manufacturers with a technical and market advantage over other dairy regions in the country.

This project, at Cornell University, is Phase 1 of a two-phase effort leading to the full-scale demonstration of the technology at a dairy processing company in New York.

DESCRIPTION

Freeze-concentration equipment will be installed at Cornell. New York State milk will be concentrated and tested for quality, shelf life, and taste. Derivative products, such as cream cheese, salad dressing, whey powder, ice cream, and chocolates, will be produced for testing by New York dairy processors.

BENEFITS

1. Up to 40% less energy consumed than conventional milk evaporation.
2. Increased product recovery.
3. Improved product quality.
4. Minimal environmental impact.
5. Low operating and maintenance costs.
6. Extended product shelf life of product.

SCHEDULE AND STATUS

Equipment has been installed. Ooperator training has been completed, and milk testing is under way. Derivative products are being produced and tested in 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$115,000	$115,000
Electric Power Research Institute	0	350,000	350,000
New York State Electric & Gas Corp.	0	115,000	115,000
TOTALS	0	$580,000	$580,000

Contractor: Cornell University
Site: Ithaca, Tompkins County
Contract Duration: 5/97-12/98
Key Words: industrial process, university, electrotechnology, food industry
Project Manager: Bill Reinhardt, (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4485-IABR-IA-98

-> Energy-Efficient Dairy Farm Electrotechnology

Develop and demonstrate seven electrotechnologies designed to improve energy efficiency of New York State's dairy farms.

BACKGROUND

New York State is the third largest milk producer in the United States. New York's dairy farms not only supply fluid milk, but other large dairy products. Dairy farms in New York are still predominantly small, family-run operations whose survival depends on efficiency and labor-saving technologies. Cornell University has developed seven electrotechnologies targeted at improved efficiency in milking, cooling, cleaning, lighting, and air circulation.

OBJECTIVE

To develop and demonstrate electrotechnologies including: (1) milk-harvesting system using adjustable-speed drive (ASD) motor control; (2) pipeline washing system using a logic controller for washing valves and air injector; (3) partial in-line milk-cooling system using ASD motors on the milk pumps; (4) complete in-line milk-cooling system using ASD motors on both the milk and cooling pumps; (5) air-circulation system using ASD fan motors and logic controllers; (6) lighting system using properly selected lamps and luminaries, light-level sensors, and automatic controls; and (7) water-delivery system using ASD pump motors, pressure transducer, and logic controller.

DESCRIPTION

Cornell will develop and test prototype units, and then help the farmers install similar systems on their farms. The utilities will install data-collection equipment on the farms and will monitor system and farm energy consumption. Cornell will analyze the data and determine the electrotechnologies' economic viability.

BENEFITS

New York's dairy farms will benefit from the availability of energy-efficient electrotechnologies applied to their individual situations. New York State will benefit from the continuing viability of its dairy industry.

SCHEDULE AND STATUS

Demonstrations are currently under way for all of these technologies. Commercialization of the adjustable-speed control for the milk harvesting system is under way with more than 100 units installed nationwide.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$282,445	0	$282,445
Cornell University	417,461	0	417,461
Niagara Mohawk Power Corp.	136,364	0	136,364
New York State Electric & Gas Corp.	83,321	0	83,321
Rochester Gas and Electric Corp.	62,759	0	62,759
Dairy farms	83,217	0	83,217
TOTALS	$1,065,567	0	$1,065,567

Contractor: Cornell University
Site: Ithaca, Tompkins County
Contract Duration: 1/95 - 9/98
Key Words: assist business, university, industrial process improvement, dairy
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Process Improvements
Contract No.: 4017-IABR-IA-95

-> Energy-Efficient Controls for Industrial Compressed-Air Systems

Develop linear-programming-based optimizer to generate best operating setpoints for set of multiple air compressors.

BACKGROUND

More and more manufacturers are aggressively pursuing energy-cost management in an effort to become more competitive. At most industrial sites, the compressed-air system used throughout the plant is often the single largest user of electricity, accounting for as much as 25% of a plant's total utility bill. Plants are typically operated with multiple compressors, each running at some previously manually established operating point. The operating points of each compressor are typically established based on the human operator's knowledge of the plant, but may not be optimal from an energy-use standpoint. Automated supervisory control of multiple compressors is a key part of a complete solution for demand-based control of compressed-air systems.

OBJECTIVE

To develop a compressed-air supervisory controller that will optimally schedule the setpoints of multiple compressor systems in response to demand for air in the plant.

DESCRIPTION

A two-phased approach is planned where the contractor will perform: (1) site selection, survey, and analysis; and (2) development, installation, and six-month monitoring of the controller.

BENEFITS

Many of the electric utilities in New York State are working to form closer ties with their key customers. This program will result in new technology that can provide economic benefits to both the electric utility and its industrial customers with large compressed-air systems. In most cases, the potential reduction in electrical energy consumption will be very large.

SCHEDULE AND STATUS

Phase I is complete: Goulds Pumps in Seneca Falls is the selected site. The majority of the equipment and software has been installed and monitoring of the base system has begun. Additional processor programming is needed. Determination to be made on the sand transport interlock by July 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$249,000	$15,000	$264,000
ESEERCO	100,000	35,000	135,000
New York State Electric & Gas Corp.	100,000	25,000	125,000
Electric Power Research Institute	150,000	0	150,000
Honeywell, Inc.	170,687	30,142	200,829
Goulds Pumps, Inc.	123,294	0	123,294
EPRI/NYSEG Tailored Collaboration	0	75,000	75,000
TOTALS	$892,981	$180,142	$1,073,123

Contractor: Electric Power Research Institute
Site: Seneca Falls, Seneca County
Contract Duration: 11/95 - 12/98
Key Words: product development, industrial
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Process Improvements
Contract No.: 4130L-IABR-IA-96

-> Manufacturing Extension Partnership

Transfer innovative energy-efficient technologies to manufacturing sector.

BACKGROUND

This project supports energy-related outreach and technical-assistance services offered to western New York industry by the Western New York Technology Development Center, Inc. (WNYTDC). These services, part of the federally funded Western New York Manufacturing Extension Partnership (WNYMEP) program, coordinate and streamline delivery of numerous State, local, and utility services to industry. The Advanced Research Projects Agency (ARPA) has sponsored this project as part of its program to enhance the productivity and technological performance of U.S. manufacturing firms.

OBJECTIVES

To inform industry of innovative industrial technologies developed through NYSERDA's industrial programs and provide technical assistance through NYSERDA's research and development and energy efficiency services programs.

DESCRIPTION

WNYTDC will enhance the competitive edge of New York State's industry by sponsoring industrial energy workshops, supporting detailed engineering feasibility studies of innovative energy-efficient process modifications, and developing demonstrations of innovative energy-efficient manufacturing technology.

BENEFITS

This project will lower the cost and increase the benefit of technical assistance to industry. Customer service will be improved by delivering technical assistance to industries while focusing on their energy-related manufacturing needs.

SCHEDULE AND STATUS

Outreach activities began in July 1995. Three workshops have been held. Four detailed feasibility studies have been completed, and six others are under way. Numerous efficiency improvements have been identified and implemented.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$180,000	0	$180,000
WNYTDC	150,000	0	150,000
Advanced Research Projects Agency	40,000*	0	40,000
TOTALS	$390,000	0	$370,000

*Total ARPA funding for the WNYMEP program was $604,113 in FY 1994-95, $872,330 in FY 1995-96 and, $936,000 in FY 1996-97.

Contractor: Western New York Technology Development Center, Inc. (WNYTDC)
Site: Erie, Niagara, Chautauqua, Allegany, and Cattaraugus counties
Contract Duration: 7/95 - 12/98
Key Words: assist business, industrial process
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4123-IABR-IA-95

-> "EVERCLEAN" Shower Demonstration and Commercialization

Install, monitor and commercialize white-water recycling technology for paper-making industry

BACKGROUND

Most paper mills use fresh-water shower systems exclusively to spray paper pulp during processing. The fresh water must be heated from 55°F to 110°F, which consumes large amounts of energy. White water, available at the end of the paper-making process, is low-fiber-content process water that is heated and chemically treated. Recycling this heated water for use in shower systems has many benefits, including decreased energy costs, reduced fresh-water use, and reduced environmental impact of effluent components.

OBJECTIVE

To demonstrate and commercialize the "EVERCLEAN" Shower System designed by Shower Technology in an earlier phase of the project.

DESCRIPTION

The contractor will: (1) develop a project management plan; (2) sign a site agreement with the demonstration facility; (3) finalize the design; (4) purchase and assemble the system; (5) deliver and install the system; (6) monitor the system at the site; (7) ramp up manufacturing; (8) gather data on potential New York State installations; and (9) prepare final report and carry out technology transfer activities.

BENEFITS

This project will demonstrate and commercialize a new energy-saving shower technology that could help New York State paper companies become more competitive.

SCHEDULE AND STATUS

The demonstration at Mohawk Paper Mills in Cohoes is complete. The manufacturing ramp-up began in January 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$22,878	$6,812	$29,690
Shower Technology	2,000	25,881	27,881
Mohawk Paper Mills	5,300	0	5,300
TOTALS	$30,178	$32,693	$62,871

Contractor: Shower Technology
Site: Cohoes, Albany County, and Youngstown, Niagara County
Contract Duration: 8/97 - 6/99
Key Words: industrial process, product development, water recycling
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Process Improvements
Contract No.: 4049A-IABR-IA-95

-> Paper Drying by Hot Pressing

Develop and demonstrate new energy-efficient hot-press technology for use by paper industry.

BACKGROUND

GL&V/Black Clawson-Kennedy has developed a new hot-press technology that can reduce paper-drying energy. The technology can be used in the manufacture of all grades of paper and paperboard. The hot-press concept has been successfully demonstrated at the pilot scale and is now ready for full-scale demonstration and commercialization.

OBJECTIVES

To: (1) reduce the moisture content of corrugating medium sheet running through a press at a speed of 2,000 ft/min from a minimum of 60% to a maximum of 48%; (2) modify an existing roll-coating facility so that it can handle full-size paper machine rolls up to 72" diameter and 200" long, weighing up to 130,000 lbs; (3) develop a commercial design that can be adapted for use with most existing press arrangements; and (4) successfully demonstrate the press on a wide range of paper grades to New York State.

DESCRIPTION

The project will scale up the roll-coating process so that full-sized rolls can be manufactured. The project will also demonstrate the benefits of the hot-press technology to papermills throughout New York State. The contractor will: (1) develop specifications for the roller coating; (2) design and install the necessary roll-handling equipment in the roller-coating facility; (3) conduct durability testing on the hot roll-coating; (4) develop a commercial design for the hot press; (5) perform various marketing activities, including in-mill technical presentations at target paper companies and open house demonstrations; and (6) perform a detailed design of the first commercial installation.

BENEFITS

The technology has the potential to save up to 40% of the energy required to dry paper or paperboard sheet. In addition, many paper machines are limited in speed by their sheet-drying capability. Reducing the moisture content of the sheet as it leaves the press section would enable paper producers to increase production rates.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$200,000	$200,000
GL&V/Black Clawson-Kennedy	0	203,400	203,400
TOTALS	0	$403,400	$403,400

Contractor: GL&V/Black Clawson-Kennedy Pulp and Paper Machine Group USA Ltd.
Site: Watertown, Jefferson County
Contract Duration: 1/98 - 6/99
Key Words: product development, industrial process, gas
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Process Improvements
Contract No.: 4601-IABR-IA-98

-> Paper Sludge Pelletization Technology-Transfer Program

Conduct workshops to promote pelletized paper-mill sludge as boiler fuel.

BACKGROUND
Clarkson University and James River Corporation have been studying the feasibility of pelletizing sludge from the kraft paper process to use as a fuel. This ongoing project is looking at both the pelletization and combustion processes, as well as economic issues.

OBJECTIVE
To introduce paper sludge pelletization technology to New York State's paper industry.

DESCRIPTION
Clarkson will identify paper mills in New York that produce the appropriate sludges, and also will identify other companies that could use the pelletized material as a fuel. Two workshops will be conducted to present the results of this project and promote using pelletized paper-mill sludge as a fuel.

BENEFITS
Kraft paper-mill operations in New York could benefit from a lower-cost disposal option for their sludges. Pelletized sludge users could benefit from a lower-cost fuel.

SCHEDULE AND STATUS
Workshop materials and a analysis software package have been produced. An interest survey has been distributed. Final arrangements for one-on-one site presentation are proceeding.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA Petroleum Overcharge Funds	$150,000	0	$150,000
TOTALS	$150,000	0	$150,000

Contractor: Clarkson University
Site: Potsdam, St. Lawrence County
Contract Duration: 9/94 - 6/98
Key Words: university, environmental, sludge management, industrial waste, alternative fuels, industrial
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Industrial Process Improvements
Contract No.: 4059-IABR-POP-95

-> New York State Industrial Energy Use Profile

Develop database of energy, economic, and environmental trends of industrial sector.

BACKGROUND

The most recent in-depth profile of industrial energy use in New York State was conducted in 1977. The character of the State's manufacturing sector has changed significantly since then. New industry clusters have developed, some older industries have left, and many of those that remain have made plant and process adjustments to stay competitive. An in-depth, up-to-date evaluation of current industrial energy use in New York State would be invaluable to NYSERDA's program-planning efforts.

OBJECTIVES

To create an updated database of industrial energy-use factors in New York State that: (1) provides reliable estimates of current industrial energy use at the three- and four-digit SIC code level; (2) documents industrial energy use trends; and (3) analyzes the distribution of energy use as correlated to key economic factors such as the number and size of businesses, as well as the quantity and cost of energy used.

DESCRIPTION

The database will be constructed from all available data sources, including: the U.S. Department of Energy's Energy Information Administration, the U.S. Department of Commerce (Census Division), Empire State Development, and the New York State Department of Environmental Conservation. The analysis will develop such factors as: energy cost/value added, energy/labor cost, and energy/materials cost.

BENEFITS

This information will be used by NYSERDA to focus better on areas where benefits can be maximized and address the need to: improve efficiency in industrial processes; develop energy-efficient management of industrial waste; and develop advanced energy-related products and services that offer the potential to conserve or produce energy in the industrial sector and in local communities.

SCHEDULE AND STATUS

The database has been designed. Data are being collected and analyzed for use in the database. The U.S. Department of Commerce (Census Division) is reviewing the data we have requested from them for use in our database.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$152,500	$25,000	$177,500
TOTALS	$152,500	$25,000	$177,500

Contractor: Research Triangle Institute, North Carolina
Site: Statewide
Contract Duration: 7/95 - 12/98
Key Words: product development, industrial waste, industrial fuel use, end-use demand
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Energy Systems
Contract No.: 4228L-IABR-IA-96

-> Demonstration of Controlled Environment Agriculture Lettuce-Production Module

Demonstrate energy-efficient strategies for year-round production of lettuce in Cornell University greenhouse/pond system.

BACKGROUND

The domestic production of fresh vegetables and fruits in controlled environments (i.e., greenhouses) could experience significant growth. Controlled Environment Agriculture (CEA) crops will have consistent high quality, be available "out-of-season," and could be grown pesticide-free. New York fresh-vegetable markets (e.g., lettuce, tomatoes, spinach, and green peppers) are dominated by Sunbelt growers and foreign producers, who are gaining market share. Sales of these fresh vegetables imported into New York equal $1 billion/year, and are a rapidly growing market segment.

OBJECTIVES

To: (1) design, construct and operate a prototype greenhouse module to produce 1000 heads of lettuce/day and serve as a commercial demonstration of Cornell University's CEA lettuce-production system, and (2) to gather production and energy-use data from a commercially scaled facility and to study the marketing of a constant and consistent supply of lettuce.

DESCRIPTION

The project will demonstrate the effect of timing, duration, and intensity of supplemental lighting on lettuce-crop productivity and quality while controlling water, nutrients, CO_2, temperature, pests, and diseases. Agway staff will be trained in greenhouse production and energy management.

BENEFITS

The lettuce module will generate about $150,000 per year in sales revenue and support two growers. In addition, this facility will serve as Agway's training center to prepare future lettuce-module operators across the region.

SCHEDULE AND STATUS

Site preparation and final design work are finished. Procurement and construction are under way. Operation of the lettuce module should begin in the summer of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$244,000	$244,000
Agway, Inc.	0	350,974	350,974
ESEERCO	0	250,000	250,000
Cornell University	0	129,000	129,000
New York State Electric & Gas Corp.	0	103,000	103,000
Niagara Mohawk Power Corporation	0	75,000	75,000
Electric Power Research Institute	0	50,000	50,000
Westbrook	0	30,000	30,000
TOTALS	0	$1,231,974	$1,231,974

Contractor: Agway, Inc. & Cornell University
Site: Ithaca, Tompkins County
Contract Duration: 3/97 - 12/99
Key Words: assist business, process improvement, agricultural, lighting, electrotechnology
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4419-IABR-IA-97

-> Energy Management for Controlled Environment Agriculture Tomato Production

Use innovative lighting and ventilation systems to improve productivity of tomato-growing greenhouse.

BACKGROUND

The production of greenhouse tomatoes is growing in New York State. However, the technology and systems used are based on European experience and climate, which vary from New York's. Cornell University has developed a novel lighting strategy for greenhouse tomatoes that also affects the energy required for heating and ventilation. Tomato production has significantly increased in laboratory tests.

OBJECTIVES

To: (1) design and equip one section of a commercial greenhouse to operate on the lighting and ventilation principles tested in earlier Cornell experiments; (2) grow tomato crops for one year using the Cornell experimental system; (3) measure yield quality and grade of output; (4) calculate energy and other production costs per unit of production; and (5) develop production-cost models using electricity rates and weather conditions from three different climate zones in New York State.

DESCRIPTION

The project will involve demonstrating the lighting strategy in a greenhouse in Oswego, NY; calculating the costs and benefits of this approach compared to current practice; extrapolating these results to other climate zones in New York State; and publicizing the results of the project.

BENEFITS

Anticipated benefits include increased productivity in the greenhouse (lbs of tomatoes/yr/ft^2), with a target of 14 lbs/yr/ft^2; reduced unit-production cost ($/lb); reduced energy content (Btu/lb) compared to imported tomatoes; and increased greenhouse tomato production in New York State.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$187,597	$187,597
Cornell University	0	158,817	158,817
Atlantic Region Holdings, Ltd.	0	80,000	80,000
TOTALS	0	$426,414	$426,414

Contractor: Cornell University
Site: Oswego, Oswego County, and Ithaca, Tompkins County
Contract Duration: 4/98 - 7/00
Key Words: assist business, agricultural, lighting, electrotechnology
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 4724-IABR-IA-98

Construct and operate commercial tilapia production facility.

BACKGROUND

Controlled-environment aquaculture (CEAq) has the potential to be one of the most energy-efficient and cost-effective methods of producing protein for human consumption. Improved water quality is the key to CEAq success, permitting greater fish densities, which result in decreased costs for energy, labor, and capital per unit produced. To accomplish this, however, water-treatment technologies must be developed that are effective, energy-efficient, inexpensive to install, and reliable. Water-treatment technologies and fish-handling techniques developed at Cornell University's Aquaculture Research Facility have demonstrated these attributes at pilot scale; however, the technologies have not yet been demonstrated in a full-scale commercial facility.

OBJECTIVES

To: (1) minimize the energy use in CEAq production of freshwater species for human consumption, and (2) to assist in the commercial demonstration of innovative CEAq technologies in New York State. The technical objective is to reduce the total production costs from more than $1.00/lb (current) to less than $0.70/lb, with an energy cost of less than $0.17/lb. The project is consistent with our Agricultural Electrotechnology Program, where assistance is provided to encourage commercialization of high-yield, energy-intensive, and constant-output food-production technologies.

DESCRIPTION

Cayuga Aqua Ventures, LLC (CAV) will construct a full-scale commercial CEAq facility with an annual capacity of 300,000 to 660,000 pounds of tilapia. The module will incorporate an innovative water-treatment system, and will use harvesting and fish-handling techniques developed at Cornell. Facility operation will be optimized for maximum yield and energy costs per unit output. Concurrently, CAV will work with feed suppliers to develop an optimized feed mix. Following satisfactory completion of the first facility, up to nine additional units will be constructed to round out CAV's capacity to more than 6,000,000 pounds per year.

BENEFITS

Reduce the energy consumption of an emerging industry. Establish a new industry in NYS whose output reduces net imports of food and provides load growth for utilities. Commercialize technology piloted in the lab make availability less expensive, locally grown fish, without seasonal variations in quantity and quality, and without the risk of parasitic and bacteriological contamination associated with other fish, meat, and poultry.

SCHEDULE AND STATUS

Construction of Building #1 is complete. Breeding fish were introduced in November 1997. The first harvest of 1.5 pound fish is now scheduled for the first week in May 1998 (3 months ahead of schedule).

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$35,000	$165,000	$200,000
Cayuga Aqua Ventures, LLC	580,665	0	580,665
Electric Power Research Institute	0	0	60,000
New York State Electric & Gas Corp.	20,000	0	20,000
TOTALS	$635,665	$165,000	$860,665

Contractor: Cayuga Aqua Ventures, LLC
Site: Freeville, Tompkins County
Contract Duration: 6/97-6/99
Key Words: product development, electricity, wastewater treatment, agricultural
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Process Improvements
Contract No.: 4523-IABR-IA-97

-> Efficient Blower Development

Develop efficient locomotive blower system using advanced design techniques.

BACKGROUND

Auxiliary blowers are used on locomotives to cool a number of propulsion system components, including traction motors, alternators, and power control electronics. A typical locomotive uses approximately 100 horsepower to drive these blowers. In many cases, the blowers are run continuously at full load, even when the locomotive is idling and the equipment cooling requirements are low. Modern design techniques have not been applied to auxiliary blowers. As a result, they tend to be inefficient and are frequently subject to fatigue problems. In general, blower speed is not controlled to match cooling requirements.

OBJECTIVES

To design and develop an improved locomotive blower and control system that will replace an existing blower design (new and retrofit), decrease power consumption, and improve fuel efficiency.

DESCRIPTION

A commonly used existing blower system will be studied to determine performance and interface requirements. A parametric computer model of the blower system will be created to facilitate rapid new designs. A new blower system will be designed and constructed using an aluminum impeller, steel housing, a variable-speed drive/ controller, and control software. The new system will be tested for performance and structural integrity.

BENEFITS

Retrofitting the 2,000 locomotives that operate in NYS would reduce fleet fuel consumption by 20,000 gallons per day. The new and retrofit markets are expected to result in 20 new jobs at Super Steel's Glenville facility.

SCHEDULE AND STATUS

This project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$300,000	$300,000
Super Steel Schenectady, Inc.	0	996,456	996,456
Lockheed Martin Control Systems	0	188,899	188,899
TOTALS	0	$1,485,355	$1,485,355

Contractor: Super Steel Schenectady, Inc.
Site: Glenville, Schenectady County
Contract Duration: 3/98-2/99
Key Words: product development, industrial, rail
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Process Improvements
Contract No.: 4665-IABR-IA-98

-> Food Industry Technology Transfer Program

Expand use of new process technology by New York State food industry.

BACKGROUND

This technology transfer program was designed to increase knowledge and awareness of new process technologies among different segments of New York State's food industry and consulting engineers who may need to implement these technologies.

ACCOMPLISHMENTS

This project provided technical assistance services to three of the largest foo -industry subsectors (SIC 202 -- Dairy Products, SIC 1203 -- Preserved Fruits and Vegetables, and SIC 205 -- Bakery Products) and the engineering consultant community in the form of process-improvement manuals (approximately 200 distributed), three energy-improvement seminars (total attendance about 150), and three energy feasibility studies of innovative and efficient process modifications (economical cogeneration identified in two cases, along with less economical innovative opportunities).

FINDINGS AND CONCLUSIONS

Efficiency opportunities remain in the food industry, and innovative new technology continues to be developed, but the food industry remains reluctant to adopt new technology that might affect the safety or marketability of its food products. Competition for capital discourages investment in efficiency, such as cogeneration, when alternative investments might maintain production or develop new products.

REALIZED OR ANTICIPATED BENEFITS

While no measurable energy savings resulted directly from the information dissemination effort, the Cornell Extension Service did request additional copies of the manuals after the seminars. Manuals continue to be available at appropriate industrial events sponsored by NYSERDA.

TECHNOLOGY TRANSFER ACTIVITIES

Manuals continue to be available from NYSERDA.

FUNDING	TOTALS
NYSERDA	$314,286
American Consulting Engineering Council	50,000
Cornell University	29,958
NYCEC & NYACE*	24,000
TOTALS	$418,244

* in-kind services

Contractor: American Consulting Engineers Council/Research and Management Foundation
Site: Statewide
Contract Duration: 10/88-9/97
Key Words: assist business, industrial process, heat recovery, food industry, drying, separation, refrigeration, technology transfer
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry and Applications
Subprogram: Process Improvements
Contract No.: 1122-EEED-IEA-90

-> Energy Efficiency in Controlled-Environment Agriculture

Develop energy-management strategies for controlled-environment agriculture.

BACKGROUND

Producing fresh vegetables and fruits in New York State in controlled environments (e.g., greenhouses) shows much promise due to water-quality problems in major vegetable-growing states and controlled-environment agriculture (CEA) trends in the Northeast and overseas for vegetables and ornamentals. However, these out-of-season, fresh vegetable markets (e.g., lettuce, tomatoes) for CEA crops are now dominated by foreign producers, with limited New York State output. CEA crops have consistently high quality, are available out of season, and can be grown virtually pesticide-free. Reliable production of CEA crops will depend on electricity for supplementary lighting in the winter and ventilation in the warmer months.

ACCOMPLISHMENTS

Crop production and model development for lettuce, spinach, pak choi, and tomatoes, as well as luminaire testing, have been completed. Software and technical assistance information for growers of the four crops has been developed. Agway has made investments to commercialize the results of this project, including a lettuce greenhouse/pond system to be demonstrated in Ithaca.

FINDINGS AND CONCLUSIONS

The project has shown the positive effect of timing, duration, and intensity of supplemental lighting on crop productivity and quality while controlling water, nutrients, carbon dioxide, temperature, pests, and diseases. The project developed full- or partial-growth models for each crop to predict the effect on crop productivity of various lighting scenarios. Efforts to determine optimum lighting regimes for the principal CEA crops have had varying success. User-friendly computer software and technical information has been prepared for use by utilities and potential CEA growers. Researchers have developed model duty factors for ventilating CEA facilities to predict electric energy use by staged-fan systems, and they have evaluated the lighting efficiency of high-intensity-discharge (HID) luminaires.

REALIZED OR ANTICIPATED BENEFITS

This project has provided utilities, government, and industry with the means to achieve demand-side management within New York's emerging CEA industry while enhancing the economic benefits of CEA in the State

TECHNOLOGY TRANSFER ACTIVITIES

Follow-up research and demonstration projects are occurring with lettuce and tomato production systems based on the work in this project. A final report in both written and CD format has been prepared, and Cornell has set up a web site that covers the CEA work performed in this project, as well as other CEA research beyond the scope of this project.

FUNDING	TOTALS
NYSERDA	$365,325
Cornell University	723,658
ESEERCO	277,000
New York State Electric & Gas Corp	85,000
TOTALS	$1,450,983

Contractor: Cornell University
Site: Ithaca, Tompkins County
Contract Duration: 4/91-12/97
Key Words: assist business, university, agricultural, demand-side management, lighting, industrial process
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Process Improvements
Contract No.: 1548P-EEED-IE-91

->Electronic Printing of Textiles

Develop innovative computer-controlled ink-jet technology for textile-printing industry.

BACKGROUND

The current methods for printing textiles are engraved-roller, subminable dye-transfer, flat-screen, and rotary-screen, which is the most widely used. While the rotary-screen method enables fast production, it has drawbacks in overall energy efficiency, and wastes water, solvents, fabric, and dyestuff. Rotary-screen printing also requires a significant capital investment and lead-time to produce new textile designs.

ACCOMPLISHMENTS

During Phase I, a printhead/ink system suitable for textile printing was developed and tested. Clarkson University developed a set of dyes suitable for use in commercially available ink-jet printheads. During Phase II, a full-width ink-jet print system was designed, assembled, tested, and evaluated. In addition, a software system was developed that performs the necessary color translation between computer-based images and the Clarkson-developed pigments. This produces an image on fabric that is very close to the original image as seen on the monitor.

FINDINGS AND CONCLUSIONS

The project demonstrated the feasibility of using specially prepared textile dyes in commercially available ink-jet printheads for use in on-demand textile printing. The project also identified the complexities involved in this activity, including color translation, printhead location control, fabric movement control, dye distribution control, and printhead service life to name a few.

REALIZED OR ANTICIPATED BENEFITS

This project has laid the groundwork for possible development of a new textile printing industry. At the start of this project, no companies were publicly involved with this technology. By the end of Phase II, however, a major printer manufacturer had announced future availability of a similar, larger device. On-demand textile printing will reduce waste and lead-time.

TECHNOLOGY TRANSFER ACTIVITIES

Commercialization of this technology is currently being studied.

FUNDING	TOTALS
NYSERDA	$274,157
Artisan Textiles	54,000
Rensselaer Polytechnic Institute	224,886
Clarkson University	53,725
TOTALS	$606,768

Contractor: Artisan Textiles
Site: Troy, Rensselaer County
Contract Duration: 6/94 - 6/97
Key Words: university, product development, industry, textiles, printing, computer control
Project Manager: Ed Kear (518)862-1090, ext. 3269
Program: Industry and Applications
Subprogram: Process Improvement
Contract No.: 3100-EEED-IA-94

-> Efficient Silver Recovery from Alumina Catalyst

Developed and demonstrated innovative process to increase efficiency of silver removal and reuse from alumina catalyst.

BACKGROUND

Ames Goldsmith uses silver as a feedstock to make silver nitrate and silver oxide, which are used in the photographic, chemical, and electronics industries. The company produces 90% of the silver oxide used to manufacture batteries in the U.S. and is the industry leader for alumina catalyst refining. Ames processes more than one million pounds of spent alumina catalyst annually for silver removal and recovery. To meet increasing catalyst-refining demands, Ames needed to increase the capacity and energy/waste efficiency of its process.

ACCOMPLISHMENTS

Ames successfully developed a new process to refine spent alumina catalyst. Ames developed the new process using a pilot-scale system and working closely with its customers to maximize product quality. Once the process was refined to maximize process efficiency and product quality, a full-scale system was developed and installed.

FINDINGS AND CONCLUSIONS

As a result of the new catalyst refining process, Ames was able to increase it production capacity by 50% while decreasing process energy use and waste generation by 33% and 50%, respectively.

REALIZED OR ANTICIPATED BENEFITS

During 1996, Ames saved a total of $235,208 on energy consumption and waste disposal: $54,527 in natural gas costs, or 44,450 MMbtu; $51,664 in electricity costs, or 430,533 kWh; $4,872 in fuel oil purchases; and $124,145 in solid waste disposal fees. The company also saved approximately four million gallons of water and eliminated the emission of 481 tons of carbon dioxide. Ames also hired four new employees due to its increase in capacity.

TECHNOLOGY TRANSFER ACTIVITIES

Ames received a 1996 Governor's Pollution Prevention Award. A press event was held at Ames' facility in June 1997 and the facility was visited by more than 20 international energy experts as part of the American Council for an Energy-Efficient Economy Industrial Summer Study in July 1997.

FUNDING	TOTALS
NYSERDA	$261,935
Ames Goldsmith	263,243
TOTALS	$525,178

Contractor: Ames Goldsmith, Inc.
Site: Glens Falls, Warren County
Contract Duration: 8/94 - 8/97
Key Words: assist business, environmental, industrial waste, silver
Project Manager: Adele Ferranti (518) 862-1090, ext. 3206
Program: Industry
Subprogram: Process Improvements
Contract No.: 4028-IABR-IA-95

-> High-Temperature Extension Program

Transfer results of high-temperature-processing research program to industries.

BACKGROUND

Over a four-year period, Rensselaer Polytechnic Institute (RPI) conducted high-temperature-processing research funded under the Petroleum Overcharge Program. Five areas were investigated, among them high-temperature lubrication and seals and aluminum extrusion control. The program resulted in several beneficial findings that are now being transferred to industry.

ACCOMPLISHMENTS

RPI demonstrated both a taper-quenching system used in conjunction with aluminum extrusion, and the advantages of brush seals in high-temperature turbines and compressors.

FINDINGS AND CONCLUSIONS

The demonstration of the taper-quench system went extremely well. The participants were present during initial equipment setup and witnessed the first billet processed. The brush-seal demonstration also went well. The seals out-performed current state-of-the-art seals. Both demonstrations were well attended.

REALIZED OR ANTICIPATED BENEFITS

Keymark in Fonda (Montgomery County) is considering purchasing the system demonstrated at its facility. The taper-quench unit will alow Keymark to increase production levels while increasing product consistency and quality. The brush-seal design demonstrated by this project has generated interest in the industry.

TECHNOLOGY TRANSFER ACTIVITIES

RPI used live demonstrations, videotapes, seminars, and printed materials to carry out this technology transfer project..

FUNDING	TOTALS
NYSERDA	
Petroleum Overcharge Funds	$350,000
TOTALS	$350,000

Contractor: Rensselaer Polytechnic Institute
Site: Troy, Rensselaer County, and Fonda, Montgomery County
Contract Duration: 1/95 - 6/97
Key Words: university, industrial process
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Industrial Process Improvements
Contract No.: 4060-IABR-POP-95

-> Nuclear Magnetic Resonance Analyzer

Design circuit and mechanical specifications for low-cost, microprocessor-based nuclear magnetic resonance spectrum analyzer.

BACKGROUND

Classical wet-chemical methods for analyzing hydrogen and moisture in fossil fuel, the fat and moisture content of food, and the moisture content of a variety of products from pharmaceuticals to mining ores have been used decades. These techniques are slow and labor-intensive and require expensive wet-chemical facilities. Problems also arise in developing appropriate sample-preparation procedures and ensuring batch-to-batch repeatability. These techniques also are destructive in nature, which limits their usefulness.

ACCOMPLISHMENTS

The contractor conducted a market application survey and generated the nuclear magnetic resonance (NMR) general description and features. The contractor developed the theory of operation and design specifications, formulated the circuit descriptions, and created a business and marketing plan for use during commercialization.

FINDINGS AND CONCLUSIONS

The project successfully developed the design for a portable microprocessor-based NMR analyzer. The ability to design the unit with tremendous power and function using microprocessors was achieved. The analyzer will be more compact, less expensive, and be more functional than originally planned. Numerous applications were proposed for the analyzer, including the food, fossil fuels, and pharmaceutical industries. The contractor continues to interact with these industries, as well as to search out new applications such as monitoring the concrete curing.

REALIZED OR ANTICIPATED BENEFITS

As this project was just the initial fact-finding and design phase, there are no specific energy benefits to date. The proposed energy savings for specialized areas of ceramic manufacturing are estimated to be one-third of the electricity use for drying, which for a typical furnace would save 1,920 mWh per year.

TECHNOLOGY TRANSFER ACTIVITIES

Now that the market application study is completed, the contractor will develop a product that can be commercialized.

FUNDING	TOTALS
NYSERDA	$145,289
C4 Technologies, Inc.	60,800
NYS CACT	20,000
The Cortlandt Group	20,000
Info-Mall	22,500
APV Crepaco, Inc.	20,000
Advanced Refractory Technologies, Inc.	15,000
Central Hudson Gas & Electric Corp.	8,000
TOTALS	$311,589

Contractor: C4 Technologies, Inc.
Site: Wappingers Falls, Dutchess County
Contract Duration: 9/95 - 8/97
Key Words: product development, industrial process
Project Manager: Barbara Caropolo (518) 862-1090 ext. 3266
Program: Industry
Subprogram: Process Improvements
Contract No.: 4131-IABR-IA-95

-> Development of a Modular Ammonia-Absorption Machine

Design modular ammonia-absorption refrigeration system that uses low-grade waste heat to provide cooling for food-processing industry.

BACKGROUND

Many industries, particularly dairies, breweries, and other food processors, require low-temperature refrigeration for production and product storage. Refrigeration normally is provided using electric motor-driven mechanical compression systems. These industries could benefit from cogeneration technologies; however, the lack of an appropriate heat sink for the thermal energy often makes the application uneconomical. Absorption cooling technologies can use the waste heat from a cogeneration system while replacing some of the existing mechanical refrigeration. Systems using ammonia and water as the refrigerant-absorbent pair would be a good match for this application, but currently are available only as custom-designed units in large tonnages. A market exists for a small-capacity modular ammonia-absorption machine that will use waste heat from a companion prime mover to augment the capacity of a mechanical refrigeration plant.

ACCOMPLISHMENTS

This was the first phase of an anticipated three-phase (preliminary design, prototype development and testing, and field-testing) project. The preliminary design has been completed and a marketing study has been performed.

FINDINGS AND CONCLUSIONS

The results of the preliminary design indicate that it is possible to construct an ammonia absorption system capable of using the waste heat from an engine-generator set to economically provide a cold source at temperatures well below freezing.

REALIZED OR ANTICIPATED BENEFITS

The availability of this system would encourage the use of cogeneration at otherwise unsuitable sites. This will benefit users (primarily food processors) by decreasing overall energy costs and augmenting or replacing chlorofluorocarbon mechanical refrigeration capacity.

TECHNOLOGY TRANSFER ACTIVITIES

A marketing study was performed and a final report has been prepared.

FUNDING	TOTALS
NYSERDA	$94,339
Rochester Institute of Technology	12,654
CDH Energy Corporation	35,197
TOTALS	$142,190

Contractor: CDH Energy Corporation
Site: Cazenovia, Madison County, and Rochester, Monroe County
Contract Duration: 9/95 - 12/97
Key Words: environmental, university, industrial process, refrigeration, heat recovery
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Process Improvements
Contract No.: 4223-IABR-IA-96

-> Water Reuse and Metals Recovery in the Metals-Plating Industry

Recover and reuse water and metals in metals-plating industry.

BACKGROUND

Metal-finishing facilities typically have once-through systems that use large amounts of water, chemicals, and metals. Approximately 15,000 metals-plating firms in the U.S. generate about 10 million tons of plating waste annually; 3,000 of these firms are in New York State. Many opportunities exist for recovering and reusing plating baths and rinsewaters, as well as the plating metals. In some cases, commercially available technologies such as ion-exchange and ozonation could be used to recover and reuse metals-plating materials.

OBJECTIVES

To facilitate water and metals recovery and reuse technologies in the metals-plating industry. Plating wastes from five New York metals-plating firms will be analyzed to determine if commercially available technologies can be applied to various waste streams. Transfer of the relevant technologies to other New York State firms through a workshop and development of manuals is key to this project.

DESCRIPTION

SUNY/Buffalo, working with the New York State Center for Hazardous Waste Management and five New York State metals-plating companies, will develop treatability tests and manuals for evaluating water recovery and reuse technologies and practices based on the waste streams at each facility, and evaluate the applicability of ion-exchange systems, issues related to resin regeneration, and the use of ozonation and ultraviolet technologies for cyanide destruction. SUNY/Buffalo also will hold a workshop to disseminate the results of the project.

BENEFITS

This project will assist New York State metals-plating firms in evaluating and selecting recovery and reuse technologies appropriate for their waste streams. Ion-exchange systems may be a cost-effective, energy-efficient recovery strategy. Ozonation also may effectively replace alkaline chlorination for cyanide destruction and may be very compatible with ion-exchange systems.

SCHEDULE AND STATUS

Waste characterization manuals are being prepared. Testing is still under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$66,593	$15,065	$81,658
Research Foundation of SUNY	37,464	4,121	41,585
L.D. Mc Cauley/McGard, Inc.	9,666	0	9,666
General Super Plating Co., Inc.	9,666	0	9,666
Brainerd Manufacturing Co., Inc.	9,667	0	9,667
H.M. Quackenbush Inc,	0	5,500	5,500
Anoplate Corp.	0	5,500	5,500
TOTALS	$133,056	$30,186	$163,242

Contractor: Research Foundation of SUNY, SUNY/Buffalo
Site: Buffalo, Erie County
Contract Duration: 7/96 - 7/98
Key Words: assist business, environmental, industrial waste, metals-plating
Project Manager: Adele Ferranti (518) 862-1090, ext. 3206
Program: Industry
Subprogram: Industrial Waste Minimization
Contract No.: 4412-IABR-IA-97

Design, construct, and evaluate ion exchange/ozone/ultraviolet treatment system for water and metals recovery.

BACKGROUND

In another NYSERDA project (No. 4412-IABR- IA-97), the Research Foundation of SUNY, the Center for Hazardous Waste Management, Brainerd Manufacturing Company, and General Super Plating developed waste treatability studies and evaluated ion exchange for metals recovery and ozonation for treating cyanide-bearing waste. That project is nearly complete and has been very effective in helping the participating metal finishers better characterize their process waste streams and identify commercially available and innovative solutions to assist them in recovering process waste for reuse.

OBJECTIVE

To design, construct, and evaluate an ion-exchange/ozone/Ultraviolet (IXOX) system for water and metals recovery on individual plating lines (segregated waste streams). Ion-exchange facilitates water recycling, reducing the quantity of discharged wastewater. Ozone/UV treatment results in 96% total cyanide removal and is compatible with other technologies such as ion exchange and membranes.

DESCRIPTION

SUNY/Buffalo will work closely with Rotary Company, Inc. to design, assemble, and install two wastewater treatment systems that integrate ion exchange, ozonation, and ultra violet technologies . The IXOX systems will be tested in the SUNY/Buffalo laboratory and installed at both Brainerd and General Super Plating for in-process testing on plating lines.

BENEFITS

Preliminary estimates of energy savings associated with ion exchange for one metal-finishing facility discharging 90,000 gallons per day to a wastewater treatment facility are about 55,000 kWh/yr (75%). On average, metal finishers spend $100,000 a year on pollution abatement and consume about 213,000 gallons of water for every $100,000 in sales. The potential for savings is significant. Even with a 50% recovery rate, savings would be more than $50,000 annually.

SCHEDULE AND STATUS

The subcontract between the Rotary Co. and SUNY is being executed and system design is expected to begin this summer.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$182,289	$182,289
Research Foundation of SUNY	0	78,101	78,101
Rotary Company, Inc.	0	82,500	82,500
Oxygen Generating Systems, Inc.	0	4,200	4,200
Brainerd Manufacturing	0	10,000	10,000
General Super Plating	0	7,500	7,500
TOTALS	0	$364,590	$364,590

Contractor: Research Foundation of SUNY
Site: Buffalo, Erie County; Rochester, Monroe County; and Syracuse, Onondaga County
Contract Duration: 11/97-11/98
Key Words: assist business, environmental, ion exchange, water reuse, metals-plating
Project Manager: Adele Ferranti, (518) 862-1090, ext. 3206
Program: Industry
Subprogram: Waste Minimization
Contract No.: 4683-IABR-IA-98

-> Selective Spray System for Applying Catalysts in Electroless Plating

Evaluate spray technologies for selectively applying catalysts to different substrates.

BACKGROUND

Molded Interconnect Device, LLC (MID) designs and manufactures electronic components and subassemblies for a wide range of industries, including defense, automotive, telecommunications and biotechnology. The Rochester-based company uses innovative methods of integrating plastic injection molding, plating, coating, and circuit board manufacturing technologies to solve design problems and add value for buyers of electromagnetic impedance shielded plastic components. MID relies heavily on the application of conductive coatings to its products; this process currently produces 144,000 gallons of chromium-laden liquid waste per year.

OBJECTIVE

To evaluate the feasibility of using commercially available spray technologies to apply catalysts to various substrates. The catalysts will be used to activate surfaces for electroless plating and eliminate the need for a chromic acid etch.

DESCRIPTION

MID will work with spray-technology vendors and a catalyst manufacturer to evaluate commercially available catalytic spray-plating processes. MID will purchase and install a pilot-scale unit, evaluate the effectiveness of the technology with different catalyst formulas and substrates, and determine if the spray technology can be used in high-volume applications and incorporated into the existing process.

BENEFITS

Full-scale use of a spray technology is expected to reduce annual chromic acid waste by 10-30% (14,000-43,000 gallons) while reducing energy costs 5-10%. By applying catalysts with a selective spray process, MID could realize $1 million in new sales over the next few years. Approximately 12-16 jobs would be created to support the new sales.

SCHEDULE AND STATUS

The project is just under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$50,000	$50,000
Molded Interconnect Device	0	65,610	65,610
TOTALS	0	$115,610	$115,610

Contractor: Molded Interconnect Device, LLC
Site: Rochester, Monroe County
Contract Duration: 3/98-12/98
Key Words: assist business, waste minimization, environmental, industrial waste
Project Manager: Adele Ferranti (518) 862-1090, ext. 3206
Program: Industry
Subprogram: Waste Minimization
Contract No.: 4685-IABR-IA-98

-> Recovery and Reuse of Pickling-Acid Waste

Demonstrate closed-loop waste pickling-acid recovery system for use by iron and steel industries.

BACKGROUND

The high temperatures associated with metal processing cause surface oxides to form on the metal that are normally removed by "pickling," in which the metal is immersed in an aqueous acid solution. Pickling acids are contaminated by metal salts and eventually must be discarded, reducing productivity and quality control. In the U.S., about 250 million gallons per year of waste sulfuric acid is generated from iron- and steel-pickling operations. This acid must be neutralized with lime and disposed of at a cost of $1 to $5 per gallon. The Green Technologies Group (GTG) has developed the Pickliq process, which combines membrane-diffusion dialysis with conventional refrigerated crystallization to continuously recover sulfuric acid and produce a marketable non-hazardous ferrous-sulfate crystal.

OBJECTIVE

To design, construct, demonstrate, and monitor the Pickliq system. The process will be demonstrated at O.W. Hubbell and Sons, Inc., a galvanizing plant in New York Mills.

DESCRIPTION

Following design, construction, and installation, the demonstration unit will undergo an initial start-up and shakedown phase, followed by a three-month demonstration. During this time, production capacity, process efficiency, and product characteristics will be measured and evaluated.

INFACTIX of Rotterdam will conduct a market and economic analysis to profile the potential users of the Pickliq technology and the recovered ferrous-sulfate by-product. A literature search of information on pickling-process waste technologies and ferrous-sulfate applications will be conducted, as will a search of relevant databases dealing with known pickling-acid waste generators. A survey of potential Pickliq technology and ferrous-sulfate users will be conducted.

BENEFITS

Operating at full capacity, the O.W. Hubbell facility, a relatively small galvanizing facility, could save more than $300,000 per year in material and waste costs using the Pickliq system. One ton of steel processed/pickled generates approximately 100 pounds of waste. The U.S. metals-processing industry could save $250 million to $1.25 billion per year in landfilling costs associated with lime-neutralized pickling liquor. The Pickliq process also could reduce energy usage by about 5×10^{12} Btu per year.

SCHEDULE AND STATUS

The Pickliq system is fully operational. O.W. Hubbell is recycling pickling acids and selling the ferrous sulfate produced as a result of the recycling system. GTG is building a commercial system for its first customer. The final report is being reviewed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$235,846	0	$235,846
O.W. Hubbell and Sons, Inc.	235,846	0	235,846
TOTALS	$471,692	0	$471,692

Contractor: O.W. Hubbell and Sons, Inc.
Site: New York Mills, Oneida County; Pawling, Dutchess County; and Rotterdam, Schenectady County
Contract Duration: 9/95 - 5/98
Key Words: environmental, product development, industrial waste, electroplating
Project Manager: Adele Ferranti (518) 862-1090, ext. 3206
Program: Industry
Subprogram: Waste Minimization
Contract No.: 4202-IABR-IA-95

-> Demonstration of Membrane Technology for Dye Wastewater

Develop and demonstrate membrane technology for recovery and reuse of mixed-dye wastewater.

BACKGROUND

Compudye, Inc. dyes more than 8 million pounds of various textile fabrics annually. The company spends approximately $300,000 a year for water use and disposal. Another $330,000 is spent annually for natural gas, the majority of which is used to heat process water. The New York City Industrial Technology Assistance Corporation (ITAC) has helped Compudye evaluate energy efficiency and waste-minimization opportunities through NYSERDA's FlexTech Program and programs offered through the Hofstra University Industrial Assessment Center. Water recovery and associated heat recovery were primary recommendations resulting from ITAC's evaluation.

OBJECTIVE

To assist New York dye plants in reducing water use, water disposal, and energy requirements for heating process water. ITAC and Compudye will evaluate commercially available nanofiltration technologies for removing mixed dyes from waste- water. The water then will be reused by Compudye.

DESCRIPTION

Although membranes have been used in the textile industry for water recovery and reuse with single-dye applications, this application is innovative because Compudye's wastewaters contain many dyes. Nanofiltration will be evaluated for removal of solids and mixed colors. A pilot unit will be installed, operated, and tested at Compudye, and, if successful, at two other New York dye facilities that are participating in the project. Energy savings associated with hot-water recovery and reuse also will be evaluated.

BENEFITS

Preliminary estimates of water and sewer savings for Compudye are approximately $144,000 a year. Annual energy savings through the reuse of hot process water are estimated at 420,000 therms, or $139,000. Production costs will be significantly reduced, making Compudye more competitive. This project is helping at least three dye facilities address common waste and energy issues. There are approximately 17 other dye facilities in New York State that could benefit from this technology.

SCHEDULE AND STATUS

The pilot-scale system is being installed at Compudye. A demonstration is planned for summer.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$200,550	$200,550
Compudye, Inc.	0	200,550	200,550
TOTALS	0	$401,100	401,100

Contractor: Industrial Technology Assistance Corp.
Site: Maspeth, Queens County
Contract Duration: 4/97-12/98
Key Words: assist business, environmental, water, recovery and reuse, dyes
Project Manager: Adele Ferranti (518) 862-1090, ext. 3206
Program: Industry
Subprogram: Waste Minimization
Contract No.: 4514-IABR-IA-97

-> Anaerobic Digestion of Industrial and Municipal Waste

Design, construct, and demonstrate anaerobic digester for industrial and municipal waste.

BACKGROUND
By reducing the quantity of waste that must be disposed of, anaerobic digestion can minimize the energy required for waste treatment and disposal.

OBJECTIVE
To design, construct, and demonstrate a full-scale, five-ton-per-day anaerobic-digestion tank to process residential and industrial food-processing wastes.

DESCRIPTION
The Village of Bergen, Larsen Engineering, and Comstock Foods are evaluating anaerobic digestion as a waste disposal alternative to landfilling or using lagoons. The project will investigate facility loading rates and their impacts on biogas production, composition of the waste, and the effect of various waste "recipes" on biogas production and compost quality. The technology's economic and environmental feasibility will be analyzed. The project team will also evaluate markets for the dried waste that results from the process.

BENEFITS
Anaerobic digestion, a proven technology, may have many other applications in the food-processing industry. The production of biogas may help Comstock Foods meet its peak electric-demand requirements. In addition, the resulting compost will be used as a soil additive.

SCHEDULE AND STATUS
After operating for several months, the digester tank imploded, resulting in the project's ending prematurely. The Village is looking for other participants for a second phase to this project. The Village is revising the draft final report.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$320,085	0	$320,085
Village of Bergen	152,330	0	152,330
Comstock Foods	134,428	0	134,428
Larsen Engineers (in-kind)	126,149	0	126,149
TOTALS	$732,992	0	$732,992

Contractor: Village of Bergen
Site: Bergen, Genesee County
Contract Duration: 12/92 - 5/98
Key Words: environmental, assist business, industrial waste, wastewater treatment, municipal
Project Manager: Adele Ferranti (518) 862-1090, ext 3206
Program: Industry
Subprogram: Waste Minimization
Contract No.: 1906M-EEED-IEA-93

-> Waste Minimization in Whiteware Manufacturing

Apply advanced ceramic-processing theory to identify and reduce causes of defects in whiteware-manufacturing process.

BACKGROUND

Problems encountered during the plastic-forming process when producing dinnerware and high-tension electric insulators represent approximately $16 million in lost energy, raw materials, and labor in New York State every year. New York State College of Ceramics at Alfred University has identified a new technique for characterizing plasticity of clay-based systems that can be used to correlate variations in raw materials and colloidal-suspension behavior with changes in plasticity, that lead to defective products.

OBJECTIVE

To establish relationships among raw materials, colloidal suspension rheology and plasticity, and the manufacture of defective whiteware products.

DESCRIPTION

This project will be performed in two phases. In Phase I, Alfred will characterize raw materials and colloidal-suspension stability and rheology to develop a fundamental understanding of the factors that affect the processing and processability of whitewares. In Phase II, Alfred will work with the industrial partners to correlate the relationships developed under Phase I with the occurrence of defects in the normal production process. Scale batches will be produced and evaluated to determine the range of plasticity necessary to minimize waste.

BENEFITS

New York State's whiteware manufacturers will benefit from the development of techniques to minimize defects in their processes, that currently account for approximately 20-25% of total production.

SCHEDULE AND STATUS

Phase I has been completed and the Phase I report is being written. Phase II is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$94,451	$130,000	$224,451
Alfred University (NYSCC)	30,000	65,000	95,000
Buffalo China	43,500	84,460	127,960
Syracuse China	0	66,400	66,400
Victor Insulator	22,300	58,300	80,600
TOTALS	$190,251	$404,160	$594,411

Contractor: New York State College of Ceramics at Alfred University
Site: Alfred, Allegany County; Buffalo, Erie County; Syracuse, Onondaga County; and Victor, Ontario County
Contract Duration: 9/95 - 9/99
Key Words: assist business, environmental, university, industrial waste
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Waste Minimization
Contract No.: 4217-IABR-IA-96

-> Isopropyl Alcohol Recovery and Reuse

Develop resin-based purification system for continuously reprocessing waste isopropyl alcohol for high-purity applications

BACKGROUND

High-purity isopropyl alcohol (IPA) is used as a solvent in the manufacture of semiconductors. In fact, each year the semiconductor industry consumes 5.6 million gallons of IPA. IPA is considered to be the next industrial chemical targeted for recovery and reuse by the semiconductor industry after sulfuric and hydrofluoric acids. Present practices for handling waste IPA include off-site disposal or distillation for reprocessing and recovery/reuse. As an alternative to energy-intensive distillation, Stainless Design Corp. (SDC) of Saugerties developed a resin-and-molecular sieve system to purify waste IPA. SDC manufactures high-purity gas and handling systems for the semiconductor industry.

ACCOMPLISHMENTS

SDC designed and assembled a prototype IPA reprocessor that uses a resin-bed system instead of distillation to produce IPA with contaminants classified in parts per billion (PPB).

FINDINGS AND CONCLUSIONS

SDC's IPA Reprocessor uses molecular sieve beds to reduce water to less than 100 parts per million (PPM), activated carbon to remove organics and organo-metallics, and several filtration systems to reduce particulates as small as 0.02 microns. The resin system is a cost-effective replacement for distillation.

REALIZED OR ANTICIPATED BENEFITS

Laboratory tests of the prototype system indicate that energy savings associated with SDC's IPA Reprocessor range from 70-85% when compared to distillation and pervaporation technologies. Capital costs are 15-30% less while maintenance costs are reduced by more than 80%. The payback for SDC's system is 14 months. A facility reprocessing 75 gallons of IPA can save $36,000 a year through on-site recovery and reuse.

TECHNOLOGY TRANSFER ACTIVITIES

SDC featured the technology at SEMICON West, a paper was presented at the Semiconductor Pure Water and Chemicals Conference, and a final report has been prepared.

FUNDING	TOTALS
NYSERDA	$254,652
Stainless Design Corp.	223,543
Rensselaer Polytechnic Institute	34,800
TOTALS	$512,995

Contractor: Stainless Design Corp.
Site: Saugerties, Ulster County, and Troy, Rensselaer County
Contract Duration: 3/94 - 11/97
Key Words: product development, environmental, industrial process, membranes
Project Manager: Adele Ferranti (518) 862-1090, ext. 3206
Program: Industry
Subprogram: Waste Minimization
Contract No.: 3105-EEED-IEA-94

->Reducing Toxic Effluents from Metal Organic Chemical Vapor Deposition Processes

Develop effluent-reduction/monitoring system for use with metal organic chemical vapor deposition processes.

BACKGROUND

As metal-feature sizes decrease with each new generation of integrated circuits, new metal-deposition processes must be developed to keep pace with the need for finer pitches at the different wiring levels. At the submicron realm, Metal Organic Chemical Vapor Deposition (MOCVD) processes developed by CVC Products, Inc. of Rochester significantly reduce processing time, material consumption, and energy use compared to conventional physical vapor deposition processes currently used. Problems associated with the toxicity of MOCVD reaction products, however, must be addressed before this technology will be viable from an ecological and worker safety viewpoint.

ACCOMPLISHMENTS

An effluent-monitoring system based on mass spectrometry was developed. Laboratory experimentation at Clarkson University was conducted using the monitoring system to evaluate various candidate treatment technologies. The most promising candidate (a filter trap) was evaluated by CVC on a commercial-sized reactor using the monitoring system.

FINDINGS AND CONCLUSIONS

A filter trap and a monitoring system were successfully developed and tested. Further development of MOCVD should not be hampered by concerns about effluent control.

REALIZED OR ANTICIPATED BENEFITS

Integrated circuits manufactured using MOCVD can be more powerful and energy-efficient than those currently available. Integrated-circuit manufacturers and computer users will benefit. CVC will benefit from improved competitiveness. Clarkson will benefit from real-world experience.

TECHNOLOGY TRANSFER ACTIVITIES

CVC is incorporating the results of this project into its effort to develop a MOCVD copper process.

FUNDING	TOTALS
NYSERDA	$120,000
CVC Products, Inc.	130,000
Clarkson University	16,000
TOTALS	$266,000

Contractor: CVC Products, Inc./Clarkson University
Site: Rochester, Monroe County; Potsdam, St. Lawrence County; and Albany, Albany County
Contract Duration: 12/94 - 6/97
Key Words: product development, university, materials
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Waste Minimization
Contract No.: 4016-IABR-IA-95

->Eliminating Zinc, Cadmium, and Cyanide in Electroless Nickel-Plating

Develop and demonstrate non-zincate activator for electroless nickel-plating.

BACKGROUND

In electroless nickel (EN)-plating, nickel is deposited on a substrate without using electrodes or any external source of electricity. A zincate activator bath is used to prepare aluminum substrates before EN plating. Zincate contains zinc, nickel, cadmium, and cyanide, and has a pH of 11.5, while most EN baths have a pH of 4.5. This pH difference results in pits and nodes on a plated surface. As a result, excess coating is applied and polished off to obtain a smooth surface. Together with Le Kem, Inc., Metal Arts has developed a non-zincate activator bath (Microsmooth™) with a pH more compatible with the EN bath. Metal Arts targeted two aluminum applications for this technology: computer rigid memory disks (RMDs) and automotive wheels.

ACCOMPLISHMENTS

Metal Arts set up a pilot computer disk metal-plating line and plated and evaluated thousands of RMDs in cooperation with several manufacturers. Metal Arts also conducted several in-process demonstrations at an IBM disk-manufacturing facility in Minnesota. The company also worked closely with Alcoa on a new plating process for automotive wheels.

FINDINGS AND CONCLUSIONS

Metal Arts successfully demonstrated that its non-zincate activator bath produced a superior surface on RMDs in terms of adhesion characteristics, corrosion resistance, uniformity, and hardness. The non-zincate activator bath eliminates the need for eight pretreatment steps (i.e., plating tanks) including two acid-etching steps. The Microsmooth™ technology also showed promise as a corrosion barrier for aluminum automotive wheels, although additional worked is needed to address applications in the automotive industry.

REALIZED OR ANTICIPATED BENEFITS

Energy savings associated withe the Microsmooth technology are estimated at 60%, primarily due to reduced heating needs as tanks are eliminated. The amount of nickel used in the plating process is reduced by 20% due to the more uniform surface that results with the non-zincate activator and the reduced need for grinding to generate a smooth surface. Overall production times have been decreased as steps are eliminated. Several unexpected benefits associated with the project include the elimination of the acid-etch pretreatment steps and the compatibility of the Microsmooth™ technology with non-aluminum surfaces.

TECHNOLOGY TRANSFER ACTIVITIES

Metal Arts has entered into an agreement with a significant player in the RMD industry to further develop and commercialize the technology. It has also presented papers at several NYSERDA/U.S. Department of Energy/U.S. Environmental Protection Agency conferences and demonstrated the technology for numerous manufacturers. A final report has been prepared.

FUNDING	TOTALS
NYSERDA	$325,010
Metal Arts Company, Inc.	325,010
TOTALS	$650,020

Contractor: Metal Arts Company, Inc.
Site: Geneva, Ontario County, and Rochester, Monroe County
Contract Duration: 6/95 - 10/97
Key Words: environmental, product development, industrial waste, electroplating
Project Manager: Adele Ferranti (518) 862-1090, ext. 3206
Program: Industry
Subprogram: Waste Minimization
Contract No.: 4090-IABR-IA-96

-> Dynamic, Variable-Area, Rechargeable Zinc-Air Battery

Develop, assemble, and optimize prototype zinc-air battery for portable electronic and electric-vehicle applications.

BACKGROUND

Traditional batteries, with their "fixed-area designs" in which every unit (size/weight) of anode is nearly matched with that of cathode, electrolyte, and container, have low energy density, among other limitations. A new, rechargeable zinc-air battery has been designed that uses dynamic variable-area multiple electrodes for charging and discharging. Fresh zinc anode, in the form of porous thin foil, is continuously passed under or coupled to a discharge cathode (wet-proofed, catalyzed carbon). Oxygen from air is supplied through a membrane to carry out the "redox" reaction. The zinc-oxide foil is continuously wound onto another roll. At the end of a cycle, the zinc-oxide sheet is unrolled under an external charge for recharging.

OBJECTIVE

To assemble and demonstrate a fully operational prototype with specific energy output in the range of 300 to 500 Watthr/kg. Phase I will address fundamental issues related to both portable electronic and electric-vehicle applications. In phase II, a prototype suitable for the portable electronic market will be assembled. To serve the electric-vehicle market, the new zinc-air battery will need to address both range and cost, which are a function of volume. Range, however, is a function of total on-board energy and the efficiency with which it is used. The zinc-air battery with fresh anode feed at 500 Watthr/kg would allow a range of up to 500 miles.

DESCRIPTION

The contractor will (1) assemble for demonstration a fully operational model with energy outputs in the range of 300 to 500 Watthr/kg and fast recharging capabilities; (2) establish discharge/recharge capability; (3) measure anode passivation rates, reaction kinetics and ZnO stability, and adherence to the substrate; (4) replace the currently used thick roll of zinc with a tape that has a thin layer of zinc; (5) optimize zinc film's thickness, conductivity and stability; (6) develop seals to contain the electrolyte; (7) optimize the electrolyte for conductivity; (8) design and assemble a prototype battery; (9) optimize the prototype battery's power- and energy-density, recharge capabilities, and system integration; and (10) conduct marketing study.

BENEFITS

The portable electronics and electric-vehicle industries both could use this novel battery, which could lead to notebook computers and camcorders operating for days and cellular phones for weeks before needing a recharge. With this battery, electric-vehicle ranges would be competitive with those of conventional gasoline-powered vehicles. The near-term portable electronics market is estimated at $10 million per year, while the longer-term electric-vehicle market is enormous. This technology could make New York State home to this high-growth-potential battery industry.

SCHEDULE AND STATUS

Prototype battery units suitable for both microelectronic and transportaion applications have been assembled and tested. Prototype optimization is in progress.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$134,937	$180,026	$359,963
Reveo, Inc.	359,749	0	434,749
TOTALS	$494,686	$180,026	$794,712

Contractor: Reveo, Inc.
Site: Hawthorne, Westchester County
Contract Duration: 9/96 - 10/98
Key Words: product development, battery, materials, electric vehicle
Project Manager: Nag Patibandla and Richard Drake (518) 862-1090, ext. 3301 and 3258
Program: Industry; Transportation
Subprogram: Materials Advancement; Alternative Fuels for Vehicles
Contract No.: 4366-IABR-IA-97

-> Polymer-Derived Ceramics for Energy Conservation

Scale up production of pre-ceramic polymer used to produce low-cost silicon carbide

BACKGROUND

The production of ceramic parts has high energy requirements due to the need for very high temperatures and long hold times. Techniques that require lower processing temperatures and shorter hold times could significantly decrease energy consumption. With NYSERDA help Starfire had developed a high-yield silicon carbide (SiC) polymer called Allylhydridopolycarbosilane (AHPCS). AHPCS may be used to produce high-density, high-purity SiC parts at a cost lower than chemical precursor routes (e.g., chemical vapor infiltration) but higher than conventional techniques due to the high cost of AHPCS.

OBJECTIVE

To scale up production of the AHPCS polymer and bring down the cost of production using automation, energy-conserving methods, and economies of scale.

DESCRIPTION

The immediate project goals are to scale up the production of AHPCS polymer, reduce its production costs by at least 35%, and produce ceramic components suitable for use in energy intensive applications. The polymer cost reduction will be accomplished by automating the process, adopting energy-conserving methods, and increasing the batch size. The resulting polymer will be used to produce prototypes of a new high-efficiency hot gas filter and ceramic cardboard.

BENEFITS

Use of a pre-ceramic polymer drastically reduces the energy used to manufacture SiC parts and components. Reducing the cost of the polymer will make a number of new applications possible. The high-efficiency hot gas filters can be used to mitigate air pollution from coal-fired boilers, chemical plants, and incinerators. The project will enable Starfire to fill a $1.2-million order for the polymer and lead to commercialization of a broad range of ceramic products.

SCHEDULE AND STATUS

Production scale up via installation of multiple units is in progress.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$99,841	$150,000	$249,841
Starfire Systems	47,000	2,822,000	2,869,000
TOTALS	$146,841	$2,972,000	$3,118,841

Contractor: Starfire Systems, Inc.
Site: Watervliet, Albany County
Contract Duration: Equity Investment
Key Words: product development, energy-efficient processing, polymer precursor, ceramics
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4720-IABR-IA-98

-> High-Strength Silicon Carbide Gas Igniters

Design, fabricate, test, and market high-strength sintered silicon carbide (SiC) gas igniters used in dryers, ranges, and other gas-heated appliances.

BACKGROUND

Standard Ceramics, Inc. (SCI) developed and patented a high-strength, low-cost, electrically conductive silicon carbide (ECSC) material. ECSC can be processed using a simple pressureless sintering treatment. In this project, SCI will develop a sturdy hot-surface gas (HSG) igniter for cloth dryers, ranges, hot water tanks, and furnaces. About 10 percent of the natural gas used by gas-fired appliances is consumed by their pilot-light ignition systems. The current HSG igniters are made from siliconized or recrystallized silicon carbide using an outdated process that wastes materials and energy, resulting in products with low strength, uncontrollable properties, and low yield. SCI's new ECSC technology results in products with high strength, tight property control, and much simpler and cleaner processing.

OBJECTIVES

To develop a sturdy and reliable gas igniter from ECSC for lighting gas-burning systems by taking advantage of the ECSC technology that provides a combination of desired electrical properties and mechanical strength. Specifically, to process a strong, near-net-shape hot-surface igniter that is both energy- and material-efficient and is superior to and cheaper than currently available ones. Also, to develop and define a near-net-shaping mass-production technology, such as dry-pressing and injection molding, to fulfill the market demand.

DESCRIPTION

The contractor will (1) fine-tune both composition variables, such as starting SiC powder feeds and amount of sintering additives; and processing variables, such as sinter time and temperature, to obtain a reproducible ECSC product; (2) carry-out basic material characterization; (3) develop retrofit design(s) of ECSC igniters compatible with popular holders; (4) fabricate HSG-igniters via conventional green-forming and sintering techniques; (5) characterize and test green igniters; (6) fabricate sintered-ECSC igniter assemblies; (7) optimize both process and properties; and (8) develop commercialization and marketing strategies.

BENEFITS

The process to produce the ECSC is much simpler than the currently used recrystallized-SiC process technology. In the ECSC process, the igniters are green-shaped and sintered at a temperature lower than the recrystallization temperature. It will take only one sintering furnace run to achieve the right electrical property for SCI's ECSC products, while the currently used technology averages four furnace runs for each igniter. The electricity savings for furnacing is about 1.56×10^{10} Btu. The market for HSG igniters in 1994 was $54 million, and it is expected to double by the year 2000. SCI is expected to capture about 10 percent of the HSG igniter market which will translate into annual revenues of $20 million.

SCHEDULE AND STATUS

Fully characterized igniters have been submitted to American Gas Association (AGA) labs for certification. The final report is being prepared..

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$212,889	0	$212,889
Standard Ceramics, Inc	496,740	0	496,740
TOTALS	$709,629	0	$709,629

Contractor: Standard Ceramics, Inc.
Site: Niagara Falls, Niagara County
Contract Duration: 9/95 - 6/98
Key Words: product development, materials, igniters
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4152-IABR-IA-96

-> Silicon Nitride-Bonded Silicon Carbide for Refractory Applications

Develop, field-test, and commercialize higher-strength and better wear-, corrosion- and thermal-shock-resistant silicon carbide kiln furniture.

BACKGROUND

Silicon carbide is a high-strength, high-temperature, wear- and corrosion-resistant structural and refractory material. Most ceramic-manufacturing operations require such refractory materials. A significant component of the operating energy is used to heat up the refractory system itself. In an earlier phase, a higher strength, higher bulk-density and improved oxidation- and thermal shock-resistant silicon nitride-bonded silicon carbide (SNBSC) for refractory applications such as kiln furniture (components of a bookshelf type of structure that supports the oven load) was developed. SNBSC can support the currently used levels of firing load with less mass because of its higher strength, thus reducing kiln energy consumption. For a typical kiln, energy savings of between eight and 24 percent can be expected, depending on the oven size.

OBJECTIVES

To produce and commercialize high-strength SNBSC materials for refractory applications such as kiln furniture (shelves, posts, beams, etc.), tiles, burner tips, valve liners, and high temperature nozzles. To scale-up the present processing capability both in terms of size of the refractory product and the capacity of the batch. To install and use production size materials handling equipment and firing kiln.

DESCRIPTION

The contractor will (1) characterize the fired density of the SNBSC material; (2) optimize the oxidation- and creep-resistance; (3) determine quality control tests and guidelines for production; (4) install production scale equipment; and (5) produce prototypes for field tests, customer trials and marketing. In addition, the contractor will pursue establishing firing conditions for both electric and gas-fired ovens and reducing the processing costs by acquiring and using a gas-fired oven.

BENEFITS

Use of SNBSC material would allow design of lighter kiln furniture with the same load-bearing capacity. For example, use of thinner SNBSC batts or setter tiles at Corning Inc.'s Erwin, NY plant could result in energy savings of about 25 percent or 16 million Btu per load (assuming 0.20 Btu/lb/°F). For the six kilns located at this facility, the energy savings would be about 10 billion Btu, or some $50,000 per year (two kiln cycles per week). The U.S. market for this type of refractory material is about $20 million. As a manufacture of SNBSC products, the contractor is expected to add jobs and revenues to New York State. SNBSC refractories are expected to be superior to and cheaper than their commercially available counterparts.

SCHEDULE AND STATUS

The contractor has successfully completed phase I and demonstrated market acceptance of the SNBSC refractory products ahead of schedule. High temperature oxidation- and creep- resistance have been identified as the major barriers to commercialization. Tasks aimed at addressing these two issues are being pursued.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$97,890	0	$187,197
Silicon Carbide Products, Inc.	101,886	0	220,269
TOTALS	$199,776	0	$407,466

Contractor: Silicon Carbide Products, Inc.
Site: Painted Post, Steuben County
Contract Duration: 10/95 - 10/98
Key Words: product development, materials, ceramics, silicon carbide
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4238L-IABR-IA-98

-> Sialon Reticulated Ceramics for Energy-Related Applications

Fabricate and optimize prototypes of reticulated sialon -infrared burners, -radiant tube inserts, -volume burners, and -hot gas filters.

BACKGROUND

Sialons are silicon-aluminum-oxygen-nitrogen compounds used to make high temperature wear/corrosion-resistant ceramic parts. Reticulated ceramics are open-celled, foam-like materials with continuous solid and pore phases used in molten infrared/volume burner, radiant tube insert, metal/hot gas filtration, incinerator baffle and kiln furniture applications. Fabricating these shapes using conventional processing methods is energy consuming. Benchmark Structural Ceramics Corporation, the subcontractor, developed a controlled combustion synthesis process that uses significantly less energy; this makes sialon components cost-competitive with other reticulated ceramics.

OBJECTIVES

To develop a low-cost sialon reticulated ceramic and demonstrate prototype fabrication capability. Specifically, to fabricate and test low-cost sialon reticulated ceramic components such as infrared burners, radiant tube inserts, volume burners, and hot-gas filtration components. Also, to produce prototypes, identify and assess the four above-named applications, and identify additional leading energy-related applications for reticulated sialons.

DESCRIPTION

The contractor will (1) optimize the starting raw material characteristics and the densification/sintering process; (2) fabricate base line test-coupons for property testing, optimization, and enhancement; (3) identify and analyze product opportunities; (4)fabricate prototypes; and (5) develop a thermal and mechanical properties data base. The subcontractor will optimize the sialon powder characteristics, properties, bake out and sintering procedures and advise on material and process economic issues.

BENEFITS

Conventional sialon processing costs some $130/kg, that includes energy costs of some $50/kg. Benchmark's CCS process will cost less than $11/kg and includes energy costs of 70 cents/kg, representing a 98% reduction in the processing energy inputs. The reticulated sialon components will meet the high temperature and high thermal shock-resistance requirements and allow higher operating temperatures leading to significant energy savings in operation. The applications identified in this proposal are much broader and represent a good market.

SCHEDULE AND STATUS

Characterization of samples made from alternative sialon powders has been completed. Long-term testing of prototype parts is in progress.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$125,063	0	$125,063
Hi-Tech Ceramics, Inc.	125,063	0	125,063
TOTALS	$250,126	0	$250,126

Contractor: Hi-Tech Ceramics, Inc.
Site: Alfred, Allegany County
Contract Duration: 6/95 - 10/98
Key Words: product development, materials, composites, ceramics, sialon.
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4208-IABR-IA-96

-> Alternative Method for Forming Silica-Free Ceramics

To develop and begin commercial use of a non-silica, freeze-sensitive binder system for forming silica-free ceramics.

BACKGROUND

Blasch Precision Ceramics, a 50-employee firm with $5 million in sales, manufactures precision ceramics via a patented freeze-drying process that uses a silica binder system. However, refractory and ceramic applications totaling $15 million/year in the U.S. alone cannot tolerate silica/silicon contamination. Blasch's pursuit of silica-free ceramics led to alternative processing methods that require high-temperature (>2800°F) firing (e.g., mullite-bonded ceramics) or significant modifications to its manufacturing line.

OBJECTIVE

To develop an alternative binder system for use in freeze-forming silica-free ceramic shapes. These silica-free shapes can be processed (fired) at temperatures much lower than those needed to form mullite bonding.

DESCRIPTION

Blasch will work with Clarkson University's Center for Advanced Materials Processing (CAMP) to investigate various binder systems that combine speciality organic and commercially available aluminum hydroxide binders. The primary tasks are aimed at: (1) wet-mix property optimization, (2) wet-mix stability and working time optimization, (3) wet- and dry-strength evaluation and optimization, (4) new binder system evaluation, (5) initial commercialization and marketing effort, and (6) prototype component preparation, evaluation, and field-testing.

BENEFITS

Commercial use of a "silica-free" binder system would save $14,000 per year in electric bills based on 100 kiln loads/year. Also, because the new binder system is expected to work at low temperatures, it would eliminate the need to purchase and install a high-temperature kiln, the annualized cost of which is about $71,000. In addition, Blasch will make an entry into the silica/silicon contamination-sensitive refractory and ceramic market, which is estimated at $15 million per year. The price and near net-shape processing advantages of Blasch's process are expected to help the company quickly capture a fair market share.

SCHEDULE AND STATUS

Characterization of commercially available latex polymer binders and wet-mix optimization are in progress.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$100,000	$100,000
Blasch Precision Ceramics	0	73,640	73,640
Clarkson University	0	26,360	26,360
TOTALS	0	$200,000	$200,000

Contractor: Blasch Precision Ceramics, Inc.
Site: Albany, Albany County, and Potsdam, St. Lawrence County
Contract Duration: 3/98 - 10/99
Key Words: product development, ceramics, binders, refractories
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4716-IABR-IA-98

-> Monodispersed Indium-Tin Oxide Powders and Ink

Develop economical and energy-efficient processes to manufacture fine powders for coating applications.

BACKGROUND

Indium oxide mixed with 5-10 wt% tin oxide (ITO) deposited as a thin coating on glass or plastic has several energy-saving applications. ITO films are transparent, electrically conductive, and reflective to infrared radiation (and heat). ITO films could be used for energy-saving window and automobile glass, liquid-crystal laptop computer displays, electroluminescent lamps, and cathode-ray tubes. Indium Corporation of America is the world's leading supplier of various forms of indium metal and alloys and has market access to companies providing ITO coating services. Generally, ITO films are deposited via sputtering, an expensive, energy-intensive process that limits the widespread use of ITO films.

OBJECTIVE

To develop robust, economical processes for manufacturing ITO particles suitable for commercialization. The project's two-prong approach is aimed at producing submicron- and nanometer-size ITO powders. The submicron-sized powders will be used to make low-cost and high-performance sputtering targets for introduction into Indium Corporation's current sputter target market. The nanometer-sized powders will be used to formulate an ITO ink that can be used to produce ITO films via energy-saving conventional dip or spray techniques.

DESCRIPTION

Indium Corporation, in collaboration with Clarkson University will: (1) synthesize monodispersed indium tin hydroxide (ITH) precursor particles, (2) optimize the process conditions to convert ITH precursor particles into ITO powders, (3) evaluate the sinterability of submicron-size ITO particles, (4) formulate the nanometer-size particles into an ink that could be converted into a thin, continuous film, and (5) scale up the processes to make kilogram-size batches.

BENEFITS

The dip-and-spray techniques are low-cost, energy-conserving, and environmentally acceptable alternatives to the current sputtering technique. The ink will enable glass manufacturers to apply ITO coatings at the point of manufacture, eliminating the additional energy-consuming coating step. The project may lead to widespread use of ITO films/coatings in several energy-saving applications. If it is successful, the project is expected to lead to establishment of a new manufacturing division. Near-term commercial success is expected from marketing ITO sputter targets.

SCHEDULE AND STATUS

Several batches of ITO powders in both submicron and nanometer size ranges were produced. Submicron size powders were made into sputter targets and the nanometer size powders were formulated into inks suitable to produce ITO films. Process optimization is in progress.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$150,000	0	$150,000
Indium Corp. of America	123,119	0	123,119
Clarkson University	27,322	0	27,322
TOTALS	$300,441	0	$300,441

Contractor: Indium Corporation of America
Site: Utica, Oneida County
Contract Duration: 8/96 - 10/98
Key Words: product development, materials, coatings
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4444-IABR-IA-96

-> Porous Aluminum-Nitride Part Fabrication to Support Advanced Battery Development

Optimize process parameters and manufacturing costs of sintered aluminum-nitride (AlN) separator plates for lithium-metal sulfide (LiMS) battery.

BACKGROUND

Despite promising power and energy-density characteristics, the widespread use of LiMS batteries is hindered by a number of technical issues such as operating temperature (400-500°C) and electrolyte containment; physical issues such as volume and weight; and economical issues such as cost and lifetime. Inclusion of a low-cost, lightweight, porous, electrically resistive, and corrosion-resistant battery separator will address a number of these issues. One of the materials that satisfies the above requirements is AlN. Under a U.S. Department of Energy (DOE) Phase I Small Business Innovative Research (SBIR) contract, using an aqueous-based AlN powder-processing technology developed under a prior NYSERDA-sponsored project, Advanced Refractory Technologies, Inc. (ART) developed a cheaper roll-compaction method to produce high-strength and controlled-porosity AlN plates and had them tested at Westinghouse Electric Co. Based on promising preliminary results and with NYSERDA's support and input, ART won an SBIR Phase II award.

OBJECTIVES

To estimate the cost breakdown in processing sintered AlN separator plates. To investigate the methods of cost-reduction through process-optimization. To become the sole supplier of AlN separator plates for Westinghouse's LiMS batteries, which are used currently in several military and commercial applications. Finally, to develop a number of other electronic and structural applications for AlN.

DESCRIPTION

The contractor will (1) approach the process- and cost-reduction by addressing materials issues such as material minimization, AlN powder purity, and cost-reducing additives; and processing issues such as AlN powder-processing, large-scale and continuous-tape manufacture, and near-net shape preparation; (2) fabricate AlN separator plates and characterize for porosity, thickness, purity, and strength; (3) test single- and multiple-cell assemblies for power density, term/shelf life, and cyclic charge/discharge rate; (4) generate a database useful for marketing and commercialization; and undertake battery testing, and economic evaluation.

BENEFITS

The energy consequence of a tougher and stronger ceramic-component LiMS battery is far-reaching and is expected to advance the battery industry. The AlN separator plate is expected to cost $0.30. At that price, a number of advanced-battery applications are expected to become a reality. The success of this project is expected to create a manufacturing facility in the Buffalo area and the sale of AlN battery separators is expected to contribute significantly to New York's Gross State Product.

SCHEDULE AND STATUS

LiMS battery testing has been completed by Westinghouse. Additional field testing work funded by DOE is in progress.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$125,000	0	$125,000
ART, Inc.	160,803	0	160,803
U.S. Department of Energy	599,703	0	599,703
TOTALS	$885,506	0	$885,506

Contractor: Advanced Refractory Technologies, Inc.
Site: Buffalo, Erie County
Contract Duration: 5/94 - 8/98
Key Words: product development, materials, battery
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4033-IABR-IA-95

-> Improved Kiln Design

Compare geodesic kiln using innovative block-design system to conventional orthogonal kiln.

BACKGROUND

Kiln technology currently consists primarily of orthogonal designs that lead to turbulent gas flow, resulting in inefficient combustion, significant temperature variation, and increased loss of fired wares. Kilns with rounded walls would be more efficient; however, state-of-the-art rounded kilns require each refractory brick to be precision-hand-cut and custom-assembled, resulting in an expensive structure that is not cost-effective to manufacture and install. PolyCeramics, Inc. has patented an innovative block-design system that allows for the construction of rounded structures from simple unit shapes that do not have to be precision-cut and custom-assembled.

OBJECTIVE

To investigate the use of this ceramic-block system for an improved kiln design. The performance of a rounded kiln will be compared to a conventional kiln. This information will be used to market geodesic kiln designs.

DESCRIPTION

A rounded kiln and a conventional orthogonal kiln of the same size and materials will be constructed. The two kilns then will be tested and compared for energy efficiency and temperature uniformity.

BENEFITS

The rounded kiln design is expected to reduce energy consumption by as much as 25-30 percent. The more uniform temperature is expected to result in an increase in quality control and a decrease in firing defects.

SCHEDULE AND STATUS

Development of an improved block design delayed kiln construction, but promises to result in a more cost-effective product. Kiln construction using the new blocks has been completed. Testing is scheduled to begin in May.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$114,380	0	$114,380
PolyCeramics	181,750	0	181,750
Frederickson Kiln	10,109	0	10,109
TOTALS	$306,239	0	$306,239

Contractor: PolyCeramics, Inc.
Site: Alfred, Allegany County
Contract Duration: 1/96 - 7/98
Key Words: product development, university, process improvement, materials
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4218-IABR-IA-96

-> Integrated High-Voltage/High-Temperature Power Electronic Modules

Develop and commercialize power electronic modules.

BACKGROUND

The commercially available high-voltage electronics such as actuators, resistors, capacitors, and power modules used in motors, engines, transmissions, and power-conditioning equipment are either located away from the source of heat or cooled externally. A remote location requires additional hardware, adding weight and volume, reducing payload, and increasing maintenance and life-cycle costs. The external cooling systems are energy-intensive. A potential solution would be high-voltage electronic devices designed to operate in a high-temperature environment. Custom Electronics, Inc. (CEI), founded in 1964, is a 75-employee New York State company that designs, manufactures, and sells high-voltage mica-paper capacitors, with an 80-percent share of this niche market.

OBJECTIVE

To develop, manufacture, and commercialize a number of high-voltage/high-temperature power electronic modules, including a resistor-capacitor (RC) class power module and a voltage-multiplier module, using New York State raw materials and components.

DESCRIPTION

The contractor, in collaboration with SUNY/Binghamton, will: (1) conduct a market analysis by documenting customer requirements; (2) identify and assess materials, components, and encapsulants; (3) design, assemble, and demonstrate a resistor-capacitor-type module prototype; and (4) plan for marketing and commercialization. A voltage-multiplier module will be developed in a subsequent phase.

BENEFITS

Incorporating integrated high-voltage/high-temperature power electronic modules in such systems as motors, engines, transmissions, and power-conditioning, heating, and cooling equipment will lead to higher energy efficiency. Weight, volume, and payload reductions will improve fuel efficiency and reduced cooling requirements will improve electronic system reliability. Power electronic modules are a natural evolution of CEI's current product line, with a high potential for near-term commercialization.

SCHEDULE AND STATUS

Research tasks have been completed. The final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$197,839	0	$197,839
Custom Electronics, Inc.	217,482	0	217,482
Research Foundation of SUNY/Binghamton	62,540	0	62,540
Staffiere Consulting	3,000	0	3,000
TOTALS	$480,861	0	$480,861

Contractor: Custom Electronics, Inc.
Site: Oneonta, Otsego County, and Binghamton, Broome County
Contract Duration: 8/96 - 10/98
Key Words: product development, university, materials, power electronics
Project Manager: Nag Patibandla, (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4445-IABR-IA-96

-> Use of Recycled Glass and Fly Ash for Precast Concrete Products

Develop economical procedures for sorting recycled glass and for activating fly ash for use in concrete blocks.

BACKGROUND

Post-consumer glass represents a major component of solid waste because only a small fraction of the used glass is recycled. Disposal of waste glass is an acute problem for major metropolitan areas such as New York City, where some 70,000 tons of mixed-color glass was collected in 1994 and the tipping fee was $65 per ton. These numbers are expected to rise significantly. Another solid waste problem is the millions of tons of fly ash generated as a by-product at coal-fired electric power generation plants. Presently about 27 percent of fly ash is reused.

OBJECTIVES

To develop precast concrete products such as curtain wall panels, decorative blocks, park benches, waste containers, and tree planters containing sorted and crushed used/recycled glass in lieu of the high-priced specialty aggregate and activated fly-ash replacing portland cement. Specifically, to chemically activate the fly-ash and use it to replace 90 to 100 percent of the portland cement. In regular fly-ash concrete, only 10 to 25 percent of portland cement is replaced by fly ash, which acts as a filler. Also, to adopt and use procedures developed in another NYSERDA project to inhibit a chemical reaction between the alkali in the cement and the silica in the glass, known as alkali-silica reaction (ASR).

DESCRIPTION

The contractor will (1) evaluate economical feasibility and marketability of Glascrete products; (2) develop economical procedure(s) for sorting recycled glass by color, specific gravity, etc; (3) develop procedures for fly-ash activation to make it suitable for partial or full replacement of energy-intensive portland cement; (4) focus on extending the technology to products in which up to 100 percent of the aggregate is replaced by waste glass; and (5) fabricate glascrete masonry products containing activated fly ash or crushed glass.

BENEFITS

By replacing much or all of energy-intensive portland cement with fly ash, the project eliminates landfilling of the fly ash. The project finds a cheaper solution for using post-consumer mixed-color glass, developing marketable products from landfilled solid waste. This project is a complement of another NYSERDA project, "Use of Recycled Glass as Aggregate for Concrete Masonry Blocks" (4113-IABR-BR-95).

SCHEDULE AND STATUS

The final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$198,053	0	$198,053
Columbia University	162,518	0	162,518
Dagostino Building Blocks	30,000	0	30,000
Drexel University	25,214	0	25,214
TOTALS	$417,785	0	$415,785

Contractor: Columbia University
Site: New York, New York County
Contract Duration: 1/96 - 6/98
Key Words: product development, industry/university, solid waste materials, concrete, recycling
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4291-IABR-IA-96

-> Materials/Process Development for Semiconductor Interconnects

Develop an energy-efficient, low-cost interconnect-building scheme through process simplification and by addressing specific environmental and safety issues related to chemical mechanical polishing.

BACKGROUND

The New York State semiconductor industry is focused on developing high-performance and high-reliability interconnects and supported research at both RPI and SUNY/Albany. A Center for Advanced Interconnect Science and Technology (CAIST), co-funded by the New York State Science and Technology Foundation (NYSSTF) and Semiconductor Research Consortium (SRC), was established at RPI. NYSERDA is committed to cost-share specific energy-related product development of interest and benefit to New York State industry. CAIST is expected to serve as a prequel to establishing a $20-million Semiconductor Industry Association (SIA) center jointly operated by RPI and SUNY/Albany.

OBJECTIVE

To undertake and complete tasks aimed at giving the New York State semiconductor industry a competitive advantage by developing an energy-efficient, low-cost interconnect-building scheme through process simplification and by addressing specific environmental and safety issues related to chemical mechanical polishing (CMP).

DESCRIPTION

The contractor will: (1) identify and develop new alloys for interconnect applications, (2) develop photoimageable polymer films for interlayer dielectric applications, (3) develop an electroplating process to form the interconnects in vias and trenches of the semiconductor devices, and (4) develop electrochemical methodologies for recovering copper and other toxic materials from CMP waste. Emphasis will be placed on solving the New York State semiconductor industry's problems by developing concepts, models, materials, and processes that could be transferable and replicable at several manufacturing sites.

BENEFITS

Because the project tasks are based on an industry-wide consensus of problems of near-term interest, the solutions are expected to be widely applicable and replicable. NYSERDA funding will ensure that the energy efficiency aspects of semiconductor manufacturing are addressed. Specific research projects with New York State industry are expected to follow. Establishing an SIA center is viewed as an enticement to attract a $2-billion semiconductor fabrication facility to the Albany area.

SCHEDULE AND STATUS

New interconnect alloys and photoimageable polymer films are being identified and tested.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$100,000	$100,000
NYS Science & Technology Fdn..	0	490,000	490,000
Semiconductor Research Consortium	$2,100,000	879,959	2,979,959
Rensselaer Polytechnic Institute	331,750	0	331,750
TOTALS	$2,431,750	$1,469,959	$3,901,709

Contractor: Rensselaer Polytechnic Institute
Site: Troy, Rensselaer County
Contract Duration: 11/97 - 12/98
Key Words: semiconductor processing, interconnects, chemical-mechanical polishing
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4678-IABR-IA-98

-> Biaxially Textured Substrate for High-Temperature Superconductor

Develop biaxially textured metallic substrate suitable for deposition of high-temperature superconductor.

BACKGROUND

Superconducting materials can carry electrical currents without any resistance. In 1986, the discovery of Y-Ba-Cu-O (YBCO) superconductors that operate at 77°K (liquid nitrogen temperature) was a major breakthrough in this field. The YBCO conductors exhibit properties (current density of 10^6 Amp/cm^2) suitable for use in electric-power applications such as fault-current limiters, large motors (>100 hp), generators (>100 MVA) SMES (>1.0 MWh), and transmission cable only when deposited on single-crystal substrates or on biaxially textured buffer layers. Both options require an inherently slow and high-cost ion-beam-assisted deposition (IBAD) processing step.

OBJECTIVE

To develop and use an economical and faster processing technology to fabricate biaxially textured substrates that would involve adoption of an industrially used cube texture method. The objective of this work is to fabricate nickel or nickel-based substrates with a high degree of cube texture that then will eliminate the intermediate IBAD step currently used to deposit the buffer layer.

DESCRIPTION

The initial task is to fabricate nickel or nickel-based substrates with a high degree of cube texture. In Task 1, the processing parameters will be optimized to achieve biaxial texture in the substrate that will be characterized in detail in Task 2. The substrates will be polished as described in Task 3 for deposition of a buffer layer that will protect the nickel substrate from oxidation and block the diffusion of nickel out of the substrate. An oxide-ceramic buffer layer with a degree of biaxial texture equal to or better than that of the substrate will be deposited using techniques outlined in Task 4. The degree of biaxial texture of the buffer layer will be characterized in Task 5. A layer of high-temperature superconductor will be deposited and characterized in Task 6. Finally, a cost estimation to demonstrate the feasibility of this process will be undertaken in Task 7.

BENEFITS

The biggest hurdle in commercialization of YBCO superconductors is the processing cost. The cube texture method eliminates the use of expensive, energy-intensive vacuum-deposition technique (IBAD) used to lay down the buffer layer. The proposed approach has the potential to yield the best-performing superconducting tape of any kind at the lowest price.

SCHEDULE AND STATUS

Optimal parameters for the deposition YBCO by MOCVD on nickel substrates with ceria buffer layer have been identified. Characterization is in progress.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$64,990	0	$64,990
Intermagnetics General Corp.	64,996	0	64,996
TOTALS	$129,986	0	$129,986

Contractor: Intermagnetics General Corporation
Site: Latham, Albany County
Contract Duration: 2/97 - 10/98
Key Words: product development, materials, superconductors, substrates
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4466-IABR-IA-97

Produce high-temperature superconductors for energy applications.

BACKGROUND
Because high-temperature superconductors have no electrical resistance below the critical temperature, they have enormous potential to improve the efficiency of energy-related devices.

OBJECTIVE
To develop energy-conserving, energy-producing technologies based on high-temperature superconductivity.

DESCRIPTION
The Institute sponsors three interdependent programs. The Superconductor Characterization and Fabrication Facility provides extensive laboratories for fundamental and processing studies of high-temperature superconductors. The Industrial Superconductivity Research Consortium allows industrial firms to access Institute facilities and research projects. The Superconductivity Research Program sponsors a broad range of high-quality research at universities and industries across the State. These programs are structured to promote technology transfer by allowing industrial participants to work in tandem with government and university scientists.

BENEFITS
The Institute will accelerate the development of high-temperature superconductivity for energy-conserving, energy-producing technology. Superconductivity holds the promise of zero electrical resistance, resulting in enormous energy-efficiency improvements in electric power generation, transmission, and use.

SCHEDULE AND STATUS
Four patents and more than 60 research projects have been completed to date. The Institute continues to focus on fabricating and characterizing long wires and tapes made from high-temperature oxide superconductors. Silver-sheathed superconducting tapes up to several hundred meters in length have been fabricated and characterized. A ring furnace and an isothermal process are being used to fabricate long lengths of wire.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA Petroleum Overcharge Funds	$8,895,600	0	$8,895,600
TOTALS	$8,895,600	0	$8,895,600

Contractor: SUNY/Buffalo
Site: Buffalo, Erie County
Contract Duration: 11/87 - 3/99
Key Words: university, superconductivity, materials
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 1118-EEED-IEA-90

-> Chemical Mechanical Polishing of Metal Organic Chemical Vapor-Deposition Copper Films

Develop processes for improving copper metallization to enhance speed and reliability of integrated circuits.

BACKGROUND

Copper (Cu) metallization enhances the speed and reliability of integrated circuits (IC). Metal Organic Chemical Vapor-Deposition (MOCVD) of copper also provides energy and environmental benefits over the presently used aluminum-alloy-based processes. Successful commercialization of MOCVD Cu-deposition technology for metallization of advanced ICs requires that two critical processing elements be developed in parallel. These are high-aspect-ratio gap-fill to metallize interconnects and chemical-mechanical polishing to pattern them. Clarkson University has experience in a wide range of thin-film deposition and material-characterization technologies, particularly MOCVD of Cu and chemical-mechanical polishing. CVC Products, Inc. has extensive experience in MOCVD of Cu and the design, construction, and operation of some of the most advanced integrated-process tools being developed for semiconductor manufacturing. This project is related to an ongoing NYSERDA project that involves this team in developing an emissions-control system for the MOCVD Cu process.

OBJECTIVE

To improve MOCVD Cu gap-fill from the current state-of-the-art aspect ratio of about two to the three to four required by the next generation of sub-0.50μm integrated circuits, and to improve the Cu-to-SiO_2 removal ratio from the current state of the art of 10:1 to the required minimum of 100:1.

DESCRIPTION

A series of experimental investigations will be conducted at CVC and Clarkson. Most of the MOCVD Cu gap-fill work will be done at CVC Products, while most of the CMP work will be done at Clarkson.

BENEFITS

ICs made with Cu interconnects will be able to run faster, cooler, and with less energy. The MOCVD Cu process requires less energy than the current aluminum processes and has environmental advantages, specifically the elimination of ozone-depleting emissions. CVC will benefit in its effort to remain competitive by developing next-generation processing equipment. New York State will benefit from the continuing development of an indigenous semiconductor industry.

SCHEDULE AND STATUS

The project was late in getting started, and there was some delay due to the unavalability of Cu deposition equipment (this is new technology that is only now entering the marketplace). Work is now well under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$99,515	0	$95,515
CVC Products, Inc.	44,208	0	44,208
Clarkson University	41,500	0	41,500
Center for Adv. Materials Processing	12,000	0	12,000
TOTALS	$197,223	0	$197,223

Contractor: CVC Products, Inc.
Site: Rochester, Monroe County, and Potsdam, St. Lawrence County
Contract Duration: 6/96 - 6/98
Key Words: product development, university, process improvement, materials
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4220-IABR-IA-96

-> Improved Particles for Chemical-Mechanical Polishing Slurries

Develop aluminum-oxide-based slurries for chemical-mechanical polishing.

BACKGROUND

Development of smaller and faster microprocessors and memory devices is inevitable. Chemical mechanical polishing (CMP) is a necessary processing step that enables preparation of planerized surfaces. CMP is similar to traditional ornamental polishing used to selectively remove asperities and high points from the surface being polished e.g., silicon wafer. The process involves moving a wafer across a microporous, elastomer pad in the presence of a colloidal, aqueous slurry containing submicron abrasive particles. The Transelco Division of Ferro Corporation a leading producer of fine abrasive powders, suspensions, and colloids.

OBJECTIVES

To develop and evaluate submicron-sized aluminum oxide and other similar oxide particles of different shapes, sizes, and hardness in order to assess the role of these characteristics on dispersion, scratching, surface quality, and induced defects; to prepare and test slurries containing these particles with appropriate chemical accelerants and surfactants by polishing multiple silicon wafers; and performing the required post-polish characterizations. The project involves production of kilogram quantities of abrasive particles in optimized sizes and shapes.

DESCRIPTION

The contractor and the subcontractor will optimize the characteristics of aluminum-oxide-polishing particles as CMP slurries. The tasks include: (1) market analysis through documentation of customer requirements, (2) preparation of abrasive particles via precipitation techniques, (3) particle and slurry characterization, (4) CMP slurry formulation, (5) wafer-polishing trials on eight-inch silicon wafers, and (6) wafer characterization for defects.

BENEFITS

Use of improved CMP slurries could lead to shorter cycle times and better wafer yields. The oxide abrasive particles will be grown via precipitation techniques to eliminate energy-intensive grinding. Unlike other similar processes, CMP is a low-energy-consuming, environmentally acceptable non-capital-intensive process. High yields are expected to result in substantial energy savings in units of kWh per working chip. The energy savings could accrue from both reduced power consumption by IC chips, estimated at 10.5 million kWh for New York State for the year 2000, and reduced IC processing energy costs, estimated at $30,000 per year for a typical fabrication facility.

SCHEDULE AND STATUS

Slurries containing alumina or ceria particles were prepared. Process has been scaled up to 10 kg per batch. A CMP lab is being setup.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$100,000	0	$100,000
Ferro Corp/Transelco Div.	104,688	0	104,688
Clarkson University	23,320	0	23,320
TOTALS	$228,008	0	$228,008

Contractor: Ferro Corporation/Transelco Division
Site: Penn Yan, Yates County, and Potsdam, St. Lawrence County
Contract Duration: 3/97 - 12/98
Key Words: product development, materials, particles, microelectronics
Project Manager: Nag Patibandla, (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4467-IABR-IA-97

-> Partially Fired, Low-Mass Refractory Crucible

Develop prototype for field-test and commercialize energy-efficient metal-encased refractory crucibles of lower mass (density).

BACKGROUND

Conventional ceramic refractory crucibles are manufactured to 80% or higher theoretical density. Such high density is achieved by kiln-firing at temperatures well over 2,000°F (1,093°C), which accounts for the majority of energy costs incurred in the manufacturing process. Less energy would be required to fire crucibles of lower density/mass and at lower temperatures. Such partially fired, low-mass refractory (PFLMR) crucibles would have less strength and therefore require metal-encasement. These lower-strength PFLMR refractory crucibles have several niche applications.

ACCOMPLISHMENTS

The contractor has completed all project tasks in a timely manner. Specifically, a lightweight ceramic composition was developed and optimized, all crucible compositions were fired at or below 1,000°F, PFLMR crucibles were characterized by both Blasch and an independent testing lab, a preliminary marketing analysis was completed, and prototype crucibles were made available to a potential customer whose input was incorporated into the processing.

FINDINGS AND CONCLUSIONS

The development of PFLMR crucibles resulted in direct cost savings to Blasch while providing a ceramic refractory crucible better suited for field use.

REALIZED OR ANTICIPATED BENEFITS

Manufacturing PFLMR crucibles uses an estimated 25% less raw materials and saves more than 70% of the energy used in densification, resulting in a more energy-efficient process and product. The PFLMR products are cheaper than their fully fired counterparts. The near-term market for the PFLMR crucibles is estimated at $2.5 million, leading to a 25 percent increase in Blasch's overall energy consumption. The success of electric convection drying has led to eliminating the infrared drying used in Blasch's special products manufacturing line.

TECHNOLOGY TRANSFER ACTIVITIES

A commercial viability study and marketing analysis focusing on specific targeted applications were undertaken and completed as Task 1 of the project. The contractor is collaborating with several other customers to increase the sales of the PFLMR crucibles to more than $100,000 in 1998.

FUNDING	Totals
NYSERDA	$142,618
Blasch Precision Ceramics, Inc.	147,602
TOTALS	$290,220

Contractor: Blasch Precision Ceramics, Inc.
Site: Albany, Albany County
Contract Duration: 4/96 - 12/97
Key Words: product development, materials, ceramic refractory
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4361-IABR-IA-96

-> Developing a Multilayer Ceramic on Ferrite Substrate Power Supply

Develop planar power-supply device consisting of copper metallized on ferrite-ceramic multilayer substrate.

BACKGROUND

Multilayer ceramics are a mature technology for thick-film and ceramic-tape products; however, applying this technology to ferrite power substrates is new. This project involved planar magnetics imbedded in ceramic, a technology that uses metallized copper on a ferrite-ceramic multilayer.

ACCOMPLISHMENTS

During the course of this project the contractor developed and demonstrated the multilayer process and its cost feasibility, produced a prototype multilayer ceramic on ferrite substrate, optimized the device's performance and the manufacturing process, defined the product specification and filed patents relating to the work accomplished.

FINDINGS AND CONCLUSIONS

Zecal has developed a concept integrating dielectric insulation and ferrite materials with its patented Z-strate technology, a method of patterning ceramic substrates with high-resolution electroformed copper circuitry, to fabricate unique power-conversion products. These products include inductors and transformers and are fabricated in precise planar configurations that operate efficiently at high frequency and high power, resulting in compact and cost-effective systems. The structures allow assembly of transistors, rectifiers, and other electronic components to be integrated with the magnetic components, resulting in new product innovations.

REALIZED OR ANTICIPATED BENEFITS

The planar configuration, reduced materials, and elimination of plastic-winding insulation are expected to improve the device's efficiency through lower heat loss, enabling further miniaturization and cost reductions for many electronic components.

TECHNOLOGY TRANSFER ACTIVITIES

The contractor submitted a final report, and will market the planar magnetics.

FUNDING	TOTALS
NYSERDA	$270,000
Zecal, Inc.	928,266
TOTALS	$1,198,266

Contractor: Zecal, Inc. (formerly Ceramic Packaging, Inc.)
Site: Churchville, Monroe County
Contract Duration: 1/94 -1/98
Key Words: product development, materials, power electronics
Project Manager: Barbara Caropolo (518) 862-1090 ext. 3266
Program: Industry
Subprogram: Materials Advancement
Contract Nos.: 3118L-EEED-IEA-94

Optimizing Finned- and Rough-Ceramic Heat-Exchanger Tubes

Test innovative designs to improve heat transfer in ceramic heat-exchanger tubes..

BACKGROUND

Inex, Inc. of Ransomville, New York, manufactures ceramic-radiant tubes (CRTs), the largest market for which is as a burner component in indirectly fired, high-temperature furnaces, where the products of combustion are kept separate from the materials processed (the load). The CRT was designed to withstand high-temperature and corrosive conditions.

A second, and larger, market for the CRT is as a heat-exchanger tube for applications involving high-temperature and corrosive conditions. However, this market is both price-sensitive and performance-oriented. Therefore, this project seeks to use finned and rough inner surfaces in state-of-the-art CRTs to increase thermal efficiency. Improving the performance of these ceramic tubes will lower their installed cost and may expand their market significantly.

ACCOMPLISHMENTS

The project has identified effective internal-tube surface shapes that improve energy efficiency by up to 9%, and reduce NO_x by up to 30%. Performance testing has been completed, and pressure drop inside the tube has reduced the achievable energy benefit below 9%. Business opportunities are being evaluated by Inex, Inc. The final report is being prepared

FINDINGS AND CONCLUSIONS

The project identified the most effective internal-tube surface shapes to improve heat transfer in an innovative heat-exchanger tube manufactured by Inex, Inc. However, the pressure-drop problem has directed the attention of Inex, Inc. to an externally finned tube as a better solution for a heat-exchanger tube.

REALIZED OR ANTICIPATED BENEFITS

Using finned- and rough-ceramic heat-exchanger tubes will increase heat transfer in the radiant tube. This may expand the applications for these ceramic tubes beyond furnaces and into the much larger market of heat-exchanger tubes

TECHNOLOGY TRANSFER ACTIVITIES

Commercialization activities will be determined after Inex has completed its evaluation of business opportunities. A final report has been prepared, and technical articles have been published.

FUNDING	TOTALS
NYSERDA	$77,505
Rensselaer Polytechnic Institute	27,304
Inex, Inc.	12,820
TOTALS	$117,629

Contractor: Inex, Inc.
Site: Ransomville, Niagara County, and Troy, Rensselaer County
Contract Duration: 4/95 - 9/97
Key Words: product development, university, industrial process, gas, heat recovery, emissions control
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Materials Advancement
Contract No.: 4020-IABR-IA-95

-> Five-Wire Distribution System

Demonstrate commercial operation of five-wire system for distributing electric power.

BACKGROUND
Five-wire power distribution offers the potential for eliminating or greatly reducing the problems associated with electromagnetic fields (EMF), high-impedance faults, and stray voltage on the current four-wire distribution system.

OBJECTIVES
To demonstrate a full-scale, operational five-wire distribution line in New York State Electric & Gas Corp.'s service territory by upgrading an existing four-wire, multigrounded wye distribution line.

DESCRIPTION
The contractor will conduct: (1) preliminary engineering, (2) detailed design and construction, (3) operation and monitoring, and (4) decommissioning.

BENEFITS
Adding a ground wire to the four-wire design presently used by utilities shows considerable promise to reduce EMF up to 60 percent, reduce stray voltage produced by the primary distribution system up to 80 percent, and successfully clear 95 percent of high-impedance faults that are now virtually undetected. Cost estimates indicate the five-wire system is only 10 percent more expensive than a similar four-wire multigrounded system.

SCHEDULE AND STATUS
Engineering is completed. All monitoring equipment has been installed and one year of baseline monitoring will take place, ending in mid 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$200,000	0	$200,000
New York State Electric & Gas Corp.	250,000	0	250,000
ESEERCO	400,000	0	400,000
Electric Power Research Institute	295,000	0	295,000
U.S. Department of Energy	101,825	0	101,825
TOTALS	$1,246,825	0	$1,246,825

Contractor: Empire State Electric Energy Research Corp. (ESEERCO)
Site: Binghamton, Broome County
Contract Duration: 11/94 - 9/99
Key Words: environmental, electricity, utility
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Energy Systems
Contract Nos.: 4000-IABR-IA-95

-> Rochester District Cooling

Evaluate technical and economic feasibility of building district-cooling system in downtown Rochester.

BACKGROUND
NYSERDA is joining with the Rochester District Heating Cooperative (RDH) and other downtown businesses to investigate the feasibility of building a district cooling system that could provide chilled-water space cooling to buildings in downtown Rochester.

OBJECTIVE
To assist the downtown Rochester community in developing a district-cooling system and complete all the tasks necessary to finance $30 million for system construction.

DESCRIPTION
The contractor will: (1) organize a district-cooling cooperative, (2) market district cooling to prospective cooperative members, (3) perform a technical analysis and preliminary design of the system, (4) complete all regulatory requirements, (5) conduct an economic analysis, (6) obtain firm prices for key system components, (7) arrange for financing to build the system, (8) monitor the system after it is operational, and (9) report on the above. If the project proves feasible, a cooling cooperative (RDC) will be created to build and operate the system.

BENEFITS
Members of RDH and RDC are expected to reduce their energy costs by between $850,000 and $1.4 million annually for 20+ years. Rochester also would avoid chiller replacement or retrofit issues involving the use of chlorofluorocarbon refrigerants targeted for phase-out by the Montreal Protocol of 1987 and the Clean Air Act Amendments of 1990. The City of Rochester and surrounding region would benefit from the economic development and jobs created by short-run construction activity and longer-run strengthening of the commercial real-estate market. Rochester Gas and Electric Corp.'s summer peak demand (1,374MW) would be eased by displacing 7.5MW in a critical, congested downtown area.

SCHEDULE AND STATUS
The feasibility and engineering tasks for the project are completed. Marketing the cooling concept to potential customers, and negotiations with financiers are under way. More than 90% of the minimum required chilling load has been committed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$400,000	0	$400,000
RDH/RDC	784,500	0	30,000,000
Xerox Corp.	40,000	0	40,000
Chase Manhattan Bank	20,000	0	20,900
Monroe County	65,000	0	65,000
City of Rochester	30,000	0	30,000
TOTALS	$1,339,500	0	$30,555,900

Contractor: Rochester District Heating Cooperative
Site: Rochester, Monroe County
Contract Duration: 6/95 - 6/98
Key Words: assist business, municipal, district cooling
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Energy Systems
Contract No.: 4162-IABR-IA-96

-> District Heating Study for SUNY Cobleskill

Explore district heating options for SUNY/Cobleskill campus.

BACKGROUND
The SUNY/Cobleskill campus is among the highest-energy-cost campuses in the SUNY system. The central steam system, which services the core academic buildings, is deteriorating. Many of the newer buildings have separate individual oil-fired steam systems and most of the dorms are heated electrically.

OBJECTIVE
To compare the cost and energy effectiveness of converting the entire campus to a central district heating system such as district hot water, with minimal renovations of the existing system.

DESCRIPTION
New York State Electric & Gas Corporation will subcontract with Joseph Technologies Corp. to analyze the existing systems, produce conceptual designs for a campus-wide district heating system, and produce an engineering and economic evaluation of the options.

BENEFITS
A campus-wide hot water district heating system fueled by natural gas would probably reduce SUNY/Cobleskill's heating energy cost by 20-50%.

SCHEDULE AND STATUS
The preliminary study has been completed. Final analysis is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$33,300	$33,300
NYSEG	0	33,400	33,400
SUNY/Cobleskill	0	33,300	33,300
Joseph Technology Corp.	0	25,000	25,000
TOTALS	0	$125,000	$125,000

Contractor: New York State Electric & Gas Corporation
Site: Cobleskill, Schoharie County
Contract Duration: 9/97-9/98
Key Words: university, gas, district heating
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Energy Systems
Contract No.: 4489-IABR-IA-98

-> Effect of Stray Voltage on Dairy Cows

Study effect of short-duration, low-level stray voltage on dairy cows.

BACKGROUND

Dairy farming is a major industry in New York. Management and milking of dairy cows is a complicated process that involves mechanical, electrical, and biological systems. Stray voltages can cause undesirable behavior in dairy animals and lower milk production.

OBJECTIVES

To examine characteristics of short-duration electrical phenomena that are present on dairy farms and the effect of mitigating devices on short-duration electrical activity, the effect of short-duration electrical phenomena on dairy cows, and the combined effect of contact voltage and predisposition to mastitis to determine if contact voltage can influence the extent to which cows react to mastitis-causing bacteria.

DESCRIPTION

This project will evaluate the effect of short-duration low-level voltages on dairy cows. The contractor will: (1) develop test procedures and test equipment, (2) collect data on dairy farms, (3) test stray voltage-mitigating devices, (4) develop impedance model of cows, (5) measure sensitivity of cows to transient voltages, and (6) conduct experiments to determine whether voltages effect disease.

BENEFITS

Major beneficiaries are New York's utilities and its dairy industry, which will be provided scientific information on the effects of transient voltage that will have an impact on milk production and costs, as well as efforts by utilities and farmers to deal with stray voltages.

SCHEDULE AND STATUS

Characterization of isolation devices is complete and several peer review papers have been prepared and presented. Of the first 16 non-BST cows tested, none showed any effect from the voltage and there was no significant change in production when they went from the control week (no voltage) to the week of voltage application..

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$150,000	0	$150,000
ESEERCO	147,545	0	147,545
New York State Electric & Gas Corp.	100,000	0	100,000
Cornell University	88,350	0	88,350
NYS Center for Advanced Technology	60,000	0	60,000
Rochester Gas and Electric Corp.	25,000	0	25,000
Consumers Power (Michigan)	15,000	0	15,000
TOTALS	$585,895	0	$585,895

Contractor: Empire State Electric Energy Research Corporation (ESEERCO)
Site: Ithaca, Tompkins County
Contract Duration: 11/94 -12/98
Key Words: university, agriculture, utilities
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Energy Systems
Contract Nos.: 4001-IABR-IA-95

-> High-Temperature Superconducting Magnet for Monitoring of Food Processing

Design and assemble high-temperature superconducting (HTS) magnet for magnetic resonance imaging (MRI) monitoring system use in food processing.

BACKGROUND

The New York State Institute on Superconductivity (NYSIS) has successfully fabricated long (100-1000 meters), mono- and multifilament, silver (Ag)-sheathed Bi2Sr2CaCu2O8 (Bi-2212) superconductors with a uniform critical current along the length by tailoring the heat-treatment process to long-length conductors. The primary obstacle to obtaining a uniform critical current in long conductors was their sensitivity to the conventional partial-melt-growth (PMG) heat-treatment temperature. It was found that a variation of ±1.5°C in the PMG heat-treatment temperature was detrimental to the critical current. NYSIS developed an isothermal-melt-process (IMP) that reduced the temperature sensitivity by widening the heat-treatment temperature range from ±1.5°C to ±4.5°C. Also, to ensure identical heat-treatment temperature throughout the conductor length, a novel "ring-shape" furnace was designed and assembled. The furnace is capable of handling up to 1000 meters of the mono- and multifilament, Ag-sheathed Bi-2212 tape. This "ring-shape" furnace provides a cost-effective method for processing long-length conductors.

OBJECTIVES

To design and assemble the first HTS magnet of an MRI monitoring system in collaboration with Intermagnetics General Corporation, (IGC) of Latham. The magnet will be designed, made, and tested to the specifications necessary for use in food processing for precise detection and control of moisture content in frozen food.

DESCRIPTION

The contractor will: (1) manufacture sufficient quantities of Bi-2212 superconductor tapes via the isothermal melt process in the previously designed "ringshaped" furnace; (2) design and construct an MRI magnet operational at 0.5 Tessler and 20°K in conjunction with a cryocooler; (3) test the magnet for spatial homogeneity of the magnetic field, mechanical integrity, thermal stability, and heat-transfer characteristics; and (4) establish appropriate end-user interaction with a suitable New York State food processor.

BENEFITS

Long-term energy and economic benefits of superconductor technology are far-reaching. Applications such as very efficient power lines, highly efficient motors and power generators, and magnetically levitated trains can become feasible. In the near term, this project will lead to the development of a HTS magnet for highly sensitive MRI monitoring of food processing. Precise detection and control of moisture content in frozen food can prevent over freezing and damage, saving 20 to 30 percent of the energy used in the food processing.

SCHEDULE AND STATUS

Long lengths (kilometers) of Bi-2212 superconductor tapes have been made via an isothermal melt process. An MRI magnet suitable for use in food processing is being designed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$299,841	0	$299,841
NYSIS	171,623	0	171,623
IGC	99,659	0	99,659
TOTALS	$571,123	0	$571,123

Contractor: Research Foundation of the State University of New York on behalf of SUNY/Buffalo
Site: Buffalo, Erie County and Latham, Albany County
Contract Duration: 4/94 - 10/98
Key Words: product development, university, electricity, superconductivity, MRI
Project Manager: Nag Patibandla (518) 862-1090, ext. 3301
Program: Industry
Subprogram: Materials Advancement
Contract No.: 3000BN-IABR-IEA-93

-> Modular Steam-Turbine Generator Pressure-Reduction System

Replace throttling valves with modular steam-turbine generator pressure-reduction systems to improve efficiency at industrial sites.

BACKGROUND

The Tecogen Division of Thermo Power Corporation (Tecogen) has conducted a market survey of commercial and industrial high-pressure steam-users in New York State and has been able to quantify a category of users who operate more than 70 hours a week and who have a steam demand that averages at least 6000 lb/hr. Tecogen has proposed to package and market a nominal-rated 100-kW, completely modular, steam turbine-generator set that can be used in parallel with a facility's existing pressure-reduction valves (PRVs). The expansion of the high-pressure steam os a lower pressure can be made more efficient if the pressure reduction is performed using a steam turbine instead of the PRV. This energy-conversion system would generate power only when the user has a steam demand for heating or cooling.

OBJECTIVE

To demonstrate the feasibility of applying small steam-turbine generators. at industrial sites and to help the manufacturers meet federal and State environmental requirements regarding exhaust-gas emissions. Carrier Corporation of Syracuse will be a partner and subcontractor, providing a demonstration site for the steam-turbine generator pressure-reducing system where it will be monitored and serviced by Tecogen for 12 months. Dresser-Rand Corporation will provide the steam turbine.

DESCRIPTION

The contractor will implement two basic engineering modifications of a state-of-the art steam turbine: (1) packaging inexpensive, standardized microprocessor-based controls and switchgear that include a remote-monitoring feature to allow unattended operation to facilitate automatic control of pressure in the turbine's nozzle block at varying loads; and (2) engineering the standardized packaging of the turbine, generator, and controls to reduce the assembled cost of the turbine equipment and to facilitate its installation in small work spaces.

BENEFITS

Tecogen estimates there are more than 450 potential users in New York State and 12,000 nationwide that could generate and thus save a total of 35 and 950 MWe, respectively. This represents an energy-cost savings of about $17.5 million per year for New York manufacturers. Also, a respective 1,250 and 91 tons-per-year reduction of NO_x and CO could be realized for New York State with 30,500 tons of NO_x and 2,200 tons of CO reduced per year nationwide.

SCHEDULE AND STATUS

The turbine is operational and is being monitored.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$150,181	0	$150,181
Carrier Corp.	129,000	0	129,000
Dresser-Rand	51,000	0	51,000
Tecogen	27,501	0	27,501
Niagara Mohawk Power Corp.	5,000	0	5,000
TOTALS	$362,682	0	$362,682

Contractor: Tecogen Division, Thermo Power Corporation
Subcontractors: Dresser-Rand Corporation and Carrier Corporation
Site: Syracuse, Onondaga County, and Wellsville, Allegany County
Contract Duration: 9/95 - 6/98
Key Words: product development, industrial, electricity
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Energy Systems
Contract No.: 4230-IABR-IA-96

-> Thermal Acoustic Generator

Build and test proof-of-concept thermal acoustic generator.

BACKGROUND

Worldwide, there is commercial interest in small-scale (1-kW), inexpensive ($500), reliable electric power generation and cogeneration devices for recreational, residential, emergency, or remote applications. Applications exist for gas, biomass, and solar-fired devices. This project will combine thermal acoustic technology with a reciprocating alternator to develop a low-emission, low-noise, long-life, reliable, competitively priced, small, thermal electric generator.

OBJECTIVE

To demonstrate the integration of thermal acoustic and reciprocating alternator technologies and identify the most promising products, specifications, and secondary subsystems. The project also will develop essential components, conduct a worldwide marketing assessment, develop a business plan, and raise funding to complete product development and commercialization.

DESCRIPTION

The contractor will work with Los Alamos National Laboratory to build and test a proof-of-concept thermal acoustic generator. The contractor will: (1) design and analyze the device; (2) procure parts and materials; (3) assemble and test the device; (4) conduct marketing, business planning, and financing tasks; (5) develop essential components;, and (6) report on the results.

BENEFITS

This technology has the potential to result in clean, quiet, reliable, small, and economical generation and cogeneration products (and components) manufactured in New York State and sold worldwide. The products could make electric generation from gas, biomass, and solar more economic.

SCHEDULE AND STATUS

A prototype unit has been constructed and operated under self-sustaining conditions.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$214,209	0	$250,000
Clever Fellows	340,463	0	750,000
TOTALS	$554,672	0	$1,00,000

Contractor: Clever Fellows Innovation Consortium, Inc.
Subcontractor: Rensselaer Polytechnic Institute
Site: Troy, Rensselaer County
Contract Duration: 9/96-6/98
Key Words: product development, electricity, gas, biomass, solar
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Energy Systems
Contract No.: 4425-IABR-IA-97

-> Development of a Tele-Robotic System for Cleaning and Inspection of Crude Oil Tanks

Develop tele-robotic system to remove accumulated sludge, and homogenize and inspect large crude-oil tanks.

BACKGROUND

Sludge is formed continuously at the bottoms of crude and #6 oil-storage tanks by the precipitation of suspended particles, water, and other chemicals in the oil. Over time, the sludge condenses into an asphalt-like compound that adheres strongly to the bottom; supporting columns; and heating and cooling elements, pipes, and supports. Corrosive elements in the sludge deteriorate the surface preparations and eventually corrode the tank and other surfaces and seam welds. The buildup of the asphalt-type material up to several feet over a period of several years reduces the tank capacity and creates numerous cleaning and inspection problems. The material is not only difficult to remove, but also involves costly disposal and environmental problems. The project team has been working on a conceptual design since October 1993 with funding from Long Island Lighting Company.

OBJECTIVE

To develop an integrated robotic system that will almost entirely eliminate the build-up of sludge through regular homogenization, and clean and prepare the surface and weld lines for in-situ tank inspection. An additional subsystem also will be developed to perform the in-situ inspection.

DESCRIPTION

Conceptual designs and specifications were completed prior to this project. This project will involve the design, fabrication, and testing of a prototype system. Operational testing will be conducted in a mock-up #6 oil tank to be constructed on the SUNY/Stony Brook campus, and will involve testing both under water and in #6 oil.

BENEFITS

New York State will benefit from the ability to inspect oil tanks from the inside while in use so that defective tanks can be taken out of service prior to catastrophic failure. Tank owners and their customers will benefit from cost reductions for cleaning and waste disposal, which can be more than $500,000 for a single 300-ft. diameter tank.

SCHEDULE AND STATUS

Development of therobotic system is progressing.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$200,000	0	$200,000
Long Island Lighting Company	30,360	0	30,360
SUNY/Stony Brook	68,191	0	68,191
OmniTek, Inc.	40,187	0	40,187
Polytechnic University	69,091	0	69,091
TOTALS	$407,829	0	$407,829

Contractor: Polytechnic University
Site: Brooklyn, Kings County, and Stony Brook, Suffolk, County
Contract Duration: 9/96-9/98
Key Words: product development, university, utility, environmental, industrial waste, oil
Project Manager: Ed Kear (518) 862-1090, ext. 3269
Program: Industry
Subprogram: Energy Systems
Contract No.: 4222-IABR-IA-97

-> New York State Energy Efficiency Industry Directory

Characterize New York State energy efficiency industry in order to expand exports.

BACKGROUND

Markets for energy-efficient technology, including those in South America, Eastern Europe, and Southeast Asia, need to sustain economic growth while minimizing emissions from increased energy production. These countries lack manufacturing infrastructure, and must rely on imported technology, a situation that affords NYS manufacturers a good market. Recent trade missions have provided valuable market-assessment data for manufacturers considering export opportunities.

OBJECTIVES

To develop global NYS export-related activities compatible with NYSERDA's interests, and assist in developing better national and international marketing strategies for energy-efficient technologies. The State's specific indigenous strengths will be emphasized.

DESCRIPTION

Energy-efficient technologies will be defined by product, technology, and industry groups. Product and technology groups significant to the State's economy will be identified by assessing the industrial stock ranked by contribution to the State's gross product and employment base. A scoping study will assess the strengths and weaknesses of specific energy efficiency industries in NYS. The results will be the basis for developing a NYS Energy Efficiency Industry Export Business Directory. The Directory will identify specific businesses, while distinguishing between standard and energy-efficient versions of the same technology. The Directory will be distributed to domestic and international export agencies and businesses.

BENEFITS

The project will help expand markets; enhance economic development; and promote industry self-awareness that can be used for lobbying, technology transfer, and collaborative export marketing. NYSERDA's internal program-planning process will benefit from having highly specific demographic information.

SCHEDULE AND STATUS

The contractor has identified applicable NYS businesses, defined specific components of the energy efficiency industry, and assessed technology export opportunities. A survey of New York energy efficiency companies has been completed. An industry directory has been published.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$211,400	0	$211,400
Alliance to Save Energy	62,100	0	62,100
TOTALS	$273,500	0	$273,500

Contractor: Alliance to Save Energy
Site: Troy, Rensselaer County, and Washington, DC
Contract Duration: 3/94 - 12/98
Key Words: assist business, industrial, manufacturing, export
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Energy Systems
Contract No.: 3106-EEED-IEA-93

-> Slotless "Pancake" Brushless DC Servo Motor

Develop, design, and manufacture energy-efficient slotless DC brushless motors.

BACKGROUND

Market research and current market demand indicate a need for brushless DC motors that provide full-range power at reduced power-input levels. Currently available DC brushless motors all tend to follow a common design philosophy, with similar thermal and power performance. The PMI Division of Kollmorgen Corporation, which is at the leading edge of innovation, has recently conceptualized the next-generation DC brushless motor. By eliminating iron losses from within the motor, efficiency is greatly improved. In addition, this "slotless" technology offers zero cogging and a low-profile "pancake" design.

ACCOMPLISHMENTS

The contractor performed a design review and then completed design and development of the motor. Prototypes were built and tested. The contractor initiated and evaluated beta-test sites and determined product readiness, and released the product to the market. The new motor series is called the Platinum™ XT. Each task concluded with a review to assess progress, problems, and solutions, and to ensure the project's strategic goals and objectives were being met.

FINDINGS AND CONCLUSIONS

The contractor successfully completed the design and construction of three motor frame sizes: 9cm, 12cm, and 16cm. All original specifications of the motor design were met. The otors use a slotless armature technology, producing zero cogging and pure sinusoidal back electromechanical field and torque functions that result in almost zero torque and velocity ripple for smooth performance over the entire speed range. A large manufacturer of semiconductor handling placed a large order, but then scaled back because, unfortunately, the equipment was a little premature, as it was directed at the 300mm wafer and the market will not not moving in that direction until 1999. The semiconductor manufacturer's product will be re-released in 1998 and at that time PMI expects to see significant orders re-established.

REALIZED OR ANTICIPATED BENEFITS

The motor's design allows for a 15% improvement over the already efficient Kollmorgen Pancake brush DC motors and 30% over conventional DC brush motor technology. Large productivity gains were accomplished with this project. By implementing new manufacturing cells, PMI is saving $91,467 in labor costs per year. The company is also able to buy larger quantities of materials that overlap with its brush motors, saving them $90,000 year. The 16cm motor, when compared to an equivalent brush motor, will save $242 per year.

TECHNOLOGY TRANSFER ACTIVITIES

The contractor has made several technical presentations highlighting the new product. The contractor will continue to improve and market the Platinum™ XT line of motors.

FUNDING	TOTALS
NYSERDA	$250,000
PMI Motion Technologies	431,251
TOTALS	$681,251

Contractor: PMI Motion Technologies
Site: Commack, Suffolk County
Contract Duration: 2/96 - 9/97
Key Words: product development, industrial, motors
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Energy Systems and Applications
Contract No.: 4332-IABR-IA-96

-> Rapid-Charging System for Commercial Lawn-Care Products

Engineer, develop, and test commercial rapid-charge battery-powered lawn equipment.

BACKGROUND

Gasoline-powered lawn-care products, especially mowers and trimmers, are major contributors to air emissions. The Clean Air Act Amendments direct the U.S. Environmental Protection Agency to establish emission regulations for gasoline-powered two- and four-cycle "utility" engines rated at or below 25 HP. Pollution from gasoline engines is introduced into the atmosphere through incomplete combustion and refueling (evaporation/spillage/leakage), and consists primarily of hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NOx), and particulate matter.

The vast majority of lawn-care equipment runs on either gasoline, corded-electric, battery-electric, or manual power. Efforts are under way to both reduce emissions for gasoline engines and improve storage density and operating cycles of battery-electric systems. Of all the evolutionary paths, the rechargeable battery-electric products are the most immediately promising for providing a solution to air-emission problems.

OBJECTIVE

Phases I and II developed the commercial, walk-behind, rechargeable battery-powered line trimmer and a transportable, rapid-charging system capable of recharging in one hour to 90 percent of full charge from a discharge of less than 20 percent. Phase III will take the model developed in phases one and two and create the necessary tooling and customized machinery to manufacture the trimmer and rapid-charger.

DESCRIPTION

Phase I included: (1) a scoping study, (2) the development of design specifications for the trimmer and the rapid-charge system, and (3) bench-scale testing and development of the concept model. Phase II included: (1) the development of the trimmer prototype models, (2) development of the rapid-charging system, (3) creation of preliminary user manuals, and (4) field-testing. In Phase III, the contractor will: (1) develop the commercial trimmer and rapid-charger manufacturing drawings, (2) assemble and test the trimmer and charger, (3) finalize the users manual, and (4) demonstrate the project at a New York City or Long Island location.

BENEFITS

If successful, the contractor expects to increase sales from $.5 million (1994) to $2 million by 1998, and anticipates reaching $20 million (100,000+ units) and creating 100 jobs by 2001. In addition to their environmental benefits, electric products also eliminate the need to transport and handle petroleum products, reduce noise levels, are easier to start, reduce maintenance requirements, and contribute to utility-load growth during off-peak times.

SCHEDULE AND STATUS

Phases I and II are complete. Testing of the beta version is complete; some redesign work is under way. New model anticipated to be complete for the Fall 1998 season.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$156,503	0	$156,503
Trim-A-Lawn Corp.	156,532	0	156,532
TOTALS	$313,035	0	$313,035

Contractor: DC Power Products, Inc.
Site: Utica, Oneida County
Contract Duration: 8/95-7/98
Key Words: environmental, product development
Project Manager: Barbara Caropolo (518) 862-1090 ext. 3266
Program: Industry
Subprogram: Control Systems
Contract No.: 4227L-IABR-IA-96

-> Applicator Development for Top-of-Rail Lubrication in Railroads

Design and develop microprocessor-driven control system to automatically control railroad lubrication.

BACKGROUND

The most energy-efficient land-based mode of transportation is rail transport. By most standard measures, a ton of cargo can be moved by rail at one-third the number of Btu as with trucks. At the same time, rail transportation is a voracious consumer of energy. The most significant innovation for improving efficiency lies in the implementation of top-of-rail (TOR) lubrication. Railroad wheelsets do not roll straight down the track, which causes resistive friction, resulting in the wheelset oscillating. Recently, researchers at the Illinois Institute of Technology have demonstrated that by incorporating TOR into rail-lubrication strategies, it is possible to achieve major energy savings cost-effectively while meeting and exceeding the railroad's goals for reducing rail and wheel wear.

OBJECTIVE

To design and develop a locomotive-based microprocessor-driven control system to automatically control TOR lubrication for the purpose of reducing the primary source of resistive friction in train operation. The system will combine compactness, durability, and economy in order to achieve commercial success and provide energy savings.

DESCRIPTION

The three distinct project tasks are: (1) identifying and quantifying the inputs required to determine the optimum amount of lubricant, (2) developing a method for acquiring the necessary data in real time, and (3) building working prototypes for field-testing. Field-testing will be performed with the Research Laboratory of the Norfolk Southern Railroad to incorporate measurements of rail's the coefficients of friction before, during, and after automatic lubricant application in actual operating conditions.

BENEFITS

Overcoming wheel/rail friction uses 20-40 percent of the tractive effort of a locomotive. Preliminary testing has demonstrated that TOR lubrication can reduce resistive friction by up to 60 percent. TOR lubrication can result in overall energy savings of between 12 and 30 percent. At current consumption rates, this translates into 360 million gallons of diesel fuel annually, or a potential annual cash savings for railroads of more than $216 million.

SCHEDULE AND STATUS

Lubrication development and testing are complete. Electronics design and testing is expected to be complete by July 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$225,000	0	$225,000
IEM	226,132	0	226,132
TOTALS	$451,132	0	$451,132

Contractor: International Electronic Machines Corp. (IEM)
Site: Albany, Albany County
Contract Duration: 12/95 - 3/99
Key Words: product development, industrial, rail
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Control Systems
Contract No.: 4330-IABR-IA-96

-> Developing Laserforming Capability for Titanium Sheet Metal Parts

Demonstrate commercial viability of new sheet-forming method called laserforming

BACKGROUND

DynaBil is a New York State manufacturer of precision sheet metal components and assemblies for the aerospace industry. The Coxsackie plant employs 170 people and specializes in hot-forming titanium. The process used by DynaBil heats up the two-pound titanium work piece in an open die set-up of 4000 lbs in mass. This leads to long hold times and high energy costs. Laserforming is an ideal sheet metal-forming technique for materials that have low thermal conductivity, such as stainless steel and titanium. In laserforming sheet metal stock is heated at the bend-line so the metal melts just on the surface and a very steep thermal gradient is created through the sheet thickness. Then the metal is rapidly cooled, causing thermal contractions and bending.

OBJECTIVE

To demonstrate commercial viability of a new sheet-forming method called laserforming, the forming of titanium sheet metal parts with simple bends.

DESCRIPTION

During the course of this project, a computer-controlled, water/air-cooled laserforming machine will be designed and built. Specific tasks are aimed at: (1) simulating simple bending of titanium in laserforming, (2) designing and constructing laserforming equipment, (3) experimenting and optimizing, (4) formalizing the laserforming procedure, and (5) demonstrating commercial viability.

BENEFITS

Significant energy savings are possible. For example, a simple 90° bend in a Ti-6Al-4V alloy sheet uses 1,200 MJ of energy and takes 16.25 hours in the DynaBil conventional method. The same bend takes 81 MJ and 0.6 hrs when performed by Laserforming. This translates into a 93% decrease in process energy input and a 27-fold increase in manufacturing throughput. The basic technology has wider applicability. The cost savings are expected to increase DynaBil's competitive position in the industry leading to creation of additional jobs at the Coxsackie plant.

SCHEDULE AND STATUS

The subcontract with RPI is still being finalized.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$73,152	$73,152
DynaBil Industries, Inc.	0	70,000	70,000
NYS CAT, RPI	0	17,498	17,498
TOTALS	0	$160,650	$160,650

Contractor: DynaBil Industries, Inc.
Site: Coxsackie, Greene County
Contract Duration: 2/98 -3/99
Key Words: assist business, industrial process, lasers
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Control Systems
Contract No.: 4719-IABR-IA-98

-> Demonstration of a Refrigeration Optimization System

Improve energy-cost performance of commercial refrigeration system.

BACKGROUND
Upstate Milk Cooperative, Inc. (UMC) is a fully integrated milk processor owned by 520 dairy farmers. UMC has undertaken an aggressive program to become more competitive in the milk market, including modernizing its facilities with a view toward energy efficiency. Refrigeration equipment accounts for more than 40 percent of the total electrical requirements of dairy processing plants. These refrigeration systems often operate inefficiently, reducing capacity, increasing power consumption, or both, because they are designed for extreme climate and load conditions, but operate most of the time well away from this peak. Because most users also have spare capacity, these situations can persist for long periods without being detected. The MENTOR expert system seeks to optimize efficiency through computer controls that not only instruct the operators on adjusting operating parameters to use resources best, but also notify them when plant performance is below standards.

OBJECTIVE
To install and monitor the MENTOR computerized refrigeration expert system at UMC to improve refrigeration plant energy efficiency, identify plant inefficiencies, record operating performance, test the system's effectiveness under actual field conditions, and assess the system's applicability to other refrigeration plants.

DESCRIPTION
The project team will: (1) perform an operator survey, (2) gather data and evaluate the plant, (3) develop plant specifications, (4) develop Beta unit, (5) install Beta unit and instrumentation, (6) monitor and analyze Beta unit data, and (7) install and start up the final MENTOR version. The project team will prepare technical papers for relevant industry conferences and publications, as well as conduct a site tour at the end of the project for other suitable New York State manufacturing and processing sites.

BENEFITS
Cost savings would be achieved by improving the refrigeration plant's energy efficiency. Tests of the MENTOR system at other installations have demonstrated a reduction in electrical consumption of between 15 and 30 percent.

SCHEDULE AND STATUS
Monitoring of the base case began in February 1997. The MENTOR beta system is installed. Monitoring of the system will continue through June 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$90,000	0	$90,000
Rochester Gas and Electric Corp.	94,194	0	94,294
Upstate Milk Cooperative	12,561	0	12,561
Modern Energy Technologies Corp.	2,000	0	2,000
Veritech	6,572	0	6,572
TOTALS	$205,427	0	$205,427

Contractor: Upstate Milk Cooperative, Inc.
Site: Rochester, Monroe County
Contract Duration: 7/96 - 9/99
Key Words: product development, industrial process, refrigeration
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Control Systems
Contract No.: 4408-IABR-IA-97

-> High-Power, Distortionless AC/DC Converter

Design, build, and test high-power, distortionless AC/DC converter.

BACKGROUND

With the increase in use of non-linear loads, such as AC/DC converters and adjustable-speed drives, the quality of electric-power supply has become an important source of concern. The number of non-linear loads is expected to further increase with the use of battery chargers for electric cars. Improving the performance of AC/DC converters, which may become the dominant type of non-linear load, is an important need. The main features of the new converter are almost-sinusoidal input current with near-unity power factor and low ripple on the DC side.

OBJECTIVE

To develop a novel converter using state-of-the-art insulated gate bipolar transistor (IGBT) switches. Phase I will cover the initial research and development of a low-power AC/DC converter intended for use as the power-supply unit for domestic battery chargers. This unit is also expected to be useful with PCs, TVs, and VCRs. Phase II will emphasize scaling-up and manufacturing high-power converter prototypes.

DESCRIPTION

Phase I and Phase II will overlap in time. Phase I will cover the following tasks: (1) literature search and commercialization assessment, (2) development of computer and simulation codes, (3) design guidelines, (4) development of single- and three-phase breadboard prototypes, (5) combined performance with loads analysis, and (6) project documentation. Phase II will: (1) design, build, and test high-power AC/DC converter prototype(s) with at least one electric-vehicle-battery-charging application; and (2) demonstrate single- and three-phase operation from standard, 120VAC single- and three-phase 60Hz power sources.

BENEFITS

This AC/DC converter has a number of important applications. It is well-suited for adjustable-speed drives and battery chargers, thus benefiting utilities by reducing load distortion. It also will contribute to significant power-quality improvement during peak hours. This will be accomplished by eliminating not only the out-of-phase current components, but also the harmonics generated by nonlinear loads with input rectifiers. These loads include most office appliances and computers. The benefit to utilities will be the near-elimination of VAR losses and heating, with consequent full restoration of the nominal rating of transformers, power lines, and generators.

SCHEDULE AND STATUS

Literature search and commercialization assessment are complete. Systems analysis and simulation are nearly complete. Prototyping is expected to begin in June 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$247,503	0	$247,503
Long Island Lighting Company	188,816	0	188,816
Polytechnic University	24,019	0	24,019
Sensor Systems Industries	34,700	0	34,700
TOTALS	$495,038	0	$495,038

Contractor: Long Island Lighting Company
Site: Brooklyn, Kings County, and Utica, Oneida County
Contract Duration: 7/96 - 11/98
Key Words: product development, electricity
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Control Systems
Contract No.: 4379-IABR-IA-96

-> Development and Demonstration of Mutually Coupled Variable-Reluctance Motor Drives

Develop and demonstrate mutually coupled variable-reluctance motor drive technology.

BACKGROUND

The variable-reluctance motor (VRM) is a synchronous motor that has a stator with concentrated windings. The VRM requires a power electronic converter that is synchronized with rotor position for phase excitation. Because of advances in power semiconductor technology and the relatively simple design and construction of the motor itself, VRMs are becoming popular in industry. The VRM essentially has zero mutual inductance between phases which imposes limits on torque production. This can be attributed to the concentrated winding associated with the motor, which places the burden of torque production on the self-inductance of each phase. The VRM also suffers from reduced output due to the lack of magnetic coupling between phases, which results in energy circulation between the motor and its supply. Energy circulation prevents fast interruption of the phase currents, requiring phases to be de-energized prematurely and resulting in decreased use of the motor's energy conversion capabilities. The mutually coupled variable-reluctance motor (MCVRM) being developed is a VRM with an altered winding configuration to introduce magnetic coupling, or mutual inductance, between phases which stores a portion of a phase's energy and couples it to the next phase. As a result, energy that is normally circulated back to the supply remains in the motor during phase transitions and phases can be rapidly switched off.

OBJECTIVE

To design and develop an MCVRM suitable for field-testing, data-collection, and development of a marketing strategy.

DESCRIPTION

The contractor will: (1) develop fundamental design constraints, (2) develop a nonlinear magnetic model of the MCVRM, (3) implement the nonlinear solution, (4) create a design specification, (5) hold a design review; (6) fabricate a prototype, (7) perform laboratory testing and redesign, (8) fabricate a demonstration unit, (9) arrange field-testing, (10) analyze the data, and (11) develop a commercialization strategy.

BENEFITS

The continued development of variable-speed MCVRM systems will have an important impact on energy production as the trend continues toward implementation of energy-saving adjustable-speed drives. The MCVRM technology offers an opportunity to drive down the operating costs of such systems, which could unlock the economics of implementing adjustable-speed drive technology. The MCVRM is much simpler than induction motors and it does not use permanent magnets, which also makes it much cheaper to manufacture. Initial studies suggest it could provide 50% more specific torque than the conventional VRM, giving it important size advantage.

SCHEDULE AND STATUS

The fundamental design constraints, magnetic circuit modeling, the base nonlinear solution along with the lamination drawings are complete. Virtually all subsystems to be used in the controller are at prototype stage. The project is on schedule.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$195,724	$195,724
Advanced Energy Conversion	0	195,724	195,724
TOTALS	0	$391,448	$391,448

Contractor: Advanced Energy Conversion
Site: Ballston Spa, Saratoga County
Contract Duration: 8/97 - 6/99
Key Words: product development, industrial, motors
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Control Systems
Contract No.: 4512-IABR-IA-98

-> High-Power Diode-Pumped Solid-State Lasers

Design and develop diode-pumped solid-state lasers incorporating Uni-crystal technology.

BACKGROUND

Photonics Industries International, Inc. currently manufactures krypton-lamp-pumped solid-state lasers and laser systems. Lasers are categorized by the "active medium" used, (i.e., the basic materials used in the production of the laser energy). A laser may use solid-state crystals, such as YAG (Yttrium-Aluminum-Garnet) and YLF (Yttrium-Lithium-Floride). Most widely used solid-state lasers are made by doping Neodymium (Nd) into a variety of host materials such as YAG/YLF crystals. With a lamp-pumped laser, the laser rod is energized (pumped) by light from an electrical pump lamp; external water cools the laser rod and the lamp. Because substantial progress has been made in the availability and economics of laser diodes, it is now realistic to develop an efficient high-power diode pumped solid-state laser that will replace the lamp-pumped laser in high-power applications.

OBJECTIVE

To develop a high-power diode-pumped Nd:YLF laser that will offer better performance, minimum maintenance, and substantial energy savings. It will use no external cooling water and will be compact in size, at a manufacturing cost comparable to existing lamp-pumped lasers. Two 30-watt fiber coupled laser diodes (from Semiconductor Laser Int. Inc. in Vestal, NY) will be used to couple diode-pumping power to the laser crystal.A specially grown crystal will be used to simulate the contractor's existing laser's thermal lens characteristics in combination with a curved mirror.

DESCRIPTION

The contractor will: (1) design, characterize and test Uni-crystals of Nd:YLF; (2) purchase and test laser diodes, drivers, and controllers; (3) design the image optics, pumping cavity, and laser resonator, (4) perform continuous-wave and Q-Switch operation testing, and (5) design the laser package.

BENEFITS

The proposed product (>=20 watts output power) will save more than 87% in electricity and will use no external cooling water. This amounts to approximately $10,000 annual savings in utility cost for the average user and up to 2.6 million gallons of water saved. The contractor expects to hire a minimum of three new employees if the project is successful. This development effort would put the contractor in a leading position in terms of product output power as well as flexibility of repetition rates.

SCHEDULE AND STATUS

Difficulties with the production of the laser diode have kept the project at a slower than planned pace. Two laser diodes are in the process of being tested. The laser diode driver and controller have been successfully tested. Work will continue on the laser diode with an acceptable version anticipated by June 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$143,735	0	$143,735
Photonics Industries International, Inc.	163,715	0	163,715
TOTALS	$307,450	0	$307,450

Contractor: Photonics Industries International, Inc.
Site: Stony Brook, Suffolk County
Contract Duration: 1/97 - 5/99
Key Words: product development, industrial, laser
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Control Systems
Contract No.: 4509-IABR-IA-97

-> Light-Element X-ray Fluorescence Using Capillary X-ray Optics

Design optical system for light-element analysis on silicon semiconductor substrates using x-ray fluorescence.

BACKGROUND

Fabrication of semiconductor devices requires a precise control of trace contamination levels. The elemental contaminants with atomic weights higher than that of silicon can be monitored by a total reflection x-ray system (TXRF). However, light elements with atomic weights lower than that of silicon have poor fluorescence and the silicon signal dominates the spectra. Aluminum, sodium, and carbon are the primary light-element contaminants that need to be carefully controlled. Such elements are currently monitored through destructive analysis techniques.

OBJECTIVE

To design a novel system for light-element analysis with low-energy x-rays. The emphasis in Phase I will be on designing and constructing an optic to focus and thereby greatly intensify the x-ray beam onto a silicon semiconductor for determining low Z elements. Phase II involves developing and building a complete prototype light element XRF system and testing it in conjunction with users from the semiconductor industry and XRF equipment manufacturers.

DESCRIPTION

The first phase will include performing energy dispersive measurements on polycapillary fibers, comparing experimental data with ray-tracing simulations, designing an optic; building and testing a prototype multifiber optic, and evaluating the feasibility of the light-element XRF system. There will be a go/no-go decision point at the end of Phase I based on that phase's technical results and market requirements. The second phase will include: selecting the New York State test site; specifying the system design; designing, fabricating, and testing the system; comparing test results with the semiconductor industry association's roadmap and market requirements; and finalizing commercialization plans.

BENEFITS

The system will allow in-line detection of organic and light-element contamination in semiconductor manufacturing, leading to improved device yields and lower energy use per working device. The increase in production yield would translate into savings of $5 million per week for each micro-processor-fabrication facility. The in-line detection capability terminates further processing of contaminated batches, leading to reductions in energy and hazardous chemical use.

SCHEDULE AND STATUS

Phase I is complete and successful. Currently waiting for delivery of high power x-ray source, which has a very long lead time. Testing with a low-power source is under way. The contractor is working with an industry consultant to obtain suitable thin film samples for testing.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$200,000	0	$200,000
X-Ray Optical Systems, Inc.	242,237	0	242,237
TOTALS	$442,237	0	$442,237

Contractor: X-Ray Optical Systems, Inc.
Site: Albany, Albany County
Contract Duration: 9/96 - 12/98
Key Words: product development, industrial process
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Control Systems
Contract No.: 4465-IABR-IA-97

-> Special Coatings Emission-Control System

Develop emission-monitoring system controls for HYDRID™ paint booths.

BACKGROUND

The Clean Air Act Amendments of 1990 require significant changes for users of industrial paints and coatings. In New York State, major coaters also are regulated under 6 NYCRR Part 228 surface-coating requirements. Both of these regulations force user of highly volatile coatings to apply for special permits and variances. Optimum Air Corp. is manufacturing and selling energy-efficient, environmentally compliant paint-booth systems (HYDRID™ system) to industrial users of waterborne paints and coatings. The system enables users to comply with the regulations, save energy and increase productivity through faster drying times. At present, these systems work well for waterborne coatings because they can handle the monitoring requirements for the two or three volatile organic compounds (VOC) still present, as well as filter out the low level of volatiles given off. Modifications need to be made to the filter system and an emissions-monitoring system needs to be developed to allow for the use of volatile coatings.

OBJECTIVES

To upgrade the HYDRID™ filter-system technology and develop a combination emissions-monitoring system to monitor the myriad compounds present in today's highly volatile coatings.

DESCRIPTION

In this project, the contractor and the project team will: (1) select subcontractors and a monitoring system and develop a marketing plan for Optimum Air, (2) develop specifications listing all VOCs likely to be monitored, (3) investigate existing logistical conditions at Goulds Pumps, (4) test the monitoring system, (5) install capture-source modules and HYDRID™ modules, (6) install and test-monitoring system controls, (7) conduct operations training, and (8) develop a commercialization plan. The project team will prepare technical papers for relevant industry conferences and publications, as well as conduct a site tour at the end of the project for other suitable New York State manufacturers that use volatile coatings.

BENEFITS

This project has significant benefits to both Goulds Pumps and Optimum Air. The major direct environmental benefit to Goulds and the surrounding community is the reduction of VOC emissions from as much as 12 tons/year from special coatings to less than 100 lbs/year. The Optimum Air equipment also allows for a marked reduction in natural gas and electrical consumption, approximately $6,500 annually per unit. The New York State Department of Environmental Conservation states that roughly 100 other NYS companies could benefit significantly from the development of this technology.

SCHEDULE AND STATUS

Monitoring systems and filtration systems have been selected. Installation of the monitoring system is expected to be complete by May 1998. The outstanding equipment installations are planned for late September 1998. Production constraints are the reasons for the delay in the project.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
Goulds Pumps, Inc.	479,873	0	479,873
Optimum Air Corp.	157,760	0	157,760
TOTALS	$887,633	0	$887,663

Contractor: Goulds Pumps, Inc.
Site: Seneca Falls, Seneca County and Malta, Saratoga County
Contract Duration: 3/97 - 12/98
Key Words: product development, industrial process, emissions
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Control Systems
Contract No.: 4508-IABR-IA-97

-> Compressed Air Challenge - Resources for System Optimization

Encourage greater energy efficiency, reliability, and productivity in compressed air systems.

BACKGROUND

Existing research and consensus among industry experts indicate that compressed air, or "plant air," systems are energy-inefficient mainly due to a lack of awareness in the industrial community. Known as the "fourth utility," plant air is often vital to production, and plant air experts often look for ways to significantly reduce energy usage while increasing system effectiveness and reliability. According to U.S. DOE, plant air systems consume, on average, 3-4% of a plant's electric energy use, although in some operations that quantity can be much higher. Therefore, the 25-50% savings potential realized from the average plant air audit, reduced capital outlays, and increased reliability and productivity make optimization of plant air systems highly beneficial to customers.

OBJECTIVE

To mobilize a national collaborative that provides tools for partners' use, including literature, marketing materials, training programs, and, potentially, certification programs.

DESCRIPTION

In the first year, the collaborative goals are to (1) develop an inventory of existing materials; assess market opportunities, and create promotional materials for a comprehensive customer awareness campaign; (3) create a package of high-quality technical information that will form the basis of a training curriculum for plant engineers; (4) assist partners in training, including at least five workshops; (5) develop criteria, test materials, and implementation strategy for a plant engineer certification program; and (6) evaluate the effectiveness of the training and marketing materials, and conduct an overall assessment of partner satisfaction. Additional funding will be sought for year-two efforts, when the collaborative plans to (1) revise and refine materials based on lessons learned and year-one evaluations; (2) implement the plant engineer certification program; (3) deliver, with additional support from partners and other organizations, the plant engineer training curriculum; (4) conduct a market assessment to determine the feasibility of a certification program for plant air system professionals, and, based on the results of this evaluation, (5) make a decision about establishing a professional certification for plant air system assessment services.

BENEFITS

Improvements in plant air systems tie directly to production, efficiency, and reliability. Plant air systems consume 27 to 32 Twh/y of electricity. A typical system can be improved by 25% through proper matching of equipment and distribution with pressure needs, and by reducing losses. The collaborative will provide the industry with much-needed training, standards, and informational materials. In addition, ASERTTI participation will provide an important industry focus and ensure broad applicability of project results.

SCHEDULE AND STATUS

The project is on schedule. The Compressed Air Sourcebook is available and training material is being developed. Training is expected to begin in early 1999.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$30,000	$30,000
U.S. Department of Energy	0	30,000	30,000
Energy Center of Wisconsin	0	30,000	30,000
Iowa Energy Center	0	30,000	30,000
All others	0	210,000	210,000
TOTALS	0	$330,000	$330,000

Contractor: Energy Center of Wisconsin
Site: National
Contract Duration: 12/97 - 12/98
Key Words: compressed air, industrial
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Control Systems
Contract No.: 4659-IABR-IA-98

-> High-Efficiency Check-Valve Development

Develop and test new energy-efficient check-valve design for submersible-pump applications.

BACKGROUND

Underground sources of water are becoming increasingly important due to increases in the cost and complexity of treating surface-water sources. Submersible pumps offer maintenance and service advantages over line-shaft pumps in these deep-well applications. Each deep-well submersible pump requires a down-hole check-valve. The friction losses through these valves are typically high. Flomatic Corporation has developed a check-valve concept that has the potential to reduce the flow loss and significantly improve the energy efficiency of deep-well pumping.

OBJECTIVES

To develop a complete check-valve product line with sizes ranging from 12 inches down to four inches. The initial effort will complete the design and testing of a single 6-inch valve. This will be followed by design-test activities with other valve sizes.

DESCRIPTION

The project will include laboratory-testing of the prototype valves to optimize hydraulic efficiency and establish durability. It also will include field-testing of the valve to verify energy benefits in actual deep-well applications. Production-tooling will be developed for commercial manufacture of the valve. The results of the testing will be presented in technical papers. Marketing efforts will include product literature, a video, and trade shows.

BENEFITS

This high-efficiency check-valve has the potential to reduce the pumping energy requirements in water-well systems using submersible pumps. Improvements of two to three percent compared to systems using conventional check-valves are expected. Economic development benefits will accrue from the product being manufactured in New York State.

SCHEDULE AND STATUS

After some unanticipated delays, field-testing is under way in collaboration with Goulds Pumps, Inc. Interim results have led to minor modifications and additional testing.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$81,000	0	$81,000
Flomatic Corporation	128,012	0	128,012
TOTALS	$209,012	0	$209,012

Contractor: Flomatic Corporation
Site: North Hoosick Falls, Rensselaer County
Contract Duration: 5/93 - 12/98
Key Words: product development, municipal, pump, water system
Project Manager: Bill Reinhardt (518) 862-1090, ext. 3257
Program: Industry
Subprogram: Control Systems
Contract No.: 2032-EEED-IEA-93

-> Microprocessor-Controlled Radio-Frequency Induction Heating (Phase II)

Develop new line of more efficient radio-frequency induction-heating equipment for heat-treating applications.

BACKGROUND

Radio-frequency (RF) heating allows for the rapid application of heat to certain materials in a highly localized, controlled manner. This electrotechnology allows for higher throughput and tighter physical integration in today's manufacturing lines. Wherever industrial heat-treating occurs (metals fabrication, semiconductors, packaging, fiber optics, etc.), an opportunity for RF exists. The capacity of an RF unit is defined in terms of its kW power and Khz frequency output. The kW output depends on power electronics, which affect power-conversion efficiency, power factor, and harmonic distortion. The Khz frequency output is affected by the speed at which the signal-target interaction can be monitored and controlled. Generally, higher RF frequencies require high-speed tuning-control capability, with modern digital signal-processing (DSP) technology expected to play an important role. The extent to which Ameritherm, Inc. can develop and produce RF systems with higher kW power and Khz frequency outputs will dictate its ability to remain competitive in this market.

OBJECTIVE

To further advance features and capabilities of an RF heating system developed under Phase I of this agreement, allowing penetration into new markets and retention of market share by keeping ahead of the competition.

DESCRIPTION

The contractor will advance the capability of the products to the 60kW and +450 Khz range by: (1) developing in-house DSP microprocessor tuning-control capability; (2) transitioning to more advanced power electronics in the switch mode power supply to improve the power factor from 0.6-0.7 to 0.9; and (3) product-line planning, including mapping known heat-treating applications against kW-Khz RF system requirements to better define product-market segments and appropriate product-development evolutionary paths.

BENEFITS

Helping this New York State manufacturer of leading-edge RF heat-treating technology will provide general economic development benefits (jobs, multiplier effects) and promote an electrotechnology that offers higher energy efficiency and lower environmental emissions than fossil-fuel methods. The technology is also consistent with higher productivity and electricity-load-growth for New York State manufacturers.

SCHEDULE AND STATUS

The prototype 3 kW power supply using the Agile Tuner technology is complete. Five beta power supplies with the Agile Tuner will be filed tested in May 1998, with production of commercial product expected in July 1998. Development of the Buck Regulator is complete. Full qualification testing of the integrated systems is complete.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$450,000	0	$450,000
Ameritherm, Inc.	909,308	0	909,308
TOTALS	$1,359,308	0	$1,359,308

Contractor: Ameritherm, Inc.
Site: Scottsville, Monroe County
Contract Duration: 12/95 - 7/98
Key Words: product development, industrial process, RF induction heating
Project Manager: Barbara Caropolo (518) 862-1090 ext. 3266
Program: Industry
Subprogram: Control Systems
Contract Nos.: 3124-EEED-IEA-94

-> Firestix Kiln

Design and develop improved kiln technology

BACKGROUND

Firewood is a billion-dollar national industry. The national market for packaged firewood is growing and offers tremendous opportunities to those companies capable of meeting consumer demands. The packaged firewood industry has traditionally been served by small sawmills and other wood-products companies that treat firewood as a secondary product, resulting in poor product quality. The lack of quality standards resulted in suppliers producing toward the "lowest common denominator" and traditional packaged firewood was of extremely low quality. Firestix Industries has broken the mold with its Firestix® brand packaged firewood by addressing the three key elements of consumer demand: (1) clean, dry hardwood free of insects; (2) the means to start the fire; and (3) packaging that makes the product easy to handle and store. Kiln-drying of the wood is the key to product performance. "Traditional" kiln-drying technology cannot be used in the production of packaged firewood for two reasons. First, the production-cycle time is too long to manufacture the product in a cost-effective manner. Second, the temperatures in "traditional" kilns are too low to meet USDA standards for pest control.

OBJECTIVE

To design and develop an improved kiln/oven design that will offer significant benefits over the existing technology to dry cut, split hardwood for packaged firewood.

DESCRIPTION

The contractor will: (1) evaluate the characteristics of the water molecules, (2) evaluate alternative heat-energy sources and current kiln/oven design, (3) evaluate existing high-performance kiln and oven designs, (4) perform a computer analysis of ideal arrangements of product and structure, (5) develop controls and instrumentation, (6) construct a prototype, and (7) perform testing and evaluation.

BENEFITS

Firestix is currently running a 450,000-Btu burner with monthly gas expenditures of $10,000 during peak production. The potential energy impact from the improved kiln design is an approximate one-third reduction of the plant's natural gas consumption. In addition the company could realize a significant manufacturing-cost savings; presently, kiln fuel accounts for 8% of Firestix's manufacturing cost. Also, Firestix is unable to keep up with demand for its product due to process constraints, and this improved technology will allow the company to dry wood faster and gain more throughput, thus improving profitability.

SCHEDULE AND STATUS

A kiln design has been developed and is in the process of being prototyped. A modification to the project is in process, expanding the scope to include installation of an alternative energy source as well as additional kilns.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$76,255	0	$76,255
Firestix Industries, L.P.	76,255	0	76,255
TOTALS	$152,510	0	$152,510

Contractor: Firestix Industries, L.P.
Site: Ballston Spa, Saratoga County
Contract Duration: 3/97 - 9/98
Key Words: product development, industrial, heating
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry
Subprogram: Control Systems
Contract No.: 4510-IABR-IA-97

-> Commercialization of Weld Controller - Phase II

Develop expanded product line for WeldComputer's adaptive control technology.

BACKGROUND

The WeldComputer technology, which can be retrofitted to existing industrial resistance welders, allows for monitoring of and compensation for weld variations that may arise from the weld machine, the workpiece, or external sources. The controller's advantage compared to other weld-control devices is that it can identify the source of the weld variation and take corrective action. These features benefit the user by eliminating periodic destructive testing and overwelding, cutting energy use through reduced welds, and wasting less material. However, the price of the WeldComputer often limits acceptance.

ACCOMPLISHMENTS

Performed the marketing necessary to introduce three new products. Designed, tested, and implemented three new hardware configurations and software modifications. Delivered three existing-design WeldComputer adaptive controls to companies to have them help define new product requirements. Developed six prototype units and two additional preproduction units. Conducted performance testing identifying weaknesses and enhancement opportunities and integrated any upgrades into the product lines. Significantly increased the company's revenues with the addition of the new product lines.

FINDINGS AND CONCLUSIONS

Scaling down the cost per head of the WeldComputer has greatly contributed to increased awareness about adaptive controls. High-quality original equipment manufacturers (OEMs) and representatives are now aware of the company's products and a higher percentage of sales is now being generated by outside contacts. This project has also allowed the contractor to maintain dedicated demonstration units that it can loan to potential customers while providing technical assistance, which has proven to be an effective sales method.

REALIZED OR ANTICIPATED BENEFITS

As a result of the Phase I and II projects, the company has been able to introduce the WeldComputer in many markets other than the original target areas of aerospace and defense. In Phase II, a number of product enhancements and market niches have been identified that are vital to the company's ability to expand its market share and achieve significant revenue growth. Among these new product opportunities are: tube mill seam welder controls, the multiple-head WeldComputer adaptive control and the low-cost WeldComputer. The last two niche areas address the price barrier that was a concern for the original WeldComputer. The low-cost WeldComputer, named the L-series, contains fewer functions and cost components than the original design.

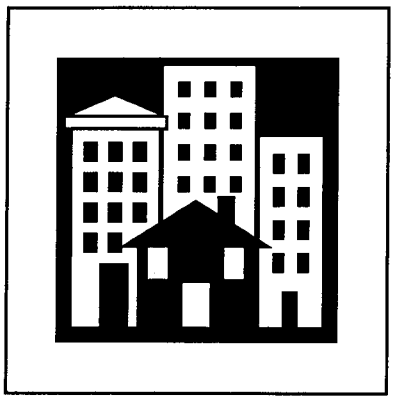
TECHNOLOGY TRANSFER ACTIVITIES

WeldComputer Corporation greatly expanded its marketing system. The company now employs 11 manufacturers' representatives and has two distributors who have maintained welding laboratories for evaluations. Fifteen companies are participating with WeldComputer as OEMs, which allows them to use the adaptive controls in their resistance welding products.

FUNDING	TOTALS
NYSERDA	$650,000
WeldComputer	754,060
U.S. Department of Energy	100,000
Gilbert International	118,500
Keeweld, Inc.	74,500
Aerospace S&E	23,300
TOTALS	$1,720,360

Site: Troy, Rensselaer County
Contract Duration: 12/94 - 9/97
Key Words: product development, microprocessor control
Project Manager: Barbara Caropolo (518) 862-1090, ext. 3266
Program: Industry and Applications
Subprogram: Control Systems
Contract No.: 1960L-EEED-IEA-93

BUILDINGS



Benefits and Rationale

Residential and commercial buildings account for 49% of New York's net energy use, largely due to the State's concentration of office buildings. More efficient building equipment and systems could reduce New York's $20.8 billion annual energy bill in the residential and commercial sectors by at least 20%, while providing significant environmental benefits, such as reducing the 69.5 million tons of CO_2 emissions attributed to the State's buildings in 1996.

Several hundred manufacturers in New York produce energy equipment and systems for buildings, including products used for lighting, heating/cooling, ventilation, and building controls. These companies are primarily small businesses with limited resources to develop advanced energy technologies. Helping New York manufacturers respond to the expanding market for energy and environmental products will create economic development in New York.

According to a recent nationwide study by the President's Committee of Advisors on Science and Technology, "the buildings sector represents a classic case for government involvement in R&D," as it is a highly disaggregated industry engaging hundreds of thousands of architects, developers, and contractors; and, for a variety of reasons, is risk averse and under-invests in R&D. In fact, nearly 20 states have established buildings-related R&D programs to address some of these problems and take advantage of the many remaining opportunities for increased innovation in the buildings sector. With commercial and residential buildings accounting for nearly one-half the net energy used in New York State, considerably more than the national average, the need for buildings-related R&D in this State is even greater.

Lighting comprises 22% of total electric use in New York. Wider use of efficient lighting could conservatively reduce New York's annual lighting bill by over $600 million. Properly specified and commissioned lighting systems alone could cut lighting energy use by 50%. Large saving opportunities exist for further penetration of emerging lighting technologies such as metal halides, light-emitting diodes, fiber optics, and lighting controls. NYSERDA's work in lighting has historically focused on testing, evaluation, and information dissemination; and, more recently, developing a high-efficiency lighting industry in New York through co-funding new lighting product development. Future efforts will build on these activities through targeted outreach to New York lighting designers, specifiers, manufacturers, energy service companies, and end-users.

Space heating, domestic hot water, and air conditioning consume 60% of the energy used in residential and commercial buildings and are prime candidates for energy efficiency improvements. Energy-efficient heating equipment with very low NO_x, carbon monoxide, and particulate emission levels could reduce local and regional air pollution, while also significantly reducing the amount of greenhouse gases emitted into the atmosphere. NYSERDA has over the years helped build New York's heating and cooling manufacturing industry, which operates on an extremely tight profit margin and suffers from lack of R&D resources. NYSERDA will continue with its successful industry partnerships to develop energy-efficient and environmentally friendly New York products in this sector.

Electrical and control systems also offer potential efficiency improvements that could produce energy cost savings for the consumer and product-development opportunities for New York manufacturers. A combination of both rapid technological advances in electronics as well as changes in the marketplace associated with utility restructuring have resulted in a marked increase in activity in this area in the private sector. Promising R&D areas include energy management systems, motors and drives, and controls for building equipment (such as HVAC). New technologies are expected to play a major role in advanced meter reading and load profiling, communications, and more sophisticated energy control and monitoring. As new markets are opening up with utility restructuring, NYSERDA's role will be to (i) help the small companies in New York take advantage of these technical advances and market opportunities, while ensuring that their products have significant energy-saving attributes and provide "public benefits" and (ii) objectively assess new technologies developed in this area, as there is limited independent data available on operation, quality, and functionality of many of the new building equipment controls and energy-management and energy-monitoring systems.

Integrated Building Systems and Building Envelopes. Improvements in energy efficiency and indoor air quality in buildings can be obtained by optimizing the whole building system, considering various interactions between major energy uses (refrigeration, lighting, insulation, HVAC, windows, etc.), as well as the potential for multifunctional products (*e.g.*, use of photovoltaic panels for building skins). Studies have shown that thermal distribution systems, for example, can waste up to one-third of the energy produced by heating equipment, while adversely affecting indoor air quality. Use of ventilation systems will also be an important factor in buildings to maintain indoor air quality in an energy-efficient manner. Improving the building envelopes of new residential structures can reduce heating and cooling system requirements by up to 80%. New design approaches and construction and maintenance practices, as well as "smarter"/more integrated building products, will be needed to improve overall building performance and further the "greening" of buildings.

Several building technologies that use renewable energy, often termed "end-use renewables", are currently cost-effective in certain applications, or have the potential to be cost-effective in the near term. These include earth-coupled and groundwater heat pumps, daylighting, passive solar heating, and solar heating of ventilation air and domestic water. These technologies require further research and need to be integrated into overall building system design.

New York has an estimated 550,000 units of publicly assisted *low- and moderate-income multifamily housing.* Many of the 500,000+ electrically heated dwellings in New York are in this publicly assisted housing. Despite the State's annual expenditure of some $800 million to assist low-income residents, effective energy efficiency measures have been difficult to implement in this sector for a variety of reasons, including limited access to financing and various disincentives inherent to low-income sector housing for both owner investment and tenant conservation. The potential for improved energy efficiency in the public housing and low-income sector is estimated to range from 12-30%. NYSERDA will create partnerships with housing authorities, the New York State Division of Housing and Community Renewal, and the U.S. Department of Housing and Urban Development, to conduct deployment demonstrations of new, energy-efficient technologies. NYSERDA will also seek to transform the design, procurement, and implementation practices of public housing entities to ensure that life-cycle costing considerations for energy efficiency products and services are incorporated into their routine business practices. As the restructuring of the utility industry has the potential to significantly impact the low-income/multifamily sector in New York, NYSERDA will support and evaluate strategies to improve the market power of low-income households, while incorporating energy efficiency strategies. These deployment-based research activities will be done in coordination with NYSERDA's Residential Energy Affordability Program.

As part of NYSERDA's SBC activities, the Buildings program will focus on advancing the state-of-technology in emerging lighting technologies, advanced variable speed drives and HVAC applications, energy management systems, and fuel-neutral, innovative projects that reduce energy use in buildings.

The primary impact of the Buildings program will be measured in terms of annual sales of new, New York State-manufactured energy-efficient products; installations of energy-efficient products in New York; number of start-up companies initiated; energy saved in New York; and emissions avoided; as well as continued contributions in providing objective information on new building products and systems for policy-makers and consumers in New York.

Goals

- Reduce consumer energy costs for residential and commercial buildings and address the special energy needs of the low-income housing sector.
- Improve building equipment performance to minimize environmental impacts and ensure energy efficiency and healthy indoor air.
- Develop energy-efficient and environmentally friendly products that can be manufactured in New York.
- Increase the use of renewable energy in buildings.

-> Lighting Research Center Partnership

Maintain and expand capabilities, scope, and usefulness of Lighting Research Center.

BACKGROUND

NYSERDA recognized the need for a Lighting Research Center (LRC) and, after a competitive process, selected Rensselaer Polytechnic Institute (RPI) as the site. The LRC conducts applied research, development, and demonstration projects to encourage the use of more efficient lighting systems and strategies in the State. The activities of the LRC include a broadly based technology-transfer and education program aimed at informing the lighting industry, the lighting-design community, and end-users of energy-efficient and productive lighting strategies. It also educates future lighting-system producers and designers about effective lighting.

OBJECTIVE

To provide support for the LRC Partnership Program.

DESCRIPTION

The contractor will engage in specific research projects, maintain the organizational structure for the LRC, plan and implement lighting research, and acquire technical, financial, and marketing support from national sponsors.

BENEFITS

In New York State, lighting accounts for as much as 30% of the electricity consumed. A reduction of 20% is attainable through developing and commercializing efficient lighting products. This program continues to support a center of excellence in lighting research that attracts research dollars to New York, generating economic development spin-offs as new products and services are developed.

SCHEDULE AND STATUS

The LRC is fully established and conducts a broad range of research, outreach, and educational activities for the lighting industry on a continuing basis.

FUNDING	Past Years	FY 1997-98	Total Anticipated*
NYSERDA	$1,600,000	$100,000	$1,750,000
Rensselaer Polytechnic Institute	180,000	0	180,000
Other co-funders	3,135,000	500,000	4,335,000
TOTALS	$4,915,000	$600,000	$6,265,000

* Includes incremental funding through FY 1997-98 only.

Contractor: Rensselaer Polytechnic Institute
Site: Troy, Rensselaer County
Contract Duration: 3/88 - 4/99
Key Words: university, lighting, commercial, residential
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 1052A-EEED-BES-88

-> National Lighting Product Information Program

Research, develop, publish, and disseminate information about energy-efficient lighting products and systems.

BACKGROUND
This project was initiated in 1990 to collect manufacturer-specific performance and other information on a series of lighting products and systems, to evaluate this information, and perform independent testing on these products. The resulting information has been documented in a series of publications that include: Specifier Reports, with manufacturer-specific information; Lighting Answers, which addresses specific lighting problems; executive summaries; and special reports.

OBJECTIVE
To continue to support the National Lighting Information Program.

DESCRIPTION
The contractor will continue work on: (1) Specifier Reports for photocell controls, dimmable electronic ballasts (combining compact fluorescent lamps with linear fluorescent lamps), residential luminaires, panel-level power reducers, exit signs, and screwbase compact fluorescent lamps; (2) Specifier Report Supplements for electronic ballasts and exit signs; and 3) a Product Guide for choosing a ballast for occupancy sensor applications.

BENEFITS
In New York State, lighting accounts for as much as 30% of the electricity consumed. This lighting energy use could be reduced 20% through the development and commercialization of efficient lighting products. This project is the nation's primary source of objective information on efficient lighting products and is promoted by U.S. EPA/DOE Green Lights and other programs.

SCHEDULE AND STATUS
The fourth year of research is complete. Twenty-nine publications have been produced on different lighting products and subject areas, with approximately 200,000 copies circulated worldwide. The program will continue to add new publications to the series.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$800,000	$200,000	$1,200,000
U.S. Environmental Protection Agency	800,000	200,000	1,350,000
Bonneville Power Authority	50,000	0	50,000
New England Utilities	200,000	0	200,000
The Energy Center of Wisconsin	200,000	50,000	250,000
Southern California Edison	100,000	0	100,000
Hydro Quebec	50,000	0	50,000
CINergy	100,000	0	100,000
U.S. Department of Energy	150,000	0	150,000
Northern States Power	250,000	0	300,000
Northwest Energy Efficiency Alliance	0	50,000	50,000
Northern Light	50,000	0	50,000
Iowa Energy Center	150,000	50,000	200,000
Electric Power Research Institute	100,000	0	100,000
Other co-funders	234,800	0	500,000
TOTALS	$3,234,800	$550,000	$4,650,000

Contractor: Rensselaer Polytechnic Institute
Site: Troy, Rensselaer County
Contract Duration: 3/90 - 11/98
Key Words: university, lighting, commercial, residential
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4010-IABR-BR-95

-> New York State Excellence in Lighting

Design, specify, produce, and commercialize energy-efficient lighting in New York.

BACKGROUND

The project was originally funded in April 1994 as the Lighting Market Transformations Program, funded by NYSERDA, the U.S. Department of Energy (U.S. DOE)/Bonneville Power Administration, the U.S. Environmental Protection Agency (U.S. EPA), and Rensselaer Polytechnic Institute (RPI). The project worked with user groups, utilities, manufacturers, industry associations, researchers, government, and public interest groups to achieve consensus on new energy efficiency specifications for selected products. It developed, tested, and evaluated new specifications for exit signs, office lighting, and occupancy sensors.

OBJECTIVE

To work directly with New York lighting manufacturers and specifiers to support the design and commercialization of energy-efficient lighting products to ensure New York products compete successfully with U.S. DOE and U.S. EPA ENERGY STAR lighting products by equaling or exceeding ENERGY STAR specifications.

DESCRIPTION

The contractor will host 1) four round tables to introduce New York lighting manufacturers to the new and proposed ENERGY STAR specifications for exit signs, residential luminaires, and task lighting, 2) one roundtable to present the results of the National Lighting Product Information Program (NLPIP) lamp/ballast compatibility testing, and 3) one symposium to encourage photovoltaic (PV) and lighting product manufacturers to develop PV-powered lighting systems. The Excellence in Lighting Program also will provide up to one day of Lighting Research Center expert consultation to New York manufacturers on an as-needed basis to help their products meet ENERGY STAR specifications, as well as showcase the lighting products developed by New York companies in collaboration with NYSERDA in a DELTA Snapshot publication. U.S. EPA and RPI will continue to develop and evaluate new ENERGY STAR specifications for exit signs, residential luminaires, and task lighting as new, more energy-efficient models become commercially available.

BENEFITS

Increased economic development will result from the manufacture and sale of these products, which will be up to 50% more energy-efficient than conventional products and operate in the top 10% of product efficiency levels.

SCHEDULE AND STATUS

Specifications have been prepared for exit signs and residential and exterior luminaires. Office and residential luminaires, task lighting for offices, photo sensors, light-emitting diodes, and other product specifications are being developed. Four roundtables have been held; on residential lighting, ENERGY STAR exit signs, task lighting, and lamp/ballast compatitibility. A symposium on PV-powered lighting systems is planned for June 25, 1998.

FUNDING	Past Years	FY 1998-99	Total Anticipated
NYSERDA	$375,000	0	$525,000
U.S. Environmental Protection Agency	715,000	$125,000	840,000
U.S. DOE/Bonneville Power Administration	150,000	0	150,000
Rensselaer Polytechnic Institute	35,000	6,000	41,000
Hewlett Packard*	0	75,000	150,000
Pacific Gas & Electric	0	375,000	375,000
TOTALS	$1,275,000	$581,000	$2,081,000

* Proposal pending.

Contractor: Rensselaer Polytechnic Institute
Site: Troy, Rensselaer County
Contract Duration: 4/94 - 8/98
Key Words: product development, university, lighting
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 3154-IABR-BR-94

-> High-Efficiency Fiber Optic Illuminator

Develop and commercialize high-efficiency fiber optic illuminator.

BACKGROUND

Fiber optic lighting has been growing in popularity over the past decade. Presently, most fiber optic systems are designed for MR16 incandescent or single-ended metal halide lamps. The MR16 systems are inefficient and the metal halide systems tend to be very complex and expensive, due to the extra features that are included, such as color filtering, DMX controls, and mounting options. Although the metal halide systems have significant energy and lamp-replacement savings, their high up-front costs have prevented wide acceptance in the marketplace.

OBJECTIVE

To develop a stripped down, highly efficient, illuminator that concentrates on efficiency and light output, achieving a minimum of twice the efficiency at one-half the cost of other fiber optic illuminators available in the marketplace.

DESCRIPTION

The contractor will: (1) conduct a market study to determine customer design and performance criteria for fiber optic systems; (2) design and produce a highly efficient fiber optic illuminator; (3) prototype-test the product; and (4) move the product into production.

BENEFITS

An efficient and cost-competitive fiber optic illuminator will help eliminate some of the economic barriers to wider use of energy-efficient fiber optic systems in retail display applications. The project will also create jobs in the lower Hudson Valley, save consumers energy and lamp replacement costs, and reduce landfill waste.

SCHEDULE AND STATUS

The market study is underway and preliminary design work has been inititated. Commercially available lamp/reflector combinations are being considered for possible incorporation in the project.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$200,000	$200,000
Lighting Services, Inc.	0	206,979	206,979
TOTALS	0	$406,979	$406,979

Contractor: Lighting Services, Inc.
Site: Stony Point, Rockland County; and Rensselaer, Rensselaer County
Contract Duration: 12/97 - 7/99
Key Words: product development, lighting, commercial
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4631-IABR-BR-98

-> Commercial Production of Solar Lighting Systems

Commercialize new solar lighting product that can be integrated with high-intensity discharge lighting system.

BACKGROUND

Under contract with NYSERDA, Synertech Systems, Corp. developed a unique concept for a solar lighting system that can be integrated with an artificial light source to provide backup power when solar power is insufficient or unavailable. Past efforts to commercialize solar lighting products have been unsuccessful due to both the high production costs and lighting's constant energy requirements. Lightron of Cornwall's lighting consultant, Artech, has developed a revolutionary new lighting system called the "Multi-Beam System 2000", which is being developed by Lightron under a separate contract with NYSERDA (No. 4298-IABR-BR-96), that requires a minimal amount of energy. This technology provides a unique opportunity to test the integration of a solar power option. Lightron, a well-established New York manufacturer of lighting products, will commercialize Synertech's product if this project indicates that it is technically and economically feasible.

OBJECTIVE

To develop an active solar collection system and a method for integrating it with Lightron's Multi-Beam System.

DESCRIPTION

The contractor will develop the tooling requirements, controls, performance ratings, and installation practices for a solar lighting/energy-efficient light-conveyance system and its interface with Lightron's Multi-Beam 2000 System. The contractor will prepare design specifications for the system's ultimate production by Lightron, and collaborate with Lightron on a demonstration of an integrated energy-efficient conveyance/solar lighting system at an appropriate facility. If technically and economically feasible, Lightron will manufacture the solar lighting system and market and sell it with or without the energy-efficient light-conveyance products.

BENEFITS

Combining solar lighting with Lightron's energy-efficient lighting system will achieve unprecedented savings in electrical energy. Commercializing the solar lighting system will result in a significant number of manufacturing jobs at Lightron's main facility in New Windsor, New York.

SCHEDULE AND STATUS

Specifications for a solar lighting prototype that comprises a complete system for transferring natural light into a light distribution system have been developed. Preliminary experimentation with the proof-of-concept model of the off-axis design, the electronic design for steering the system, and writing of the software have also been accomplished. A preliminary optical interface between the solar lighting system and Lightron's Multi-Beam System has been designed by Artech. The contractor is seeking additional funding to proceed with the project.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$120,000	0	$120,000
Synertech	100,000	0	100,000
Artech	18,500	0	18,500
Ashley McGraw	1,500	0	1,500
TOTALS	$240,000	0	$240,000

Contractor: Synertech Systems Corp.
Site: New Windsor, Orange County, and Syracuse, Onondaga County
Contract Duration: 4/96 - 12/98
Key Words: product development, lighting, solar
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4297-IABR-BR-96

-> Develop Energy-Efficient Ballasts

Develop, produce, and test prototypes of fully controllable electronic ballasts for compact fluorescent lamps.

BACKGROUND

Effective November 1, 1995, new federal regulations contained in the 1992 Energy Policy Act banned the use of most incandescent sources, including the PAR incandescent reflector lamps. As a result, applications for compact fluorescent and other fluorescent lamps will continue to grow as light fixture companies bring new fluorescent lighting fixture designs to market. The new regulations also specified the use of sensors and sensor control systems to further reduce energy consumption for areas that have sporadic occupancy. As a consequence, there will be a growing market for fluorescent lighting that can be linked with control systems.

OBJECTIVE

To design, develop and test electronic ballasts to accommodate twin 4-pin, Linear Quad, Quad, and Hex type compact fluorescent lamps (CFL). The electronic ballasts will be fully dimmable and will be engineered for 100,000 power-on hours.

DESCRIPTION

The contractor will: (1) complete the initial engineering to determine product features; (2) design, develop, and prototype-test the fixture; (3) evaluate ballast/lamp compatibility; (4) develop final designs and specifications; (5) design, test, and put into operation the production line; (6) develop final packaging and a marketing strategy; and (7) undertake an initial pilot manufacturing run.

BENEFITS

The contractor's ballast will save seven watts over the leading competitor's products, resulting in $3.15 per year per ballast savings to the customer. Reduced ballast operating temperatures will reduce air-conditioning loads, as well as enable customers to downsize their air-conditioning equipment by 20%, resulting in total savings of 12-15%.

SCHEDULE AND STATUS

Electronic ballasts with fully dimmable capability have been constructed and are undergoing outside testing. Full scale manufacturing options in China are being investigated.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$250,000	$250,000
JRS Technology, Inc.	0	325,220	325,220
NYS Science & Technology Foundation	0	250,000	250,000
TOTALS	0	$825,220	$825,220

Contractor: JRS Technology, Inc.
Site: Endicott, Broome County
Contract Duration: 11/97-2/2000
Key Words: product development, lighting, commercial, residential
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4630-IABR-BR-98

-> High-Intensity Discharge Track Fixtures

Develop and commercialize family of fixtures for new energy-efficient high-intensity discharge PAR 30 metal halide lamps.

BACKGROUND

Merchandise in retail stores is typically lit by incandescent light sources. New federal regulations have banned the use of incandescent sources in many applications and, as a result, several new light sources are coming on the market, including the PAR 30 metal halide lamp. This project will develop a family of track fixtures to optimize the use of this lamp. Metal halide lamps are part of a group of light sources known as high-intensity discharge (HID) lamps, which are used in a wide range of commercial and industrial lighting applications. HID lamps produce light when current passes through a gas at a relatively high pressure. In addition to metal halide, HID lamps include mercury and high-pressure sodium. HID lamps are used for applications requiring substantial light output, long reliable life, and high efficiency.

OBJECTIVE

To develop a family of six track fixtures for use with the PAR 30 lamp, including two wallwashers and four accent lights.

DESCRIPTION

The contractor will: (1) complete the initial engineering to determine product features; (2) design, develop, and prototype-test the fixture; (3) evaluate ballast/lamp compatibility; (4) develop final designs and specifications; (5) design, test, and put into operation the production line; (6) develop final packaging and a marketing strategy; and (7) undertake an initial pilot manufacturing run.

BENEFITS

A new family of energy-efficient light fixtures will be marketed by a New York State manufacturer, resulting in increased employment and revenues. The 35-watt metal halide lamps produce more light than 150-watt PAR-38 incandescent lamps, while consuming one-third as much energy and providing three times the life.

SCHEDULE AND STATUS

Engineering studies, design development, and product testing are under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$100,000	$100,000
Edison Price Lighting, Inc.	0	122,220	122,220
TOTALS	0	$222,220	$222,220

Contractor: Edison Price Lighting, Inc.
Site: New York, New York County
Contract Duration: 9/97 - 9/98
Key Words: product development, lighting, commercial
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4621-IABR-BR-98

-> Design and Produce Luminaires for the Linear T5 Fluorescent Lamp

Develop luminaires linear for the T5 fluorescent lamp.

BACKGROUND

Many new energy-efficient lighting products are being developed in the United States. However, most of these are lamps and ballasts, with few luminaires being developed to incorporate the new lighting technologies. Several new lamp products, such as the T5 fluorescent lamp, have been available in Europe for the last five years and have now become available in the United States. T5 fluorescent lamps are an improvement over the standard energy-efficient T8 fluorescent lamps because they are more energy-efficient and their smaller diameter can achieve improved light focus in a lighting fixture reflector. Prior to this effort, luminaires for the T5 lamp were unavailable in the United States.

OBJECTIVE

To analyze the market potential for a T5 fluorescent luminaire family, and produce and commercialize high-quality, energy-efficient luminaires for the T5 lamp.

DESCRIPTION

SELUX Corporation and its consultant, Synergy Consultants, performed market research and a technology assessment for T5 lamps and ballasts; defined the design, developed prototypes and produced sales samples of T5 luminaires.

BENEFITS

The T5 fluorescent lamp's high efficiency and narrow profile could result in significant energy savings and new opportunities for efficient lighting. SELUX is the first U.S. manufacturer to produce a luminaire to accommodate the T5 fluorescent lamp with electronic ballast. If the new lamp technology replaces the T8 fluorescent lamp, SELUX's luminaires will enable specifiers and buyers to obtain appropriate luminaires in New York, creating jobs locally and saving U.S. dollars from being spent abroad.

SCHEDULE AND STATUS

The market research was completed and prototypes of the luminaires were exhibited at the April 1997 International Lightfair at the Javits Center in New York City. The luminaires are being demonstrated at the Woodstock Children's Center in Woodstock, NY. Factory retooling is under way to manufacture the fixtures in Highland Falls, New York.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$245,612	0	$245,612
SELUX Corporation	245,612	0	245,612
TOTALS	$491,224	0	$491,224

Contractor: SELUX Corporation
Site: Highland, Ulster County
Contract Duration: 5/96 - 10/98
Key Words: product development, lighting, commercial
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4325-IABR-BR-97

-> In-Line Press-Side Rapid-Cycle System

Develop an innovative system to apply reflective coatings suitable for automotive and high-efficiency industrial lighting products.

BACKGROUND

The use of plastic to manufacture reflectors and other lighting products for automotive, industrial, residential, and consumer applications has increased dramatically in the past 10 years. This has resulted in expanded use of paint to apply reflective coatings on lighting components. Paints are also used to prepare the surface of reflectors to receive vacuum-deposited metal films and to protect the metal films deposited. The painting process has resulted in an industry-wide environmental problem of increased emission of volatile organic compounds (VOCs). Stricter State and federal regulations require reduction of VOC emissions and will effectively limit the ability of New York companies to expand production volumes and create new businesses in the area of lighting products.

OBJECTIVE

To design and manufacture an innovative in-line manufacturing system to apply reflective coatings suitable for automotive and high-efficiency industrial lighting products. The goal will be to manufacture complete lighting products at a rate equal to the capacity of the injection-molding sequence predominantly used in the lighting industry to produce reflectors and lenses. The system will be aimed at solving the problem of VOC emissions associated with protective top coats by implementing an in-chamber monomer-to-polymer conversion coating capable of meeting current automotive and industrial coating standards.

DESCRIPTION

The manufacturing system will be designed with individual process modules that can be integrated into a complete system based on specific production requirements. The work will: (1) develop separate vacuum chambers for the reflective and top coatings with appropriate tooling to transfer the parts automatically from one process sequence to the next, and (2) evaluate a method of applying a protective layer by using a monomer that will be converted to a polymer through the use of known plasma-conversion techniques.

BENEFITS

The process could result in a dramatic reduction in VOC emissions associated with paint used in reflective coatings in the lighting industry. It also could eliminate the need for equipment to collect and burn residual emissions and result in waste-disposal savings. The project is also expected to lead to more manufacturing jobs at the contractor's facility in Van Etten, NY.

SCHEDULE AND STATUS

Monomer injection testing is under way and cycle time has been reduced significantly. Cathode testing using various power supplies and various frequencies will commence the summer of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$250,000	$250,000
Vergason Technology	0	984,614	984,614
TOTALS	0	$1,234,614	$1,234,614

Contractor: Vergason Technology, Incorporated
Site: Van Etten, Chemung County, and Jamestown, Chautauqua County
Contract Duration: 9/97-9/98
Key Words: product development, lighting, industrial
Project Manager: Marsha Walton, (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4613-IABR-BR-98

-> Energy-Saving High-Performance Indirect Lighting

Develop and commercialize family of luminaires for compact fluorescent and metal-halide lamps.

BACKGROUND

Recent improvements in lighting technology provide new opportunities for reducing lighting energy loads and for improving the performance of light fixtures. These improvements include the availability of high-lumen, T-5 compact fluorescent and T-6 ceramic arc tube metal halide light sources with excellent color-rendering properties; the introduction of high-quality electronic ballasts; improved, very high-reflectance sheet aluminum products; and advanced software to optimize reflector designs.

OBJECTIVE

To establish commercial production in New York of a family of architectural light fixtures for retail applications that accommodate the new T-5 single-ended compact fluorescent and T-6 ceramic arc tube metal halide lamps.

DESCRIPTION

The project will: (1) develop designs for a family of architectural fixtures optimizing energy savings, production costs, and appearance; (2) establish full-scale production capability in New York for the fixtures; and (3) commercialize the new fixtures through the contractor's well-established product-distribution networks.

BENEFITS

The fixtures will provide lighting energy-load savings to retailers of approximately 66% over incandescent alternatives, and help establish a solid manufacturing base for a New York State lighting product company.

SCHEDULE AND STATUS

Preliminary fixture designs are being evaluated.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$200,000	$200,000
Genlyte	0	401,125	401,125
TOTALS	0	$601,125	$601,125

Contractor: Genlyte
Site: Fall River, MA, and Brooklyn, Kings County
Contract Duration: 9/97 - 10/98
Key Words: product development, lighting, commercial
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4632-IABR-BR-98

-> Residential Lighting for the Elderly

Evaluate common-area lighting designs for senior housing.

BACKGROUND

The Lighting Research Center (LRC) is currently under contract to NYSERDA to design and evaluate residential lighting at South Mall Towers, a senior residential facility. This project will build on and complement the work that is currently under way.

OBJECTIVE

To: (1) design and evaluate common-area lighting designs for South Mall Towers, and (2) provide comprehensive lighting guidelines for renovation or new construction of senior housing. A light-therapy room will be designed and installed in part of the facility's community room. An evaluation will assess the impacts of light therapy on visual comfort and sense of well-being.

DESCRIPTION

Lighting specifications will be developed for common areas, including entryway and elevator lobby, community room, laundry room, and a connecting corridor. An evaluation and case study will document the success of the lighting designs. Data-collection will be accomplished through written and in-person interviews, photometric measurements, and light-loggers. A light-therapy room will be designed, installed, and evaluated to determine potential impacts of various lighting levels on elderly residents' well-being.

BENEFITS

The results of this project will be documented and published as an LRC Demonstration and Evaluation of Lighting Technologies and Applications (DELTA) Portfolio publication. This information will make an important contribution to addressing the special visual needs of the State's elderly.

SCHEDULE AND STATUS

All of the lighting has been installed and the light therapy room construction has been completed. An evaluation to assess the impacts of light on visual comfort and sense of well-being will be initiated during the summer.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$194,000	0	$194,000
Northeast Utilities Service Co.	100,000	0	100,000
Philips Lighting (in-kind)	17,500	0	17,500
Somaltow Housing Company	20,000	0	20,000
TOTALS	331,500	0	$331,500

Note: NYSERDA funds include $10,000 PO.

Contractor: Rensselaer Polytechnic Institute
Site: Troy, Rensselaer County; Albany, Albany County; and Simsbury, Connecticut
Contract Duration: 11/95 - 9/98
Key Words: product development, residential, lighting, elderly
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4343L-IABR-BR-96

-> National Tuberculosis Coalition Project

Test germicidal ultraviolet irradiation to eradicate tuberculosis bacteria.

BACKGROUND
Through its Health Care Initiative, the Electric Power Research Institute (EPRI) is examining the use of ultraviolet germicidal irradiation (UVGI) as a potential method of air disinfection, specifically to deal with the resurgence of drug-resistant tuberculosis. The National Tuberculosis Coalition has been formed to evaluate the effectiveness and safe application of UVGI as a supplement to ventilation.

OBJECTIVE
To install and test UVGI technologies at several different sites around the country, including four shelters in New York City.

DESCRIPTION
The contractor will: (1) solicit competitive proposals to furnish and install UVGI equipment in the shelters, (2) conduct a field trial of the UVGI technology in the men's shelters, (3) summarize the state of the art of the UVGI technology for air disinfection, (4) provide interim guidelines on the application of UVGI technology, (5) refine the application guidelines based on the conclusions of the field trial, and (6) provide a technical report of the findings of the study.

BENEFITS
The UVGI technology could produce benefits to the health care industry and utility end-use customers by providing a cost-effective supplement to current ventilation systems while providing potential disinfection of airborne disease.

SCHEDULE AND STATUS
UVGI equipment has been installed in four shelters in New York City and two shelters in Birmingham. TB conversion rate data sets are being collected and tabulated for both cities. New Orleans will be the next city added to the study, and the design and planning stages are expected to be completed in early fall 1998. Fundraising efforts are ongoing to include two more American cities in the study.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$107,724	$42,276	$150,000
NYS Dept. of Health Aids Institute	0	100,000	100,000
NY Stock Exchange	0	10,000	10,000
Citibank	0	20,000	50,000
Con Edison	375,000	0	900,000
ESEERCO	200,000	0	225,000
EPRI Health Care Initiative	50,000	$50,000	950,000
Manhattan College	19,800	0	19,800
Health Resources & Services Administration	0	75,000	150,000
Central & Southwest Services	0	50,000	50,000
City of Birmingham, Alabama	0	75,000	150,000
Houston Light & Power	0	50,000	50,000
Donors via St. Vincent's Hosp.	317,900	145,000	502,900
Pittsfield Anit-Tuberculosis Association	0	5,000	5,000
The Potts Memorial Foundation	0	15,000	15,000
The United Hospital Fund	0	25,000	60,000
TOTALS	$1,070,424	$662,276	$3,387,700

Contractor: Electric Power Research Institute
Site: EPRI's Northeast Regional Community Environmental Center, Riverdale, Bronx County; and five shelters in New York City, New York County
Contract Duration: 3/97 - 11/98
Key Words: assist business, lighting, commercial, health care
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4233-IABR-BR-97

->Energy-Saving Track Lighting

Design, test, produce, and commercialize energy-efficient track-lighting systems.

BACKGROUND

Most display- and flood-lighting of commercial retail spaces uses inefficient incandescent lights. Recent technology developments in light sources and electronic ballasts provide the opportunity to replace these lights with efficient light sources.

ACCOMPLISHMENTS

The contractor completed all aspects of design optimization, development, testing, production setup, and marketing for track-lighting fixtures dedicated to a series of differently sized and configured compact-fluorescent lamps (CFLs). The research included design and testing of optical, thermal, mechanical, and electrical properties of the fixtures for minimization. Production lines were designed, value-engineered, and installed to manufacture the products.

FINDINGS AND CONCLUSIONS

The availability of a new product line of display- and flood-lighting track fixtures for CFLs especially designed for commercial retail lighting applications will greatly enhance the retail industry's ability to take advantage of new CFLs the major lamp manufacturers have recently introduced.

REALIZED OR ANTICIPATED BENEFITS

The fixture/ballast/lamp combinations provide potential savings of 60% over comparable fixtures using incandescent lamps, and are expected to result in approximate savings of 50 megawatts.

TECHNOLOGY TRANSFER ACTIVITIES

Marketing and training materials were developed and distributed through Genlyte's established marketing channels. The product series was displayed at the 1997 International Lightfair in New York City.

FUNDING	TOTALS
NYSERDA	$300,000
Genlyte/Lightolier	331,680
TOTALS	$631,680

Contractor: Genlyte/Lightolier
Site: Fall River, Massachusetts
Contract Duration: 4/93 - 11/97
Key Words: product development, lighting, fixture design, commercial buildings
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 2028-EEED-BES-92

-> Demonstration and Evaluation of Lighting Technologies and Applications (DELTA)

Demonstrate, evaluate, and publish results of end-use lighting applications.

BACKGROUND

In New York State, lighting accounts for as much as 30% of the electricity consumed. A 20% reduction is attainable through lighting research and technology transfer. In 1990, the Lighting Research Center (LRC) performed a survey to determine the barriers and key initiatives that could be undertaken to stimulate the use of energy-efficient lighting in commercial buildings. One of the primary initiatives identified was the promotion of in-situ demonstrations that could be evaluated in a comprehensive, uniform, and comparative manner. To address that need, NYSERDA designed this project in cooperation with the LRC.

ACCOMPLISHMENTS

The project documented good lighting practices at a number of sites in the Northeast. The sites were described in a series of publications produced to make this information available to key audiences. A total of six DELTA Portfolios (12-page evaluations) and six DELTA Snapshots (2-page technology application descriptions) were produced.

FINDINGS AND CONCLUSIONS

This project produced information that will promote informed decision-making about energy-efficient lighting alternatives by demonstrating efficient lighting in a series of end-use applications. Lessons learned include the following. (1) Task visibility is not always improved with more light. (2) Windows can reduce visibility due to reflections. Choosing the right computer screen can solve video display terminal lighting problems. (3) Uplight on ceilings improves warehouse lighting because it makes the luminaires appeal less glaring, provides soft, bounced light at the task level (which helps wash out distracting shadows), provides greater vertical illuminance on storage shelves, and results in a psychological lift because the space appears brighter and more cheerful. (4) Dock lights often create poor visibility because they use a narrow-beam lamp to direct light deep inside the truck. An improved dock light design would use a lower-brightness lamp and a larger reflector system that shines more diffuse light into the truck.

SCHEDULE AND STATUS

The DELTA publications have been completed and distributed to lighting designers, specifiers, end-users, product manufacturers, and utilities.

FUNDING	TOTALS
NYSERDA	$307,500
Northeast Utilities Service Co.	412,000
Niagara Mohawk Power Corp.	5,000
Bonneville Power Administration	70,000
SONY	32,000
Con Edison	72,500
Rochester Gas and Electric Corp.	20,000
General Electric	12,000
Other co-funders	37,000
TOTALS	$968,000

Contractor: Rensselaer Polytechnic Institute
Site: Troy, Rensselaer County
Contract Duration: 4/95-4/98
Key Words: university, lighting, demonstration, commercial
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4084-IABR-BR-95

-> Lighting Evaluation Tools Development

Develop set of tool kits to evaluate lighting systems.

BACKGROUND

While many programs promote and install energy-efficient lighting in commercial buildings, no standardized or easy methods existed to evaluate lighting system performance or effectiveness. This project was designed to develop tools and methodologies to measure the overall effectiveness of lighting installations, including evaluating different approaches to understanding the effects of and human responses to various lighting systems.

ACCOMPLISHMENTS

The contractor developed a usable method to evaluate the responses and relationships between lighting energy consumption and lighting levels. The contractor developed standardized methods to evaluate the performance of lighting systems in different types of buildings and exterior applications, and developed, used, tested, and evaluated evaluation tools in the field. The contractor produced commercial office and exterior lighting toolkits, which involved developing instruments for qualitatively measuring and assessing the power density, energy consumption, visibility, disability glare, light pollution, ease of maintenance, and user acceptance of an exterior lighting installation. Toolkits containing the measurement instruments and training materials were constructed and accompanying software was also developed for the exterior toolkits. An evaluation of an installation of commercially available metal-halide and high-pressure sodium lamps at Schenectady County Community College's parking lot was completed, and a simple measurement for glare was developed. A supplementary evaluation of an experimental metal halide lamp (EX) for use at low luminances typically found in parking lots was also completed at the College parking lot.

FINDINGS AND CONCLUSIONS

The results of the study indicate that visual search abilities may be improved in outdoor lighting applications using metal halide lamps with spectrums designed to coincide with the visual system's sensitivity under mesopic lighting conditions. The study also showed that the ability to identify colors under metal halide lamps was better than under high-pressure sodium lamps.

REALIZED OR ANTICIPATED BENEFITS

Lighting accounts for as much as 30% of the electricity consumed in New York State. The lighting evaluation tools developed under this project may promote more effective and efficient lighting usage. Using such tools could, for the first time, permit standardized evaluation of visual comfort and performance, in addition to energy performance.

TECHNICAL TRANSFER

Basic evaluation kits for commercial, retail, and outdoor spaces; an advanced kit for commercial spaces; and a comprehensive evaluation kit with a software component are available at cost through the Lighting Research Center. Ten commercial and two exterior tools were sold as of April 1998. The toolkits sell for $1,000 each.

FUNDING	TOTALS
NYSERDA	$290,000
New York Power Authority	60,000
Energy Center of Wisconsin	50,000
TOTALS	$400,000

Contractor: Rensselaer Polytechnic Institute
Site: Troy, Rensselaer County
Contract Duration: 4/93 - 6/97
Key Words: university, lighting, DSM, commercial
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4011-IABR-BR-95

-> Commercial Production of Energy-Efficient Light-Conveyance Systems

Commercialize new integrated lighting product based on high-intensity-discharge (HID) bulbs and solar lighting components.

BACKGROUND

The National Energy Policy Act of 1992 requires states to have energy codes equivalent to the ASHRAE 90.1 standard, which limits retail unit lighting from 2.1 to 3.3 watts per square foot. This does not provide enough lighting power if incandescent sources are used. Although this standard provides enough lighting power if fluorescent lights are used, their output cannot be aimed efficiently for the purposes of display lighting and down-lighting from high-ceiling spaces. Lightron of Cornwall developed a revolutionary new lighting technology to address this problem for retail, commercial, and industrial markets. It is based on energy-efficient HID bulbs coupled with a system that directs light from HID sources into multiple beams for display- and down-lighting.

ACCOMPLISHMENTS

This project completed the work needed to specify the tooling requirements for making pre-production prototypes of Lightron's light-conveyance technology: the multibeam projector, the trackmold, and the wall washer. The contractor finalized the design and production work to commercialize the Multi-Beam Light Conveyance System and integrate it with solar lighting system, developing controls, performance ratings, and installation practices for these integrated systems; and marketing and selling the lighting systems through a demonstration facility, brochures, catalogs, videos, and other promotional efforts. Lightron of Cornwall may also manufacture a solar integrated lighting product that Synertech Systems Corporation is developing under a separate contract with NYSERDA (No. 4297-IABR-BR-96) to interface with the Lightron system.

REALIZED OR ANTICIPATED BENEFITS

The project will have significant economic development and environmental benefits, particularly for retail applications. The new technology is expected to deliver substantial savings in lighting costs.

TECHNOLOGY TRANSFER ACTIVITIES

Rensselaer Polytechnic Institute's Lighting Research Center will feature an installation of the Multi-Beam Light Conveyance System in a forthcoming DELTA Snapshot Publication. The DELTA Snapshot will be distributed to interested parties.

FUNDING	TOTALS
NYSERDA	$70,212
Lightron of Cornwall	198,070
TOTALS	$268,282

Contractor: Lightron of Cornwall
Site: New Windsor, Orange County, and Syracuse, Onondaga County
Contract Duration: 4/96 - 12/97
Key Words: product development, lighting, solar
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4298-IABR-BR-96

-> Developing Fixtures for Energy-Saving Metal Halide Lamp

Develop and commercialize family of fixtures for new, energy-efficient PAR 30 metal halide lamps.

BACKGROUND

Merchandise in retail stores is typically lit by incandescent light sources. New federal regulations have banned the use of incandescent sources in many applications and, as a result, several new light sources are coming on the market, including the PAR 30 metal halide lamp. This project developed a family of fixtures to optimize use of this lamp.

ACCOMPLISHMENTS

The contractor developed a family of nine fixtures, "arclites," to apply the PAR 30 lamp to a series of end-use commercial retail applications. The contractor completed the initial engineering to determine product features; designed, developed, and tested the prototype; evaluated ballast/lamp compatibility; and developed final designs and specifications. By the conclusion of the project, the contractor had also designed, tested, and put into operation the production line; developed final packaging and a marketing strategy; and had undertaken an initial pilot manufacturing run.

FINDINGS AND CONCLUSIONS

The contractor produced a valuable product that will encourage designers and specifiers to use the new energy-efficient, lower-wattage metal halide lamps. Its largest market appears to be the retail and museum lighting industry.

REALIZED OR ANTICIPATED BENEFITS

A new family of energy-efficient light fixtures will be marketed by a New York State manufacturer, resulting in increased employment and revenues. Energy-efficient metal halide lamps will replace mostly incandescent lamps, greatly reducing energy use and minimizing environmental impacts associated with electricity use.

TECHNOLOGY TRANSFER ACTIVITIES

The arclite Par 30 fixtures received an excellence award for new products at the April 1997 Lightfair in New York City.

FUNDING	TOTALS
NYSERDA	$150,000
Edison Price Lighting, Inc.	196,848
TOTALS	$346,848

Contractor: Edison Price Lighting, Inc.
Site: New York, New York County
Contract Duration: 12/95 - 10/97
Key Words: product development, lighting, commercial
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4300-IABR-BR-96

-> New York Lighting Network

Developed computerized mailing list of lighting-related businesses in New York State and surveyed industry's research and technical assistance needs.

BACKGROUND

While New York State is recognized as a design center for lighting products, centralized information about buyers and sellers of lighting products was unavailable. This project was aimed at developing a better understanding of the scope of New York's lighting-related businesses and their business assistance and technical information needs.

ACCOMPLISHMENTS

The contractor used commercially available mailing lists and conducted telephone and written interviews with New York lighting-related companies to develop a computerized information base of New York lighting-related companies and their products. The contractor also surveyed a wide target audience with a potential interest in lighting (including manufacturers, lighting specifiers, building owners, medical and insurance professionals, electric utilities, energy service companies, and electronics and engineering companies) and developed a list of information and research needs representative of the lighting industry as a whole.

FINDINGS AND CONCLUSIONS

The project helped NYSERDA develop an up-to-date, comprehensive mailing list of New York lighting-related companies for its outreach efforts. It also helped NYSERDA remain abreast of the lighting industry's changing research and technical assistance needs and better target its lighting research and development program.

REALIZED OR ANTICIPATED BENEFITS

Lighting accounts for as much as 30% of the electricity consumed in New York State. Many demand-side management and other energy-efficient lighting programs implemented throughout New York State and the country over the last decade are being phased out in response to the electric industry's efforts to adapt to a more competitive business environment. This creates an even greater need on the part of the public and private sectors for better information about energy -efficient products and efficiency services. The mailing list will be available at cost through the Lighting Research Center (LRC). The database will be maintained and used by LRC staff to respond to the lighting industry's information needs.

TECHNOLOGY TRANSFER ACTIVITIES

A mailing list of lighting-related New York companies and the final report identifying key concerns and trends common to lighting manufacturers, distributors, ESCOs, and lighting consultants were completed in November 1997.

FUNDING	TOTALS
NYSERDA	$39,763
TOTALS	$39,763

Contractor: Rensselaer Polytechnic Institute
Site: Troy, Rensselaer County
Contract Duration: 3/96 - 8/97
Key Words: university, assist business, lighting, DSM, commercial
Project Manager: Marsha Walton (518) 862-1090, ext. 3271
Program: Buildings
Subprogram: Lighting
Contract No.: 4347-IABR-BR-96

-> Commercial-Sector Real-Time Pricing Demonstration

Investigate and demonstrate real-time pricing (RTP) with large commercial customers.

BACKGROUND
RTP is an innovative rate structure intended to encourage energy efficiency and peak-load shifting.

OBJECTIVES
To assess, demonstrate, and evaluate the potential benefits of RTP in the large commercial sector and to develop new control software that can be used at other RTP sites in the country.

DESCRIPTION
In Phase I, the contractor will perform a technical and market assessment of the ability of one of Con Edison's largest commercial building customers to respond to RTP. Twenty-four-hour spot-price menus will be developed to evaluate the costs/benefits of RTP. A market survey, audits, and analyses will evaluate customers' willingness and ability to respond. The preliminary economics of RTP will be evaluated. In Phase II, 15 of Con Edison's largest commercial customers will operate under RTP. An upgraded Honeywell energy management system (EMS) will be installed at the New York City Marriott Marquis Hotel to implement optimal operation of the hotel's HVAC and lighting systems under RTP. Two cooling seasons will be monitored to determine energy and demand savings.

BENEFITS
This project will demonstrate and evaluate customers' response capability, potential benefits, and cost-effectiveness of implementing RTP in the large commercial sector. This approach is believed to have the potential to reduce utility peak loads, delay the need for new generation capacity, and use existing generation capacity more efficiently.

SCHEDULE AND STATUS
A Phase I final report has been completed. The Phase II effort to implement RTP with 15 Con Edison customers has been completed. Phase III demonstration of the system at the Marriott Marquis Hotel is continuing, with the RTP control system functioning as expected. Test data have been collected at the field-test site. The final data analysis has been conducted and the final report is currently in publication.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$438,615	0	$438,615
Con Edison	727,204	0	727,204
Electric Power Research Institute	460,995	0	460,995
Honeywell	825,996	0	825,996
ESEERCO	333,000	0	333,000
Pacific Gas & Electric	90,000	0	90,000
TOTALS	$2,875,810	0	$2,875,810

Contractor: Consolidated Edison Company of New York, Inc.
Site: New York, New York County
Contract Duration: 12/88 -8/98
Key Words: product development, utilities, commercial real-time pricing, rate structures
Project Manager: Mary Ann Bowers (518)862-1090 ext. 3254.
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 1141-IABR-BR-89

-> Non-intrusive Disaggregation of Commercial Power Loads

Develop new algorithms to disaggregate complex commercial end-use loads.

BACKGROUND
Metering equipment that will non-intrusively disaggregate residential loads is commercially available from Enetics, Inc. Research is also being conducted by NYSERDA, Rochester Gas and Electric Corp., the Electric Power Research Institute, and Enetics to extend this technology to the commercial building sector. However, due to the complex nature of many commercial building loads, the algorithms originally developed for the residential product are not sufficiently accurate. Research is needed into new mathematical approaches and algorithms to identify loads that rapidly turn on and off, or have variable-speed components or multiple operational states.

OBJECTIVES
To: (1) investigate complex loads, (2) develop mathematical solutions, and (3) implement and test algorithms to identify commercial building loads.

DESCRIPTION
The contractor will: (1) characterize end-use loads, (2) define power profile primitives, (3) develop advanced algorithms, and (4) implement and test those algorithms.

BENEFITS
Using metering to identify commercial loads is essential to allow building owners and managers to make decisions about energy expenditures. Utilities need a low-cost method for helping commercial customers reduce energy bills, identify under-performing equipment, and make new purchase selections. Low-cost disaggregated billing would provide information that could allow for significant energy savings.

SCHEDULE AND STATUS
Phase I algorithm development has been completed. Phase II testing has begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$22,224	$22,224
Electric Power Research Institute	0	22,222	22,222
Rochester Gas and Electric Corp.	0	152,222	152,222
TOTALS	0	$196,668	$196,668

Contractor: University of Rochester
Site: Rochester, Monroe County
Contract Duration: 6/97-5/99
Key Words: university, commercial, metering, non-intrusive, algorithms
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4530-IABR-BR-98

-> Commercialization of a Non-Intrusive Appliance Load-Monitoring System

Develop and commercialize monitoring system to identify and capture individual appliance load data.

BACKGROUND

Determining the energy consumption of individual end-use equipment traditionally has been both difficult and expensive. The technology for separating total residential energy consumption into its constituent parts without costly intrusion into the home did not exist. As a result, this type of load research is not available in sufficient quantities to meet utility needs. Through work done at the Massachusetts Institute of Technology, under contract with the Electric Power Research Institute, a prototype load-monitoring device has been developed that is capable, without intruding into the home, of isolating and analyzing individual load signatures from the complex, overlapping signals generated by end-use equipment. The prototype, which uses pattern-recognition algorithms, underwent extensive field evaluation at Rochester Gas and Electric Corp. to verify its capabilities. Additional design work needs to be done so the product can be commercialized.

OBJECTIVES

To undertake product development to provide a fully commercialized end-use load-monitoring system for electric utilities based on the technology and prototype already developed.

DESCRIPTION

The contractor will: (1) develop functional design specifications, (2) develop and test prototypes, (3) evaluate first production-run units, (4) perform alpha and beta testing, and (5) develop and implement a commercialization plan.

BENEFITS

A major benefit of the project is simplifying the collection of end-use data for utilities for a multitude of uses, including developing and evaluating demand-side management programs, rate-setting, and marketing. Using the technology will result in lower equipment and staffing costs and greater data accuracy. In addition, the non-intrusive nature of the equipment should create better customer acceptance of utility load-research programs. New York State utilities have made commitments to purchase units. Economic development benefits include the manufacture of a new product offering by a small energy-products business in New York State.

SCHEDULE AND STATUS

Alpha testing has been completed. Beta testing is drawing to a close. Commercial introduction of the product began in August 1996 and units are currently being sold across the country. Algorithm enhancements continue to be made.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$214,000	0	$214,000
Electric Power Research Institute	215,000	0	215,000
Others	419,000	0	419,000
TOTALS	$848,000	0	$848,000

Contractor: Enetics, Inc.
Site: Victor, Ontario County
Contract Duration: 9/93 - 10/98
Key Words: product development, utilities, residential, load monitoring, end-use metering, non-intrusive monitoring, appliance monitoring
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 3024-EEED-BES-94

-> Commercial Non-Intrusive Load Monitor

Design, develop, and test commercial version of Residential Non-Intrusive Load Monitoring System.

BACKGROUND

Non-intrusive load monitoring, an end-use monitoring technology, informs the customer and the utility about time-use consumption of large loads within the customer's premises by disaggregating the observed power supplied at the customer's meter. As appliances and other electrical equipment turn on and off they exhibit unique electrical signatures. Individual loads can be identified by using a patented algorithm. Much effort has been spent developing the Residential Non-Intrusive Appliance Load Monitoring System (NIALMS). Telog is under contract with the Electric Power Research Institute to commercialize NIALMS, with funding provided by NYSERDA and several New York State utilities. The technology is currently in the commercialization phase and is being alpha-tested successfully. Product introduction is expected in the fall of 1995.

OBJECTIVES

To design and develop a non-intrusive load monitor for use in commercial applications (C-NILMS) based upon the residential NIALMS.

DESCRIPTION

The contractor will (1) recruit a technical advisory committee; (2) perform hardware and software development; (3) manufacture and test prototypes; (4) conduct alpha and beta testing; and (5) develop a commercial product specification.

BENEFITS

There is a marked need for load research on an appliance-by-appliance basis. This technology allows this data to be obtained without entering the customer's building, which greatly reduces the cost of data-gathering and increases participation in load-research studies. Data previously not obtainable or obtainable only at a very high cost will now be gathered with increased accuracy at greatly reduced cost. This product also will provide growth opportunities for a New York State manufacturer.

SCHEDULE AND STATUS

Hardware design has been completed. Software design and algorithm enhancements are ongoing. Alpha testing at three sites in Rochester Gas and Electric territory has been completed. Ten Beta test sites are currently being selected.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$180,000	0	$180,000
Telog Instruments	60,000	0	60,000
ESEERCO	100,000	0	100,000
Rochester Gas and Electric Corp.	40,000	0	40,000
Con Edison	40,000	0	40,000
TOTALS	$420,000	0	$420,000

Contractor: Enetics, Inc.
Site: Victor, Ontario County
Contract Duration: 9/94 - 3/00
Key Words: product development, buildings, end-use metering, non-intrusive monitoring, commercial, utilities
Project Manager: Mary Ann S. Bowers (518) 862-1090 ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4064-IABR-BR-95

-> Building Energy Monitoring System (BEMS)

Develop energy and power-quality monitoring system for commercial buildings.

BACKGROUND

Managers of small commercial buildings have traditionally avoided investing in building energy monitoring instrumentation because such systems are expensive and complex to operate, and the perceived benefits do not outweigh the costs. However, few managers of small- to medium-sized commercial buildings feel they have adequate information on their building's energy consumption other than that provided by the utility revenue meter. Therefore, building managers often are unable to make informed energy decisions about their equipment purchases and operation. A second growing need is for information about the power quality within the building's distribution system in real time. One reason for this need is that modern office equipment uses microprocessor controls, making them more susceptible to power-supply variations. Poor power quality can translate into expensive down-time. However, power-supply variations are not always caused by the utility. Instead, modern electrical controls and drives inject substantially higher levels of noise and harmonic disturbances back into the power-supply system. This combination of power-quality disturbance and susceptibility to its effects requires building managers to have adequate instrumentation and information resources to run their buildings effectively, but a cost-effective, integrated monitoring system for small- to medium-sized commercial buildings is currently unavailable.

OBJECTIVES

To develop a system to monitor and manage information on the quality and quantity of energy used in a commercial building. The BEMS will monitor the power at the point of observation, record all power disturbances and time use of energy, and provide interval data reports. The system will communicate information automatically from the recorder to a host computer at scheduled intervals.

DESCRIPTION

The contractor will (1) conduct a market study; (2) design and develop recorder hardware, firmware, and software; (3) conduct field-testing at customer sites in Rochester Gas and Electric territory; and (4) commercialize the product.

BENEFITS

The BEMS will provide commercial end-users with economic benefits that include lower equipment and installation costs, lower electric bills, and decreased plant down-time due to poor power quality. This product will provide information to customers that will enable them to achieve energy savings without expensive site assessments or equipment purchases. In addition, the BEMS can be a valuable tool for utilities to promote more efficient and effective use of power by their commercial customers.

SCHEDULE AND STATUS

A market research study has been completed. Hardware and software design is nearing completion. Preparations are being made for system testing. Commercialization is being planned for late in 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$137,275	0	$137,275
Telog Instruments, Inc.	118,735	0	118,735
Rochester Gas and Electric Corp.	25,000	0	25,000
TOTALS	$281,010	0	$281,010

Contractor: Enetics, Inc.
Site: Victor, Ontario County
Contract Duration: 2/96 - 12/98
Key Words: product development, buildings, commercial, monitoring, power quality
Project Manager: Mary Ann S. Bowers (518) 862-1090 ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4340-IABR-BR-96

-> Universal Data-Acquisition Product

Design, develop, test, and commercialize low-cost universal data-acquisition product.

BACKGROUND

EUA Day is the controls division of EUA Cogenex Corporation and provides temperature-control, metering, and automation systems. It has developed the Day 1 and 2 Measurement, Verification, and Control Systems for measuring and verifying savings of performance contracts using data-acquisition. All data-acquisition systems require a front end for data retrieval and storage. The current means of providing this front end for the Day 1/Day 2 product is to purchase a personal computer (PC), take it apart, remove unnecessary parts, and reassemble it in a NEMA-type enclosure. This is necessary because a PC's current packaging is not robust enough to serve reliably as a data-acquisition device in control rooms and other harsh environments. This ad hoc method of providing a front end for the Day 1/Day 2 product is labor-intensive and voids the manufacturer's warranty on the product. Currently, no products exist on the market that can meet the need for a robust, low-cost data acquisition board.

OBJECTIVE

To develop a low-cost data acquisition engine that consists of a printed circuit board that can be mounted in existing end-use metering equipment, in its own enclosure, or at a building communications center. The product will be LonWorks-compatible and will be integrated with the current Day 1/Day 2 system and also offered as a stand-alone product.

DESCRIPTION

The contractor will: (1) develop a test plan, (2) perform design and manufacturing planning, (3) manufacture prototypes, (4) test and demonstrate the product, and (5) commercialize the product.

BENEFITS

The product will be sold in volume for less than $300 per unit, which is 85% less than the cost of the current PCs being used. This will result in dramatically lowered cost and increased reliability and functionality of the Day 1 and Day 2 products, thereby greatly increasing their marketability as energy-management products. In addition, the product will be marketed to the rest of the data-acquisition and control and metering community, which is expected to greatly increase manufacturing and sales for DayMetrix, Inc..

SCHEDULE AND STATUS

Product design has begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$33,100	0	$33,100
DAYMetrix, Inc.	49,650	0	49,650
TOTALS	$82,750	0	$82,750

Contractor: DAYMetrix, Inc.
Site: Victor, Ontario County
Contract Duration: 1/97-12/98
Key Words: product development, buildings, commercial, energy management systems, load monitoring, data acquisition
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4503-IABR-BR-97

-> Radio-Frequency Thermostat for HVAC Control

Develop radio-frequency thermostat to control baseboard heat and room air conditioners.

BACKGROUND

Because many multifamily housing projects, particularly those receiving state and federal aid, were built with low first cost as a priority, many of them use baseboard electric heating with simple baseboard thermostat controls. These controls are imprecise by design, difficult to regulate, generally a nuisance to adjust, and are all too often set and left at a relatively high temperature, with occupants opening windows to control comfort levels. Considerable energy savings could be realized by retrofitting to new wall-mounted line-voltage thermostats, which can save as much as 24-30 percent in some applications. Unfortunately, the typical retrofit installation of this energy-saving technology requires the use of wiremold chased along floor boards and around doors to hard-wire the thermostat to each baseboard unit. This activity is labor-intensive, aesthetically undesirable, and expensive, with typical retrofit costs ranging from $500 to $800 or higher per apartment. Consequently, these retrofits are not performed on a widescale basis. With the advent of new communications technologies, wireless thermostat controls for baseboard heating and room air-conditioning units could result in significant cost savings.

OBJECTIVE

To develop a wireless, battery-run thermostat that will operate baseboard heating units and room air conditioners using LONWORKS communication technology and radio-frequency control.

DESCRIPTION

The contractor will (1) conduct design and manufacturing planning; (2) finalize a product design;
(3) develop a test plan; (4) manufacture and laboratory-test a prototype; (5) perform pre-production manufacturing and testing; (6) manufacture the final product; and (7) market and commercialize the product.

BENEFITS

The proposed system will allow for quick, minimally intrusive installation that will result in substantial energy and cost savings. Also, each unit will measure its own power use, thereby providing direct evidence of its energy savings. The product will create substantial growth for the contractor, a small start-up company, and for energy service companies (ESCOs) in and out of New York State. The product, which will be manufactured at GC Controls in Greene, New York, will add to the State's manufacturing base.

SCHEDULE AND STATUS

A prototype thermostat design and manufacturing design review has been completed. Prototype testing will begin this fall.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$102,647	0	$149,738
ENERNET Corp.	14,974	0	14,974
New York State Electric & Gas Corp.	20,000	0	20,000
Brooklyn Union	0	0	114,516
TOTALS	$137,621	0	$299,228

Contractor: ENERNET Corporation
Site: DeWitt, Onondaga County, and Greene, Chenango County
Contract Duration: 3/96 - 12/98
Key Words: product development, buildings, thermostats, communications, HVAC
Project Manager: Mary Ann S. Bowers (518) 862-1090 ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4429-IABR-BR-97

-> Integrated Boiler Controls in Public Housing

Design, develop, and demonstrate integrated boiler controls in New York City public housing.

BACKGROUND

Boiler control systems are relatively common in large building complexes. These systems are designed to optimize the boiler's operation by using temperature inputs to determine exactly when the boiler should operate so enough heat can be provided without waste. Currently the New York City Housing Authority's (NYCHA) buildings (and many other multifamily buildings) rely on temperature sensors on the outside of the building rather than in living spaces and on return water temperature, often many hours or even days old. These sensing methods distort temperature data, leading to either too much or not enough heat in the building. Tremendous energy waste occurs in buildings with these problems. The system could be significantly improved if sensors could be easily placed in strategic areas in the building to provide accurate temperature data; however, this requires hard-wiring from remote locations to a central station, which is very costly and inflexible and, as a result, is not often done, particularly in low-income multifamily buildings. More than 95% of NYCHA housing stock, consisting of approximately 3,000 buildings with 180,000 apartments, need a solution to this problem.

OBJECTIVES

To design, develop, and demonstrate an integrated, energy-efficient boiler control system with powerline carrier communications in NYCHA housing stock.

DESCRIPTION

The contractor will: (1) select building sites; (2) design the building control configuration; (3) select an apartment monitoring sample; (4) develop and install a boiler control system; (5) install apartment sensors and submeters; and (6) perform two winters of boiler system testing.

BENEFITS

For NYCHA's buildings, the boiler control function is expected to result in fuel-cost savings of at least 10-15% per year, which would total $8-12 million per year. In addition, implementation costs will be low because of the system's wireless operation. Eliminating hard-wiring will also improve accuracy and flexibility. The submetering will provide valuable data for analyzing resident responses and energy usage. Finally, the integrated system will become a new product line with a global market potential for a NYS company.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$250,000	$250,000
Applied Energy Group	0	8,520	8,520
New York City Housing Authority	0	47,746	47,746
Herb Hirschfeld	0	15,300	15,300
Intech 21	0	178,430	178,430
TOTALS	0	$499,996	$499,996

Contractor: Applied Energy Group, Inc.
Site: New York City, New York County; Hauppauge, Suffolk County
Contract Duration: 3/98-12/99
Key Words: product development, buildings, HVAC, controls, boilers, submetering, powerline carrier
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4708-IABR-BR-98

-> Smart Controls and Diagnostics for Heating Systems

Design, develop, and commercialize intelligent heating-control system for multifamily buildings.

BACKGROUND

Very few manufacturers offer comprehensive personal-computer (PC)-based heating, ventilating, and air-conditioning management systems for large commercial buildings. These products are expensive and incorporate control strategies appropriate for commercial buildings with the corresponding occupancy profile. However, the apartment building heating systems' market has no similar products. In addition, most current energy-management systems use set-point controls along with function keypads and limited data-storage capacity. Such systems do not incorporate sophisticated energy-management and -control strategies. They also cannot store or analyze data for historical purposes and diagnosis due to a lack of computational and storage ability. US Energy Controls and others have offered products with such capabilities. However, recognizing the technological trend towards PC-based applications and the advantages of implementing advanced energy-management algorithms and intelligent control systems, US Energy Controls seeks to expand its product line.

OBJECTIVE

To design, develop, and commercialize a PC-based hardware and software system for intelligent control and diagnosis of multifamily building heating systems.

DESCRIPTION

The contractor will: (1) perform market research; (2) develop a test plan; (3) develop a conceptual product design; (4) perform control and diagnostic algorithm development; (5) develop hardware, instrumentation, and controls; (6) develop integrated software; (7) fabricate and field-test prototypes; and (8) commercialize the final product.

BENEFITS

This new product will upgrade US Energy Controls' existing aging product offerings, thus enabling it to remain competitive in the marketplace. The project is anticipated to generate jobs and to contribute significantly to the company's short- and long-term profitability. The project also will benefit the owners of multifamily buildings by reducing energy costs, providing maintenance information, and optimizing occupant comfort.

SCHEDULE AND STATUS

Product design tasks are being conducted.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$104,162	0	$104,162
US Energy Controls	113,360	0	113,360
TOTALS	$217,522	0	$217,522

Contractor: US Energy Controls
Site: Flushing, Queens County
Contract Duration: 1/97-12/98
Key Words: product development, buildings, HVAC, residential, multifamily, controls
Project Manager: Mary Ann Bowers (518) 862-1090 ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4454-IABR-BR-97

-> Super-Efficient Packaged Terminal Air Conditioners and Heat Pumps

Design, develop, demonstrate, and commercialize efficient packaged terminal air conditioners and heat pumps.

BACKGROUND

ICE CAP, Inc., is a 25-year-old New York State manufacturer, distributor, and installer of residential and commercial packaged terminal air conditioners (PTAC) and packaged terminal heat pumps (PTHP). PTACs and PTHPs are electrically powered, through-the-wall air conditioners in special cabinets that also include some form of heating, often electric strip heating. The thermostats provided with these units are problematic because they (1) are mounted on the unit's control panel without actual temperature selections, (2) sense return air from the bottom of the unit where it is coolest, and (3) are simple on-off devices with a 2-3°F differential from on to off. For comfort, temperature settings are often higher for heating conditions and lower for cooling conditions than if the units were properly controlled. Another energy-inefficienct aspect of these units is that they are designed to handle peak load conditions, which only occur during 1% of all cooling season hours. The equipment is always oversized and tends to cycle excessively under the vast majority of temperature conditions.

OBJECTIVES

To design, develop, and commercialize energy-efficient, cost-competitive PTAC and PTHP units that provide occupant comfort and to field-test these units in hotels and motels in the New York City area.

DESCRIPTION

The contractor will: (1) design the controllers and sensors, (2) produce engineering models and pre-production units, (3) laboratory test engineering models and pre-production units, and (4) plan and implement field-testing.

BENEFITS

Benefits include increased comfort at more economical temperature settings, resulting in reductions in both energy and demand costs. Energy savings in NYS alone are estimated at $1.6 million per year. Based on project costs, system benefits are anticipated to be high enough to realize simple paybacks of less than two years. Energy and demand savings are calculated to be approximately 25-30%. Operating sound levels in the conditioned space and adjacent outdoor spaces will be reduced. The project will also create business growth, new jobs, and increased profits for ICE CAP.

SCHEDULE AND STATUS

The market study and concept design tasks have begun.

FUNDING	Past Years	FY 1998-99	Total Anticipated
NYSERDA	0	$188,496	$188,496
ICE CAP, Inc.	0	140,624	140,624
DSM Engineering Associates, P.C.	0	63,120	63,120
Others	0	10,000	10,000
TOTALS	0	$402,240	$402,240

Contractor: ICE CAP, Inc.
Site: Long Island City, Queens County
Contract Duration: 4/98-4/00
Key Words: product development, buildings, HVAC, controls
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4707-IABR-BR-98

-> Building Automation Software Development

Develop software for energy-management systems.

BACKGROUND

Energy-management systems can provide significant savings. Elemco Buildings Controls, Inc. offers a DOS-based energy-management system software product, Energy Executive II, that is compatible with several different controls systems. This allows building managers to design and retrofit energy-management systems with more flexibility. To continue the success of this product, Elemco needs to update the software.

OBJECTIVE

To update the Energy Executive II product to operate with more control systems and convert it to the Microsoft Windows operating environment.

DESCRIPTION

The contractor will (1) convert the Energy Executive II software to Microsoft Windows; (2) design new graphical user interfaces; (3) add new communication interfaces to make the software compatible with more control systems; (4) develop a software version that can operate control systems remotely over standard telephone lines; and (5) add the capability of monitoring and regulating indoor air quality to the software versions developed in the previous phases.

BENEFITS

This project will save energy in New York State by assuring the proper use of energy-management systems in new and existing applications. A New York State software company also will benefit through the increased sales of its product.

SCHEDULE AND STATUS

Several beta versions of the software have been installed in independent commercial buildings. These systems have performed satifactorily. Work on the graphical user interface and hardware interfaces has continued.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$198,472	0	$198,472
Elemco Building Controls, Inc.	198,473	0	198,473
TOTALS	$396,945	0	$396,945

Contractor: Elemco Building Controls, Inc.
Site: Hauppauge, Suffolk County
Contract Duration: 1/95 - 12/98
Key Words: product development, HVAC, lighting, energy management systems, building automation software
Project Manager: Bob Carver (518) 862-1090, ext. 3242
Program: Buildings
Subprogram: Electrical and Controls Systems
Contract No.: 4079-IABR-BR-95

-> Automated Control of Thermal Energy Storage under Real-Time Pricing

Develop automated control algorithms for thermal energy storage under real-time pricing.

BACKGROUND

A number of prominent electric utilities are using real-time pricing (RTP) rate structures to give large customers economic incentive to reduce electric usage during periods when the cost of providing power is high. The Electric Power Research Institute (EPRI), Con Edison, the Empire State Electric Energy Research Corp. (ESEERCO), Pacific Gas & Electric (PG&E) and NYSERDA cosponsored a project with Honeywell to investigate automated control of commercial buildings in response to RTP. The RTP Controller at the Marriott Marquis Hotel in Manhattan is operating as designed, with the hotel having increased its load-shedding during high RTP periods to over 1.2 MW, a five-fold increase, over manual control. The hotel saved more than $100,000 in the first year without adversely affecting business. To further develop the RTP Controller, NYSERDA, Con Edison, EPRI, and ESEERCO cosponsored a project to enable shedding/shifting of ventilation load in response to RTP using a CO_2/VOC sensor manufactured by a small NYS company, Spence Associates. The enhanced RTP Controller was installed at the World Financial Center (WFC) in Manhattan in July 1995. TES systems have great potential to shift electric usage from typical afternoon peak periods to low night and morning periods, with significant additional potential for optimizing central chiller plants and using free cooling from river water. No integrated building-control system exists to automatically implement these strategies in response to RTP.

OBJECTIVES

To further enhance the RTP Controller to enable shifting of load from TES and central plant systems in response to RTP, and to evaluate advanced numerical and neural network techniques for forecasting hourly building cooling and RTP profiles.

DESCRIPTION

The contractor will (1) conduct a site survey and develop a controller requirement definition; (2) install automation and controls hardware; (3) perform control algorithm development; (4) conduct system engineering and field monitoring; and (5) perform a cost/benefit analysis.

BENEFITS

Developing this hardware and software should significantly enhance the savings realized by TES and central plant systems, and encourage customers who have not installed TES systems because of the long payback associated with its traditional application to consider such systems. Specific benefits will vary depending on building and HVAC characteristics, operating schedules, and other variables, but, conservatively, a 15-20% reduction in electricity costs could be realized using the enhanced Controller. The contractor's economic analysis indicates the WFC will realize $197,307 in additional cost savings and energy savings of 1.5 MWh annually.

SCHEDULE AND STATUS

Site visits and initial data collection are complete. Equipment installation has been completed. Optimization algorithms have been developed and implemented. System testing will begin in the summer of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$446,075	0	$446,075
Electric Power Research Institute	525,000	0	525,000
Con Edison	525,000	0	525,000
ESEERCO	275,000	0	175,000
Honeywell	329,722	0	329,722
TOTALS	$2,100,797	0	$2,100,797

Contractor: Honeywell Home and Building Control
Site: New York, New York County
Contract Duration: 1/95 - 1/99
Key Words: product development, real-time pricing, thermal storage, commercial
Project Manager: Mary Ann Bowers (518) 862-1090 ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4338-IABR-BR-96

-> Multifunction Digital Power Transducer

Design, develop, test, and commercialize state-of-the-art digital power transducer.

BACKGROUND

Transducers are devices used to monitor variables associated with power transmission and distribution. Manufacturing facilities rely on these devices to accumulate information regarding the energy consumption of processes, machines, and equipment. This information then is used to make informed energy and business decisions. Traditional monitoring techniques use single-function analog transducers to collect information for energy management, power quality, and process control. The limitations of these devices include increased wiring costs, reduced accuracy, single-measurement capability, limited output-signal range, and digital-device interface problems. Digital-transducer technology overcomes these impediments by offering reduced wiring costs, lower maintenance requirements, greater accuracy, RS232/485 communication support, and extended measurement range. Rochester Instrument Systems (RIS) is a 35-year-old manufacturer of electronic instrumentation that employs 225 people and has revenues in excess of $50 million. In the past, it had a strong business in analog transducers; however its market share is rapidly being eroded by competitors with digital offerings.

OBJECTIVE

To develop an innovative design for a digital power transducer that is technologically and functionally superior to competitors' products by using Digital Signal Processing and Application Specific Integrated Circuit technologies.

DESCRIPTION

The contractor will: (1) plan the product design and manufacturing, (2) design the product, (3) develop a test plan, (4) manufacture prototypes, (5) test the product, and (6) commercialize the product.

BENEFITS

This digital product is expected to bring more than $24 million in new business to RIS over seven years. Developing a superior digital transducer will allow RIS to remain competitive in the transducer market, which has been its core business in the past. Transducers are a cost-effective energy-management tool that provide valuable power-consumption and quality information about critical equipment. The use of these devices will maximize machine efficiency and minimize repair and operating costs.

SCHEDULE AND STATUS

Hardware and software design is nearing completion. Preparations are underway for product testing. Commercialization is planned for July of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
Rochester Instrument Systems	455,064	0	455,064
TOTALS	$705,064	0	$705,064

Contractor: Rochester Instrument Systems, Inc.
Site: Rochester, Monroe County
Contract Duration: 12/96 - 9/98
Key Words: product development, industrial, HVAC, transducers, energy management
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4504-IABR-BR-97

-> Interdrive Communications Bus

Develop general-purpose variable speed drive interface for ac and dc drives.

BACKGROUND

Harland Simon Control Systems is an engineering and manufacturing company specializing in the design and construction of coordinated alternative current/direct current (ac/dc) variable speed drive (VSD) systems. Harland Simon has not manufactured its own VSD for incorporation into new drive systems since the mid-1980s, but has used purchased VSDs. As new VSD technologies enter the marketplace, it has become increasingly difficult for Harland Simon to remain competitive. To assimilate each new VSD and its accompanying application software requires extensive retraining of Harland Simon's engineering personnel. Harland Simon has taken the following steps to reduce the impact of technological changes in the VSD market: (1)
it has recently purchased the manufacturing rights to Robicon's digital dc drive line (5-14000 HP). Harland Simon will manufacture single-motor drive units, as well as use this product in its coordinated dc drive systems business and (2) Harland Simon's parent company, Spartec International, is completing development of a multitechnology variable speed product that also will be used in the company's coordinated drive systems business.

OBJECTIVE

To develop/upgrade four features for both drive products: (1) a high-throughput communications bus linking drive to drive, (2) a moderately high throughput communications bus linking each drive to external controllers such as programmable logic controllers and personal computers, (3) an onboard-drive application execution environment, and (4) an off-line drive application development environment.

DESCRIPTION

The contractor will: (1) develop a communications bus linking drive to drive and the drive to external controllers, (2) develop applications execution and development environments, (3) develop hardware and software documentation, (4) perform customer and staff training, and (5) commercialize the products.

BENEFITS

These products will enable Harland Simon to maintain its core business. Without these products, Harland Simon would no longer be able to do business cost-effectively in the long term. In addition, it will give Harland Simon an additional product to add to its product line, thereby increasing sales. The products themselves will make energy-efficient variable speed drives easier and more cost-effective to apply.

SCHEDULE AND STATUS

Hardware and software design and testing are ongoing.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$188,000	0	$188,000
Harland Simon Control Systems	488,472	0	488,472
TOTALS	$676,472	0	$676,472

Contractor: Harland Simon Control Systems Inc.
Site: Baldwinsville, Onondaga County
Contract Duration: 4/97-12/98
Key Words: product development, buildings, variable speed drives, communications
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4507-IABR-BR-97

-> Small High-Speed Centrifugal Compressors

Develop small (100 tons or less) high-speed direct-drive centrifugal compressor for HVAC and refrigeration applications.

BACKGROUND

The U.S. air-conditioning and refrigeration industry has grown and prospered in the past because of viable, practical reciprocating-piston compression technologies. However, six of the largest manufacturers in this industry are now located in other countries. This is mainly a result of new rotary-compression technologies that have largely replaced the reciprocating technology developed in the U.S. In order for the U.S. to regain its dominant position, new compression technologies need to be introduced that address government regulations, as well as customer and market requirements for these products. These requirements include reduced size and noise and increased compressor efficiency, zero refrigerant leakage, more compact heat exchangers, and new air-cleaning technologies. This project represents an opportunity to recover a leadership position in compressor technologies through compact, high-speed, centrifugal compressor technology integrated with various compact, heat-exchanger and air-moving technologies and new high-speed direct-drive motors.

OBJECTIVES

To design, develop, test, and construct prototypes of a high-speed centrifugal compressor system. Subcomponents to be designed or developed include: a compressor with mid-80% isentropic efficiencies; low-cost bearings capable of operating at 25,000 to 50,000 rpm; high-speed direct-drive, refrigerant lubricated motors with mid-to-high-90-percent efficiencies; low-cost, high-efficiency, high-frequency inverter drives with good power quality; and compact heat exchangers integrated with air-moving technologies.

DESCRIPTION

The contractor will (1) develop system specifications; (2) perform subcomponent design; (3) conduct system analysis and selection; (4) fabricate and test components; (5) perform subsystem assembly and testing; (6) conduct system laboratory and field testing; and (7) evaluate and analyze test data.

BENEFITS

Carrier's comprehensive performance and cost analysis shows that 10-15% annual energy savings are expected from rooftop units with that cost lowered even more by a 50-80% size and weight reduction and 50% fewer moving and total parts. Environmental benefits include hydrofluorocarbon refrigerant use and oil-less operation. In addition, if the project is successful, Carrier estimates that 400-1000 jobs will be created, about half of which will be in New York State, and that up to $500 million in new sales will be generated.

SCHEDULE AND STATUS

The first phase of product design has been completed. Preliminary product and component testing has begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$400,000	$200,000	$600,000
Carrier Corporation	620,000	145,000	765,000
National Institute of Standards & Tech.	2,105,000	1,095,000	3,200,000
Others	1,085,000	920,000	2,005,000
TOTALS	$4,210,000	$2,360,000	$6,570,000

Contractor: Carrier Corporation
Site: Syracuse, Onondaga County
Contract Duration: 10/95-1/99
Key Words: product development, HVAC, refrigeration, compressors, high-speed motors
Project Manager: Mary Ann S. Bowers (518) 862-1090 ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4077M-IABR-BR-96

-> Design and Development of a Direct-Reading Radon Monitor

Design, develop, and produce low-cost continuous radon monitor.

BACKGROUND

U.S. Environmental Protection Agency (U.S. EPA) radon-level guidelines, and laws requiring mandatory radon testing before a home sale in some states, have made radon a major concern for many homeowners and building managers. In an earlier NYSERDA project, Rad Elec, Inc. developed a radon monitor called the E-Perm™ that uses a permanently charged disk of teflon (called an electret) as the radon sensor. As the radon radiates, ions are generated and drawn to the surface, where they collect and cause the electret's surface voltage to decrease. The magnitude of this decrease can be correlated to the radon concentration in the air. The product is now available commercially and widely used by professionals. Its use by homeowners is limited, however, because reading the electret voltage requires off-site laboratory analysis or expensive professional equipment.

OBJECTIVE

To create a low-cost, easy-to-use monitor that will perform continuous radon-concentration measurement by combining the existing E-Perm™ product with readout equipment to produce a device that will monitor radon levels on a long- and short-term basis, with the ability to display real-time and historical results.

DESCRIPTION

The contractor will: (1) design, develop, fabricate, and calibrate laboratory and pre-production prototypes; (2) evaluate the precision and accuracy of the prototype operation over time; (3) perform field-testing by professionals and homeowners; (4) obtain U.S. EPA certification of the final prototype; and (5) develop and demonstrate the final commercial product.

BENEFITS

Real-time monitoring will allow mitigation systems to be turned on only when radon concentrations exceed certain preset limits. This avoids continuous operation of these systems, thereby providing energy savings. The project also will facilitate growth of a small New York State company.

SCHEDULE AND STATUS

Development work on the field sensor, hardware and software has been completed. A prototype model is being laboratory-tested while product packaging is being designed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$95,813	0	$95,813
Sensor Plus, Inc.	81,015	0	81,015
TOTALS	$176,828	0	$176,828

Contractor: Sensor Plus, Inc.
Site: Buffalo, Erie County
Contract Duration: 11/92 - 10/98
Key Words: product development, environmental, indoor air quality, HVAC, radon, monitoring
Project Manager: Mary Ann Bowers (518) 862-1090 ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 1952-EEED-BES-92

-> Microprocessor-Based CO_2/VOC-Makeup Air Controller

Design, develop, and demonstrate microprocessor-based ventilation-control device based on carbon dioxide (CO_2) and volatile organic compound (VOC) concentrations.

BACKGROUND

Many buildings have either completely eliminated using added air or only add outside air when it is required. Adding excessive outside air increases heating, ventilating, and air conditioning (HVAC) energy consumption, while too little can produce a "sick" building, due to high levels of CO_2 and VOCs in the building's interior work space. Recognizing that indoor air quality is the primary cause of sick buildings, the U.S. Environmental Protection Agency (U.S. EPA), American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), and the National Institute for Occupational Safety and Health (OSHA) have issued guidelines for CO_2 and VOC levels in occupied work spaces.

OBJECTIVES

To design and develop the sensors and accompanying microprocessor controller and algorithms for a duct-mounted integral unit that will control outside ventilation according to measured levels of CO_2 and VOC.

DESCRIPTION

The contractor will (1) perform sensor and system research; (2) develop a microprocessor controller and algorithms; (3) conduct bench-scale demonstration and testing as well as field-testing; and (4) formulate and implement a commercialization plan.

BENEFITS

A major benefit is the projected energy savings that can be achieved by using the new control system. Energy savings will be achieved while maintaining the building's air quality to published standards and regulations. The system will increase worker comfort and productivity. Economic benefits will accrue from manufacture of the product in New York State.

SCHEDULE AND STATUS

Product development is completed. Testing of the units at the World Financial Center and the Marriott Marquis Hotel in Manhattan has been completed. How the product will be configured for commercialization is being investigated.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$119,953	0	$119,953
Spence Associates, Ltd.	123,332	0	123,332
TOTALS	$243,285	0	$243,285

Contractor: Spence Associates, Ltd.
Site: Saint James, Suffolk County
Contract Duration: 1/94-8/98
Key Words: air quality, buildings, ventilation, VOCs, CO_2
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 3110-EEED-BES-94

-> Monitoring and Evaluation of 200kW Fuel Cell

Monitor and evaluate 200kW phosphoric acid fuel cell operating on anaerobic digester gas.

BACKGROUND

The ONSI PC25 phosphoric-acid fuel cell is the first commercially available fuel cell. Approximately 55 of these 200kW units have been sold throughout the world to various gas and electric utilities, providing economic development benefits to New York State because New York manufacturers provide approximately 29 percent of the dollar value of the fuel cell through subcontracts with ONSI. Three of these units were sold to New York State utilities. NYSERDA, in cooperation with the Gas Research Institute and the fuel-cell owners, developed a project to monitor the performance of each of these three fuel cells. Monthly data has shown that the units are very reliable in the field and each of the utilities is very pleased with their performance. This is a vast departure from the first generation of units, which was plagued with operating problems. In May 1995, the New York Power Authority (NYPA) issued a request for proposals for a fuel cell, using any of the technologies, to be installed at the Yonkers sewage treatment plant. In June 1995, ONSI responded with a proposal as the only bidder. NYSERDA also is co-funding the purchase of this fuel cell with NYPA under Contract No. 4314-ERTER-ER-96.

OBJECTIVES

To monitor the operation of the fuel-cell power plant, operating on anaerobic digester gas (ADG), for a one-year period, beginning approximately two months after initial unit start-up.

DESCRIPTION

The contractor will (1) perform a site survey; (2) develop a test plan; (3) install and commission instrumentation; (4) perform data collection and analysis; and (5) conduct emissions testing.

BENEFITS

The main benefit of this project is its research value. The application of the PC25"C" 200kW fuel cell for use with ADG has not been done before. Testing of the technical performance, especially in such areas as emissions and efficiency, will provide important information for others considering such an application. A successful application along with an independent monitoring effort will pave the way for other similar ADG or landfill sites. In addition, little objective data on the operation of the new PC25"C" units has been gathered to date.

SCHEDULE AND STATUS

The fuel cell has been installed, however design modifications are being implemented to allow the unit to operate at full load. Monitoring is scheduled to begin upon completion of the modifications in the Spring.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$114,900	0	$114,900
TOTALS	$114,900	0	$114,900

Contractor: Science Applications International Corporation
Site: Yonkers, Westchester County
Contract Duration: 3/96-1/99
Key Words: environmental, phosphoric acid fuel cells, monitoring, evaluation, commercial, cogeneration
Project Manager: Mary Ann S. Bowers (518) 862-1090 ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4474-IABR-BR-97

Instrument, monitor, and evaluate lighting and motor retrofits.

BACKGROUND
Energy conservation retrofits were made by the former New York State Energy Office at two universities and four correctional facilities in New York State Electric & Gas Corporation's (NYSEG) service territory. As the cost of metering and monitoring all facilities would be prohibitive, a representative sample of these retrofits is being used to validate project savings.

OBJECTIVE
To verify the energy savings and demand reduction achieved by lighting and motor retrofits, with special emphasis on determining savings persistence.

DESCRIPTION
The contractor will verify savings through instrumenting, monitoring, and evaluating pre- and post-retrofit energy-use characteristics of lighting and motor installations. Pre-retrofit monitoring will be performed for a minimum of six months. Post-retrofit monitoring will be performed for a minimum of five years. Engineering estimates of demand and energy savings will be compared with metered results. Interim and final reports will be prepared and distributed.

BENEFITS
Energy and demand savings data will be compared with engineering estimates and will be used to verify and calibrate the Hybrid Statistically Engineering model. This model, and the information gained from investigating the persistence of savings, will help to guide utility DSM efforts.

SCHEDULE AND STATUS
Pre-retrofit monitoring began in August 1992 and continued through April 1993. Retrofits have been completed at Cornell and Binghamton. The post-retrofit period has begun and data collection is ongoing. An interim report has been completed with a final report expected in the fall of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$374,456	0	$374,456
New York State Energy Office	200,000	0	200,000
TOTALS	$574,456	0	$574,456

Contractor: XENERGY, Inc., Dryden, Tompkins County
Site: Cornell University, Tompkins County, and SUNY/Binghamton, Broome County
Contract Duration: 4/92 - 10/98
Key Words: environmental, utilities, integrated resource planning, DSM, metering, lighting, motor, retrofits
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 1861-EEED-BES-92

-> Energy-Management System (EMS) for Wayne-Finger Lakes Board of Cooperative Educational Services

Promote regional energy management centers.

BACKGROUND

The regional energy management center concept was conceived in response to a growing awareness of energy conservation opportunities for the State's school districts. Their regional energy management center, under the aegis of Wayne-Finger Lakes BOCES, was to provide centralized energy-monitoring services for its constituent school districts.

ACCOMPLISHMENTS

In Phase I, the regional energy management center was implemented. Phase II involved a shift in project focus. Energy performance contracting was used to promote the implementation of energy efficiency measures both inside and outside the jurisdiction of Wayne-Finger Lakes BOCES.

FINDINGS AND CONCLUSIONS

Wayne-Finger Lakes BOCES played an important role in promoting energy efficiency and energy performance contracting to the State's school systems.

REALIZED OR ANTICIPATED BENEFITS

Since the inception of this project in 1989, implementation of energy efficiency improvements in New York State schools has skyrocketed, due in large part to the achievements of Wayne-Finger Lakes BOCES.

TECHNOLOGY TRANSFER ACTIVITIES

Project presentations have been made to school board associations and individual school district boards of education.

FUNDING	TOTALS
NYSERDA	$151,815
Rochester Gas and Electric Corp.	150,000
NYS Electric & Gas Corp.	150,000
BOCES and schools	160,170
TOTALS	$611,985

Contractor: Wayne-Finger Lakes BOCES
Site: Newark, Wayne County
Contract Duration: 2/89-6/98
Key Words: buildings, energy performance contracting, HVAC
Project Manager: Norine Karins (518) 862-1090 ext. 3211
Program: Buildings
Subprogram: Electrical Systems
Contract No.: 1114-EEED-AEP-89

-> Refrigerator Monitoring Devices, Phase II

Evaluate electricity use in residential refrigerators.

BACKGROUND

This project provided program planning support, and third-party evaluation of the first year of the New York Power Authority Refrigerator Replacement Program.

ACCOMPLISHMENTS

The energy performance of a sample of both old and new refrigerators was measured both in the field and in an environmental test chamber. Two data loggers were used: a sensitive watt-hour meter, supplemented by spot checks of ambient and refrigerator temperature, and an 11-channel data logger designed specifically to measure a number of parameters associated with refrigerator use and performance. A total of 276 tests were conducted in the field, 220 on existing refrigerators and 56 on the newly installed General Electric units.

FINDINGS AND CONCLUSIONS

Based on New York Power Authority energy costs of 3.54 cents per kWh, and using a blend of refrigerator control settings, overall project savings were 578 kWh per year, yielding a dollar savings of $39.25 per refrigerator. With a total of 20,000 refrigerators replaced during the first program year, annual savings were estimated to be $785,000.

REALIZED OR ANTICIPATED BENEFITS

Refrigerator replacements are excellent electric energy conservation measures. Under the New York Power Authority bulk purchasing initiative, other housing authorities are taking advantage of the energy and cost savings attributable to energy-efficient replacement units.

TECHNOLOGY TRANSFER ACTIVITIES

Project results have been presented at several national forums, including the American Council for an Energy-Efficient Economy Summer Study and the 1997 International Energy Program Evaluation Conference.

FUNDING	TOTALS
NYSERDA	$248,939
New York Power Authority	1,000,000
Electric Power Research Institute	55,121
Synertech Systems Corp.	42,163
TOTALS	$1,346,223

Contractor: Synertech Systems Corporation
Site: New York, New York County
Contract Duration: 10/95 - 6/97
Key Words: refrigeration, DSM, multifamily
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income Sector
Contract No.: 3015L-EEED-BES-94

-> Commercialization of Operative Temperature Sensor Technology, Phase II

Test, manufacture, and commercialize operative temperature sensor system.

BACKGROUND

Currently, dry-bulb temperature (DBT), or air temperature, is the only parameter used to control heating, ventilating, and air-conditioning (HVAC) systems. The use of air temperature alone does not take into consideration other thermal environment factors that affect the occupant comfort. Mean radiant temperature (MRT) is a measure of the radiant heat present in a space. Thermal comfort has been shown in studies by ASHRAE to be a function of both MRT and DBT. Operative temperature (OT) is defined as the average of these two temperature parameters. A thermostat based on OT has been shown in studies by the National Association of Home Builders (NAHB) to allow for more efficient use of energy and increased occupant comfort. OT sensing provides a method of reducing or eliminating the effects of the extremes of DBT and MRT that result when the system responds to DBT only. OT sensing provides a means of including MRT in building energy use. In addition, it can be used to control the operation of radiant heat-transfer equipment to provide occupant comfort without affecting DBT. In Phase I of this project, the Markel Heater Corporation developed and patented an Operative Temperature System (OTS) prototype for which it holds the patent.

ACCOMPLISHMENTS

Final product design and development were successfully completed. Commercialization of the product was also accomplished, with the first product orders pending. In addition, a hand-held operative temperature meter was also developed and commercialized.

FINDINGS AND CONCLUSIONS

The initial plan to commercialize the OTS through a strong marketing campaign alone was determined to be inadequate for this product. As a result, a hand-held operative temperature meter (OPTEMP Meter) was developed to pull the OTS into the market place. This approach was found to be highly effective in educating the industry on the benefits of operative temperature sensing.

REALIZED OR ANTICIPATED BENEFITS

Studies by NAHB have shown that using the OTS technology to control HVAC systems can result in a 33-50% reduction in energy use, resulting in considerable cost savings. In addition, successful commercialization of this product will significantly increase profitability and employment at Markel Heater, GC Controls, and Akers Associates. The market study conducted in the first phase indicated that, upon commercial release, the product will have no competition and could become the controlling sensor of choice.

TECHNOLOGY TRANSFER ACTIVITIES

Many papers have been presented at industry trade shows by the team members on the topic of operative temperature sensing, radiant heating, and thermal comfort. In addition, Akers Associates is actively marketing the OTS and the OPTEMP Meter with SSHC, Inc. as the first distributor.

FUNDING	TOTALS
NYSERDA	$385,772
Markel Heater Corporation	217,926
GC Controls	55,375
Akers Associates	66,814
Others	110,000
TOTALS	$835,887

Contractor: Markel Heater Corporation
Site: Buffalo, Erie County, and Greene, Chenango County
Contract Duration: 8/93-7/97
Key Words: product development, HVAC, operative temperature control, thermostats
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings Research
Subprogram: Electrical and Control Systems
Contract No.: 3020L-IABR-BR-96

-> Automated CO_2 and VOC-Based Control of Ventilation Systems Under Real-Time Pricing

Design, develop, and demonstrate software for automated control of ventilation equipment in response to real-time pricing.

BACKGROUND

A number of prominent electric utilities throughout the U.S. are currently implementing real-time pricing (RTP) rate structures as a means of giving their large customers an economic incentive to reduce their electric usage during periods when the utility's cost of providing power is high. Con Edison, Niagara Mohawk, and LILCO are among those utilities offering RTP rates to a select group of commercial and industrial customers. In anticipation of RTP rates becoming more widely available, EPRI, Con Edison, ESEERCO, NYSERDA, and PG&E started a project with Honeywell in 1992 to investigate automated control of commercial buildings in response to RTP because manual load-shedding/ shifting requirements were too labor-intensive and operationally inefficient for wide-scale RTP. Honeywell then developed a building control system that automatically sheds buildings loads in response to utility RTP prices. The RTP Supervisory Controller was successfully demonstrated at the Marriott Marquis Hotel in Manhattan; however, additional load-control points such as ventilation were identified as necessary system enhancements.

ACCOMPLISHMENTS

Ventilation control strategies for application with automated RTP-based load-control technology to enable shedding or shifting of ventilation loads while maintaining prescribed levels of indoor air quality was accomplished. A new VOC/CO_2 sensor from Spence Associates of St. James, NY, was integrated with the RTP control system. The complete system was demonstrated at both the Winter Garden of the World Financial Center and the Marriott Marquis Hotel in Manhattan in 1997.

FINDINGS AND CONCLUSIONS

This project showed that RTP control is feasible for achieving cost and energy savings while maintaining prescribed levels of indoor air quality as determined through measured CO_2 levels. While state-of-the-art VOC-sensing technology was used, this portion of the testing did not perform as anticipated because of baseline drift and loss of sensitivity in the VOC sensors. Work is being performed to compensate for these problems.

REALIZED OR ANTICIPATED BENEFITS

While there were both energy and cost savings associated with the project, the totals were less than expected because of unique weather conditions. The Northeast's extremely mild summer in 1996 caused RTP prices to rarely exceed the 10 cents/kwh trigger price. This can be contrasted with a typical summer, where the price normally exceeds $1.50/kwh for several hours. Payback under normal conditions is estimated at 20 months.

TECHNOLOGY TRANSFER ACTIVITIES

Honeywell is actively marketing the Automated Controller worldwide and has sold six systems to date. A paper is being presented at the EPA 1997 Engineering Solutions to Indoor Air Quality Problems Symposium in North Carolina this summer.

FUNDING	TOTALS
NYSERDA	$199,000
Honeywell	66,733
Electric Power Research Institute	100,000
Con Edison	225,000
ESEERCO	75,000
TOTALS	$665,733

Contractor: Honeywell Technology Center
Site: New York, New York County
Contract Duration: 1/95-7/97
Key Words: product development, buildings, HVAC, commercial, real-time pricing
Project Manager: Mary Ann Bowers (518) 862-1090 ext. 3254
Program: Buildings Research
Subprogram: Electrical and Control Systems
Contract No.: 4073-IABR-BR-95

-> Commutation of Alternating Current Motors, Phase II

Develop controller using encoder technology for alternating current (AC) motors.

BACKGROUND

Low-hp AC electric motors, used in millions of applications worldwide, operate at much less than the 80-90% efficiency most motors are capable of, primarily because most are designed to be operated at a single speed at a single given voltage, current, or load. However, motor applications seldom function in such "optimal" single modes, but operate under varying conditions and demands, producing excessive energy losses recoverable by improving motor efficiency. Varying the motor speed, a very effective way to save energy, often is accomplished with variable-speed drives. Such motor-speed control actually optimizes the energy needed for most applications and dramatically diminishes energy consumed and wasted for variable loads or conditions. Several types of variable-speed drives are used for fans and pumps. These drives often recoup their cost several times through energy savings. For many residential and commercial applications, however, these variable-speed technologies are not implemented, primarily due to complexity, cost, and size constraints. Phase I of this project, completed in January 1995, was successful in producing a working prototype that demonstrates energy savings in a variety of applications.

ACCOMPLISHMENTS

Product development was successfully carried out from the design phase through to product commercialization. The first product order was obtained from Bodine Electric for 4,000-5,000 units for industrial applications.

FINDINGS AND CONCLUSIONS

The original product design was found to be workable and sound as evidenced in a successful prototype and testing phase. Original product cost targets were also easily met. Because the product is vastly different in functionality and price from other competitors, market penetration will be more difficult and require more effort.

REALIZED OR ANTICIPATED BENEFITS

Product benefits include energy efficiency; low-cost, easy manufacturing and installation; and low maintenance requirements. This product will also represent a significant new source of sales and jobs for this NYS company.

TECHNOLOGY TRANSFER ACTIVITIES

Product commercialization and marketing efforts have been extensive to date. In addition, two press events were held to publicize the product. Many relevant trade journal articles have appeared and more are anticipated.

FUNDING	TOTALS
NYSERDA	$500,000
Opto Generic Devices, Inc.	675,412
Bodine Electric	250,000
NYS Business Development Council	100,000
TOTALS	$1,525,412

Contractor: Opto Generic Devices, Inc.
Site: Van Hornesville, Herkimer and Otsego counties
Contract Duration: 9/95-10/97
Key Words: product development, motor controllers, drives
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings
Subprogram: Electrical and Control Systems
Contract No.: 4078M-IABR-BR-95

-> Submetering Manual and Information Package

Design and develop submetering "how-to" manual and standard package of submetering information.

BACKGROUND

NYSERDA has been involved with submetering projects for more than 10 years. Several NYSERDA projects and other investigations showed an immediate 20-25% energy savings when a master-metered building converted to submetering. More recently, NYSERDA completed the Facilitating Submetering Implementation (3121-IABR-BR-94) project. This project identified and analyzed the many barriers to submetering and made recommendations for removal of barriers. One recommendation was for NYSERDA to develop a Submetering Manual and Standard Information Package that will fill the need for comprehensive and objective information.

ACCOMPLISHMENTS

A comprehensive and thorough Submetering Manual and Submetering Information Package was produced.

FINDINGS AND CONCLUSIONS

The profound need for the information and the lack of other sources was much greater than expected. The confusion that exists in the industry over current regulations and procedures is widespread.

REALIZED OR ANTICIPATED BENEFITS

It is anticipated that both items will be used extensively by agencies, cooperative councils, and many other related organizations for the promotion of submetering. Initial reaction to a draft release of the products was extremely positive in terms of their usefulness for educational purposes. This will be the only complete and up-to-date source of submetering information available. The Manual and Package will help facilitate submetering because they will reduce confusion, misinformation, and time-consuming background research, and will help answer the many questions that arise when confronting this complex issue.

TECHNOLOGY TRANSFER ACTIVITIES

The Manual and Information Package will be widely distributed to agencies, condominium and cooperative councils, consultants, and many other parties. More than 2,000 advance orders for the materials have been received.

FUNDING	TOTALS
NYSERDA	$38,530
TOTALS	$38,530

Contractor: Applied Energy Group, Inc.
Site: Hauppauge, Suffolk County
Contract Duration: 2/97-10/97
Key Words: assist business, submetering, residential, multifamily, buildings
Project Manager: Mary Ann Bowers (518) 862-1090, ext. 3254
Program: Buildings Research
Subprogram: Electrical and Control Systems
Contract No.: 4483-IABR-BR-97

Develop domestic hot water (DHW) sizing requirements.

BACKGROUND
Given the lack of data on heating and domestic hot water (DHW) systems in New York City multifamily buildings, this project will address the issues of heating plant and DHW systems' operations in selected multifamily buildings.

OBJECTIVE
To develop and analyze multifamily building operational energy-performance data for 30 New York City multifamily buildings, and to analyze DHW consumption data on a subset of buildings.

DESCRIPTION
The contractor will: (1) collect energy-performance and DHW consumption data, (2) develop operational profiles for each building, (3) develop models of DHW generation and storage systems, (4) determine the effects of seasonal efficiency and (5) determine the most efficient DHW generation system for multifamily applications.

BENEFITS
The results of this real-time energy performance monitoring project will contribute substantially toward reducing energy waste in this building stock.

SCHEDULE AND STATUS
A draft final report was received. NYSERDA will initiate planning for at least one or more technical workshops. A final project meeting is planned this summer to determine the validity of a pilot project to demonstrate an optimized DHW system.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$146,268	0	$146,268
EMRA	110,065	0	110,065
TOTALS	$256,333	0	$256,333

Contractor: Energy Management & Research Associates (EMRA)
Site: New York City, New York County
Contract Duration: 2/91 - 6/98
Key Words: buildings, multifamily, low-income
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings Research
Subprogram: Low-Income/Multifamily
Contract No.: 1647-EEED-BES-91

Master-meter, submeter, and aggregate low-income multifamily buildings.

BACKGROUND

Approximately 1,100 low-income limited-equity, resale-restricted cooperatives commonly known as Housing Development Fund Corporations (HDFCs), exist in New York City. These buildings range in size from less than 10 to more than 100 units, all of which are direct-metered. Because their electricity usage is relatively small compared to other customers, they are the least attractive to alternative service providers, even though they are billed at the highest rate. Only through master-metering, submetering, and aggregation into a larger purchasing block can these buildings attain the retail access benefits equal to larger buildings. Con Edison has addressed this issue in its most recent rate settlement by making up to 200 MW available to low-income aggregated customers. With the onset of competition, more sophisticated technologies are becoming available for metering and billing. Multifamily buildings will face difficult, but extremely important, choices of the systems most appropriate to their needs. Small, financially disadvantaged buildings often lack the sophistication and expertise needed to properly evaluate their options.

OBJECTIVE

To master-meter and submeter 10-20 HDFC buildings, and then aggregate them into a consortium that can purchase electricity in the retail market.

DESCRIPTION

The contractor will: (1) implement the pilot master-metering and submetering installation program; (2) establish an institutional infrastructure that will help cooperatives finance conversion, obtain necessary government approvals, and join other cooperatives in an aggregation to purchase electricity; and (3) investigate alternative metering technologies suitable for low-income, multifamily application.

BENEFITS

The 10-20 buildings will realize energy cost savings of approximately 10-20% resulting from the lower bulk rate, and will be able to continue to enjoy the 18-26% per-apartment energy savings of submetering/individual metering, as well as access to alternative service providers that previously would not have been available to them. Equally important is the thorough and systematic evaluation of metering systems that will enable buildings to purchase the most cost-effective and highest-performance meters. The project could serve as a model for clearing the institutional and technological hurdles that small or otherwise disadvantaged multifamily buildings will face when seeking to submeter and purchase electricity in the competitive marketplace.

SCHEDULE AND STATUS

The project kick-off was conducted in April. A total of 10 buildings have indicated preliminary interest; walk-through inspections of each building are being conducted. A metering workshop is tentatively planned for summer 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$209,457	$209,457
Energy Investment Systems, Inc.	0	157,825	157,825
TOTALS	0	$367,282	$367,282

Contractor: Energy Investment Services, Inc.
Site: New York, New York County
Contract Duration: 3/98-11/99
Key Words: submetering, multifamily, low-income, retail access
Project Managers: Mary Ann Bowers and Norine Karins (518) 862-1090, ext. 3254, and 3211, respectively
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4740-IABR-BR-98

.-> Marcus Garvey Village Feasibility Study

Convert electrically heated buildings to hydronic baseboard heat using innovative piping technologies.

BACKGROUND

Electric-resistance heat was installed in a vast number of the State's low-income housing complexes during the 1970s. To a considerable degree, electric baseboard heat also has been installed in new low-income construction as a means of reducing upfront costs. New energy-efficient technologies may offer a cost-effective alternative to this costly fuel source. This project will examine the use of Kitec® piping for converting electric heat to hydronic systems.

OBJECTIVE

To: (1) quantify the energy, economic, and health and safety effects of converting an electrically heated multifamily building to hydronic baseboard heat using innovative piping practices, and (2) evaluate the conversion's impact on energy consumption and related cost issues.

DESCRIPTION

A feasibility study will be conducted at Marcus Garvey Village, a 625-unit complex in Brooklyn. The apartments now have baseboard resistance panels, with domestic hot water supplied by a system of central gas-fired heaters. The study will: (1) evaluate all costs and benefits of replacing the existing system with hydronic baseboard heat, and (2) determine the feasibility of using Kitec® piping to reduce installation costs. Kitec® is a multipurpose pressure-piping system constructed of a plastic/metal laminate.

BENEFITS

The energy savings per dwelling unit are anticipated to be more than $300.

SCHEDULE AND STATUS

A mock installation of the Kitec piping was conducted. Preliminary specifications have been prepared for a potential conversion. A cost/benefit analysis will be conducted over the next several months..

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$24,058	0	$24,058
Brooklyn Union	24,058	0	24,058
R.Y. Management (in-kind)	1,566	0	1,566
TOTALS	$49,682	0	$49,682

Contractor: Energy Management & Research Associates
Site: Brooklyn, Kings County
Contract Duration: 1/97 - 8/98
Key Words: electricity, low-income, multifamily, buildings
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4499-IABR-BR-97

-> Ductless Heat-Pump Feasibility Study

Convert electric-resistance baseboard heat to ductless heat pumps.

BACKGROUND

Electric-resistance heat was installed in a vast number of the State's low-income housing complexes during the 1970s. To a considerable degree, electric baseboard heat also has been installed in new low-income construction as a means of reducing upfront costs. New energy-efficient technologies may offer a cost-effective alternative to this costly fuel source. This project will examine the use of ductless heat pumps to replace electric-resistance baseboard heaters.

OBJECTIVE

To: (1) evaluate the feasibility of installing ductless heat pumps to lower heating costs at the Ithaca Housing Authority's Southview Apartment complex, and (2) determine the feasibility of lowering the installed cost of ductless heat pumps in multifamily buildings by using the existing electric-baseboard heaters as backup heat.

DESCRIPTION

The study will examine all the costs and benefits of a conversion at Southview Apartments, including an analysis of each of the following: ductless heat pumps, with low-cost modifications; no change (retain electric baseboard heaters); central boiler with hydronic baseboard heating; and through-the-wall, gas-fired heaters. A small-scale pilot demonstration is then anticipated.

BENEFITS

If economically attractive, the ductless heat pumps would present a new option for reducing energy costs in all-electric multifamily buildings, specifically those for which other fuel-conversion options are neither feasible nor economically attractive. Heating energy-use reductions could be fairly significant.

SCHEDULE AND STATUS

Energy performance data was collected on one through-the-wall, gas-fired heater installed at Southview Apartments. Comfort and performance data was also collected from other housing authorities across the State. A final feasibility report which incorporates the results of one season's monitoring, will be prepared over the next few months.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	37,983	0	$37,983
Ithaca Housing Authority	38,170	0	38,170
TOTALS	$76,153	0	$76,153

Contractor: Taitem Engineering, P.C.
Site: Ithaca, Tompkins County
Contract Duration: 3/97 - 3/99
Key Words: electricity, low-income, multifamily, buildings, heat pumps
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4517-IABR-BR-97

Convert electrically heated buildings to gas-fired systems.

BACKGROUND

Electric resistance heat was installed in the State's low-income housing complexes throughout the 1970s. New energy-efficient technologies may offer a cost-effective alternative to costly electric heat. This project will evaluate the cost-effectiveness of two new technologies for selected complexes owned by the Albany Housing Authority.

OBJECTIVE

To: (1) quantify the energy and economic benefits of converting an electrically heated multifamily complex to direct-vent, gas-fired baseboard heaters and hot water/radiant convective panel systems; and (2) to determine the energy savings and costs related to such conversions.

DESCRIPTION

The feasibility study will include an evaluation of all costs and benefits of replacing the existing electric baseboard systems at selected Albany Housing Authority properties. Data collection will include historic energy consumption data, new equipment costs, installation costs, and start-up expenditures. Projected repair costs to the existing baseboard systems also will be used to evaluate the economics of a conversion. A small-scale pilot test will be conducted using the direct-vent, gas-fired baseboard heater and the hot water radiant/convective panel systems. Performance will be monitored for six months.

BENEFITS

The Albany Housing Authority owns approximately 500 electrically heated residential units. It is anticipated that the new technologies will result in significant energy consumption and demand savings. Based on the results of the project, Albany Housing Authority may consider larger-scale conversions.

SCHEDULE AND STATUS

The feasibility reports are being revised in light of new data supplied by Albany Housing Authority. A May completion date is anticipated.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$75,000	0	$75,000
Joseph Technology Corp. (in-kind)	36,997	0	36,997
Albany Housing Authority	9,000	0	9,000
Albany Housing Authority (in-kind)	30,000	0	30,000
TOTALS	$150,997	0	$150,997

Contractor: Joseph Technology Corporation, Inc.
Site: Albany, Albany County
Contract Duration: 2/97 - 5/98
Key Words: electricity, multifamily, low-income
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4521-IABR-BR-97

-> Evaluation Protocols for the New York City Housing Authority

Develop spreadsheet tools and models to estimate energy savings of refrigerator-replacement programs.

BACKGROUND

The New York Power Authority/New York City Housing Authority (NYPA/NYCHA) refrigerator-replacement program was launched in 1996, and is considered one of the most successful market transformation programs in the nation. In the first year of the program, savings amounted to $40 per unit replaced. This project will provide analytical support to the third year of the NYPA/NYCHA refrigerator program.

OBJECTIVE

To develop and pilot-test spreadsheet tools and models that support the reduction of metering requirements in connection with refrigerator-replacement programs.

DESCRIPTION

One or more integrated spreadsheets and models will be developed that will enable field technicians to estimate savings from refrigerator replacements. The primary purpose will be to reduce metering requirements for this program and other future initiatives across the State. The spreadsheets will be tested using data from the New York refrigerator-replacement program and other projects, if available. The tools will be submitted for peer-reviewed publication.

BENEFITS

Spreadsheet tools and models that reduce the need for widescale refrigerator monitoring will greatly reduce operational costs for the State's housing authorities. The availability of such tools may induce other housing authorities in New York to initiate similar programs.

SCHEDULE AND STATUS

The first meeting of the program advisory committee was conducted to review results of the 1997 program year. Spreadsheet and model development is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$29,000	$29,000
U.S. Department of Energy	0	51,000	51,000
TOTALS	0	$80,000	$80,000

Contractor: Battelle Memorial Institute/Pacific Northwest National Laboratories
Site: New York City, New York County
Contract Duration: 1/98 - 12/98
Key Words: low-income, multifamily, refrigerators
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4706-IABR-BR-98

-> Domestic Hot Water Recirculation System Control Strategies

Demonstrate low-cost domestic hot water (DHW) recirculation-control strategies.

BACKGROUND

Preliminary analyses of recirculation flows have shown that recirculation losses account for up to 25% of DHW energy consumption. DHW-recirculation systems in multifamily buildings usually operate with the recirculation pump set to run continuously. DHW data produced in a related research project showed that continuous operation may consume significant energy. Energy savings may be realized by cycling the recirculation pumps.

OBJECTIVE

To demonstrate and quantify the effects of four DHW recirculation-control strategies in multifamily buildings, and to quantify the impact of each on energy consumption.

DESCRIPTION

The contractor will: (1) equip six buildings with pump-control devices and monitoring equipment; (2) install an aquastat on the DHW return line in each building; (3) install appropriate meters and monitoring devices in each building; (4) collect DHW flows, recirculation flows, and other data points using the four control strategies; and (5) compare the effects of each control strategy with respect to DHW volume changes and system temperatures.

BENEFITS

A recirculation-control strategy that results in even a small savings would conserve millions of gallons of fuel annually.

SCHEDULE AND STATUS

Numerous delays have precluded the preparation of a draft final report. The final report should be received in June.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$78,271	0	$78,271
EMRA	24,688	0	24,688
Langsam Property Services	30,460	0	30,460
TOTALS	$133,419	0	$133,419

Contractor: Energy Management & Research Associates (EMRA)
Site: New York City, New York County; Brooklyn, Kings County; and Bronx, Bronx County
Contract Duration: 3/95 - 6/98
Key Words: buildings, multifamily, low-income
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4142-IABR-BR-95

-> Financing Energy Efficiency Improvements in Publicly Assisted Housing

Develop financing strategies to facilitate energy improvements in publicly assisted housing.

BACKGROUND

Financial barriers to energy improvements in the publicly assisted housing sector include: lack of property capital, borrowing constraints, debt ceiling limitations, loan-to-value ratios, collateral requirements, and lack of a guaranteed income stream from savings. These and information barriers have precluded implementation of energy efficiency improvements in most of the publicly assisted housing in New York.

OBJECTIVE

To: (1) develop and test up to four financing strategies at select properties in New York and (2) conduct a comprehensive Statewide information transfer campaign designed to facilitate energy improvements in the assisted-housing sector.

DESCRIPTION

Financing models to be developed include: energy service company, conventional or community lending, housing finance agency, and utility financing. Models will be tested on four different properties in New York. The performance contracting model is expected to be used to some extent in each of the models, as well as a methodology for integrating the use of Weatherization Assistance Program (WAP) funds. To encourage Statewide replication, the project will build partnerships for each model that is implemented, and provide technical assistance in the areas of U.S. Department of Housing and Urban Development (HUD) regulations.

BENEFITS

If this project can assist in eliminating financial barriers, it will make energy efficiency accessible to the State's publicly assisted housing sector.

SCHEDULE AND STATUS

The project's advisory committee met to discuss the focus and direction of the project. Draft model definitions were developed, and are being revised in accordance with NYSERDA and project advisors' comments.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$105,229	$105,229
AEA (in-kind)	0	80,250	80,250
National Center for Appropriate Technology	0	56,710	56,710
Phipps Housing (in-kind)	0	16,385	16,385
TOTALS	0	$258,574	$258,574

Contractor: Association for Energy Affordability, Inc. (AEA)
Site: Multiple
Contract Duration: 10/97 - 3/99
Key Words: multifamily, low-income
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4639-IABR-BR-98

-> Multifamily Buildings Retrofit Research

Develop protocols to deliver energy-efficiency services to multifamily buildings

BACKGROUND

Researchers have speculated that variables such as building size, construction, number of units, and heating systems may contribute to the varying energy savings achieved through weatherization in the multifamily sector. Protocols and corresponding investment strategies to achieve maximum cost-effective energy savings are lacking. This project will address these issues.

OBJECTIVE

To develop, demonstrate, and evaluate protocols and investment strategies that maximize the energy-savings potential of energy-efficiency measures in multifamily buildings.

DESCRIPTION

The contractor will: (1) select a sample of 50 New York City multifamily buildings for the demonstration; (2) instrument and monitor select variables on a subset of buildings; (3) collect pre- and post-retrofit energy consumption data on all buildings; (4) assess the impact of energy conservation measures on fuel and domestic hot water consumption and indoor air quality; and (5) develop weatherization protocols and investment strategies for future weatherization work.

BENEFITS

The new multifamily building protocols are expected to promote cost-effective energy savings within the New York State Weatherization Assistance Program, with energy saved expected to exceed the traditional 15-percent savings.

SCHEDULE AND STATUS

Delays in collecting post-retrofit data have delayed the preparation of the final report. A draft final report is expected in June..

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$220,582	0	$220,582
NYS Department of State	220,581	0	220,581
NYC AEA (in-kind)	41,022	0	41,022
ORNL (in-kind)	47,700	0	47,700
TOTALS	$529,885	0	$529,885

Contractor: Association for Energy Affordability, Inc.
Site: New York City, New York County
Contract Duration: 11/94 - 6/98
Key Words: buildings, multifamily,
Project Manager: Norine Karins, (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4047-IABR-BR-95

-> Weatherization Partnership Financing Demonstration

Develop innovative financing model for publicly assisted housing.

BACKGROUND

Publicly assisted housing owners have historically been thwarted in their attempts to obtain financing for energy efficiency improvements. Financing strategies that eliminate or minimize historical barriers are essential in this sector. Financing strategies that combine both public and private resources are required to preserve the State's low-income housing by facilitating implementation of energy improvements.

OBJECTIVE

To develop and test a financing model that will serve as a vehicle for funding energy improvement projects in government-assisted, multifamily housing in New York State.

DESCRIPTION

The financing model will blend Weatherization Assistance Program (WAP) funds with owner capital and private lending. The project will review present lending underwriting practices and weatherization procedures and recommend an efficient delivery mechanism for a funding partnership between public and private entities. The major premise of this model is to use weatherization funds as a last resort to cover shortfalls in private lending and owner capital.

BENEFITS

By establishing energy improvement financing programs, making weatherization funds available to a larger number of building owners, and developing protocols for efficiently servicing large numbers of buildings, a greater number of low-income dwellings will benefit from energy conservation retrofits. Because current weatherization funding levels are insufficient to provide services to all that need them, this project will seek to leverage resources for maximum benefit.

SCHEDULE AND STATUS

Housing and financing advisory panels were developed for the purpose of reviewing proposed models and providing critical feedback on the project. A draft financing model was developed and is being revised in light of comments received from NYSERDA and advisors.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$50,000	$50,000
U.S. Department of Energy (via NYSDHCR)	0	50,000	50,000
CEC (in-kind)	0	87,000	87,000
TOTALS	0	$187,000	$187,000

Contractor: Community Environmental Center, Inc. (CEC)
Site: Long Island City, Queens County
Contract Duration: 9/97 - 9/98
Key Words: multifamily, low-income
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4640-IABR-BR-98

-> Performance Financing and User Shared Savings

Develop financing model for implementing energy improvements.

BACKGROUND
Historically, there have been many financial barriers to affordable and energy-efficient multifamily housing. To facilitate implementation of energy improvements in this sector, new ways of financing are essential.

OBJECTIVE
To develop a program model for the delivery of financing products that eliminate existing barriers to energy efficiency in multifamily buildings.

DESCRIPTION
The contractor will develop an overall concept for a guaranteed performance financing/users shared-savings program will be developed. The development process will include an examination of key program operating assumptions and underlying issues. Specifically, this will involve: (1) a description of the financial product and parties involved, (2) the product's value to the participants and prospective sponsors, and (3) the roles of prospective participants and cosponsors.

BENEFITS
The program model to be developed in this project will be evaluated for a subsequent pilot test. It is envisioned that the financing products developed in this project will stimulate the implementation of energy improvements in the multifamily housing sector.

SCHEDULE AND STATUS
Project conceptualization has been completed, and work will be initiated on resource development and mobilization.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$14,500	$129,058
TOTALS	0	$14,500	129,058

Contractor: Jack Woolams
Site: New York, New York County
Contract Duration: 7/97 - 6/98
Key Words: multifamily, financing, low-income
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4638-IABR-BR-98

-> Effectiveness of Duct-Sealing and Insulation in Multifamily Buildings

Evaluate air leakage and conduction mitigation techniques..

BACKGROUND
In New York State, approximately 410,000 apartments use ducted heating systems. Encouraged by research conducted on single-family homes, this project was launched to investigate the cost-effectiveness of retrofit sealing and insulation in multifamily buildings.

ACCOMPLISHMENTS
Twenty-five apartments were tested. The project determined: airflows, leakage areas, and temperature in ducted systems, with and without sealing, and with and without insulation; energy savings attributable to duct-sealing and duct-insulation; and life-cycle costing for typical duct-sealing/insulation jobs in multi-
family buildings.

FINDINGS AND CONCLUSIONS
Duct sealing proved cost effective in buildings with leaky or tight basements in both Albany and New York City. For the entire sample of apartments, the total airflow imbalance was reduced. In contrast, duct insulation was not cost-effective in buildings with tight basements.

REALIZED OR ANTICIPATED BENEFITS
The energy savings potential from duct sealing in multifamily buildings is 10% for buildings with leaky basements and 6% for buildings with tight basements.

TECHNOLOGY TRANSFER ACTIVITIES
The final report has been distributed within the weatherization/retrofit community in New York State, and has been shared with the Building Performance Institute, a not-for-profit organization whose mission is to certify building performance practitioners.

FUNDING	TOTALS
NYSERDA	$99,997
U.S. Department of Energy	20,000
Steven Winter Associates	11,840
National Energy Management Inst.	3,500
TOTALS	$135,337

Contractor: Steven Winter Associates
Site: Syracuse, Onondaga County
Contract Duration: 11/93-7/97
Key Words: buildings, multifamily, HVAC, low-income
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income Sector
Contract No.: 2024-EEED-BES-93

-> Investigating Energy and Water Savings from Low-Flow Showerheads

Install low-flow showerheads to produce energy and water savings.

BACKGROUND

More than a decade ago, NYSERDA sponsored a low-flow showerhead demonstration project. Because of inconclusive research results, NYSERDA was motivated to reevaluate the efficacy of the low-flow devices installed in New York City apartment buildings.

ACCOMPLISHMENTS

The study determined warm water and energy consumption in 19 multifamily buildings, both before and after the installation of low-flow showerheads. From the original set of 19 buildings, three were excluded because of unusually large water and energy increases caused by leaks and changes of mixing valve temperature settings. For the final set of 16 buildings, the pre- and post-installation periods ranged from 6 to 12 months.

FINDINGS AND CONCLUSIONS

Ten buildings, or more than 60% of the sample of 16 buildings, achieved energy savings close to or exceeding 10%. One building had reductions of only 5%. Four buildings remained virtually unchanged, and one building showed increases of 10%. A control group of 14 buildings similar in size and composition was also used in the study.

REALIZED OR ANTICIPATED BENEFITS

The study suggests that moderate water and energy savings are possible from low-flow showerheads. The study also supports the notion that water conservation measures should be an integral part of any major energy conservation retrofit program.

TECHNOLOGY TRANSFER ACTIVITIES

Project results have been presented at a number of Statewide forums.

FUNDING	TOTALS
NYSERDA	$119,629
NYC DEP	80,000
TOTALS	$199,629

Contractor: EME Group
Site: New York City, New York County
Contract Duration: 11/94 - 11/97
Key Words: buildings, multifamily, low-income, domestic hot water, showerheads
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income Sector
Contract No.: 3142-IABR-BS-94

-> Building Energy Skills and Certification

Develop voluntary residential building industry energy standards, competency assessments, and certification.

BACKGROUND

Because no recognized competency assessment or certification existed for new residential construction, remodeling, or weatherization, the Building Performance Institute (BPI) was created to both professionalize the building performance industry and establish voluntary energy standards based on best industry practices.

ACCOMPLISHMENTS

BPI was created in 1995 as a non-profit corporation. During the three-year project, BPI established job designations for four weatherization titles, developed a best practices manual for HVAC technicians, certified more than 500 people in designated titles, executed affiliate agreements with other states to conduct certifications, and initiated work on a fourth job designation for large boiler plant operators.

FINDINGS AND CONCLUSIONS

BPI has made significant strides in helping to professionalize the building performance industry. In terms of becoming self-sustaining, BPI continues to face the challenges of a growing organization. Aggressive marketing to industry will be essential.

REALIZED OR ANTICIPATED BENEFITS

BPI has successfully begun the process of establishing one set of voluntary standards for residential building energy practitioners. BPI is expected to play a pivatol role in a future building performance market -transformation project.

TECHNOLOGY TRANSFER ACTIVITIES

BPI has been marketed through a number of energy efficiency industry-based channels, such as the Affordable Comfort Housing Network and the national Weatherization Assistance Program.

FUNDING	TOTALS
NYSERDA	$109,872
NYSDHCR (formerly NYSDOS)	285,000
Vermont Office of Economic Opportunity	19,000
TOTALS	$413,872

Contractor: Building Performance Institute
Site: Glens Falls, Warren County
Contract Duration: 3/95 - 12/97
Key Words: buildings, residential, HVAC, certification
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4115-IABR-BR-95

-> Converting Electrically Heated Buildings to Hot Water

Demonstrate energy and economic savings potential of electric-to-hot-water conversions.

BACKGROUND

More than 550,000 dwelling units in New York State are heated by electric resistance heat. Electric space heating generally entails a large waste of energy because the overall fuel-use efficiency for electric power generation, transmission, and distribution is about 30%. The annual fuel-use efficiency of gas- or oil-fired boilers for hot-water heating systems usually ranges from 70-75%. Converting from electric to hot-water heating offers significant potential fuel savings.

ACCOMPLISHMENTS

Three electrically heated apartment complexes in Jamestown, New York, were converted to gas-based, hot-water heating. District heating provided the heat source for all three conversions. Financing was provided through a combination of resources provided by the Jamestown Board of Public Utilities (BPU), the U.S. Department of Housing and Urban Development, and private funds.

FINDINGS AND CONCLUSIONS

The economics of the three conversions were not as attractive as originally envisioned, given the cost for electric power in the Jamestown area (i.e., $.045/kWh, and the fact that the subsidy offered by the Jamestown BPU was the primary reason the projects achieved a 10-year payback. Although space-heating reductions of 20% were expected, and in most cases exceeded, the simple paybacks for the three sites were: 18.8, 15.8, and 17 years, respectively.

REALIZED OR ANTICIPATED BENEFITS

For New York State, conversions from electric heat are a prudent investment over the long term, especially in other regions of New York where the present cost of power often exceeds $.11/kWh. Of no less importance, conversion from electric-resistance heat to gas-fired equipment can result in substantial fuel and cost savings.

TECHNOLOGY TRANSFER ACTIVITIES

The project results will be included in a larger technology transfer event that will highlight the results of several electric-replacement technology feasibility studies.

FUNDING	TOTALS
NYSERDA	$150,000
Jamestown BPU	169,800
Jamestown BPU (in-kind)	28,000
Joseph Technology (in-kind)	23,200
TOTALS	$371,000

Contractor: Joseph Technology Corporation
Site: Jamestown, Chautauqua County
Contract Duration: 5/95 - 12/97
Key Words: electricity, multifamily, district heating
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4144-IABR-BR-95

-> Development of a Refrigerator Replacement Program

Replace energy-inefficient refrigerators in multifamily housing

BACKGROUND

Refrigerators use approximately 8% of the electric energy consumed in the United States, and account for about 7% of the electric demand. Replacing energy-inefficient refrigerators in residential housing, particularly low-income housing where energy expenditures account for more than 25% of limited incomes, represents good public policy and prudent investment.

ACCOMPLISHMENTS

This project evaluated the cost-effectiveness of three pilot refrigerator-replacement programs (one single-family and two multifamily) in upstate and downstate New York. Existing and replacement refrigerators were tested using a sophisticated monitoring system that captured energy performance and other temperature-related data.

FINDINGS AND CONCLUSIONS

The energy savings and economics were extremely attractive in two of the three pilots. The third pilot also produced significant savings. Energy savings reported in each of the three pilots were: 946, 1,723, and 456 kWh per unit per year. Savings-to-investment ratios were: 2.60, 4.65, and 1.82. The largest energy and cost savings were achieved at the single-family sites.

REALIZED OR ANTICIPATED BENEFITS

Refrigerator replacements and other electric measures will soon be incorporated in the New York State Weatherization Assistance Program. In addition, several housing authorities in New York State are participating in bulk-purchasing cooperatives for energy-efficient refrigerators.

TECHNOLOGY TRANSFER ACTIVITIES

This project has received significant visibility in terms of energy and housing conference forums. It is envisioned that all weatherization program agencies will be trained in the use of protocols for making electric measures replacement decisions.

FUNDING	TOTALS
NYSERDA	$113,474
Petroleum Overcharge Funds	50,000
Rochester Gas and Electric Corp.	50,000
Synertech Systems Corporation	32,239
TOTALS	$245,713

Contractor: Synertech Systems Corporation
Site: Syracuse, Onondaga County; Rochester, Monroe County; and Westchester, New York, Queens, Kings, Richmond, and Bronx counties
Contract Duration: 9/95 - 12/97
Key Words: residential, refrigeration, multifamily, electricity
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4145-IABR-BR-95

-> New Technologies Feasibility Study for Tall Oaks Apartments

Explore feasibility of converting electric-resistance to gas-fired hydronic systems using various distribution technologies.

BACKGROUND

Electric-resistance heat was installed in the State's low-income housing complexes during the 1970s. New energy-efficient technologies may offer a cost-effective alternative to costly electric heat. This project will examine new distribution technologies for gas-fired hydronic systems.

ACCOMPLISHMENTS

The Tall Oaks Apartment complex in Middletown, New York, is a 150-unit housing development heated by electric-resistance baseboard heaters. Domestic hot water (DHW) is supplied by three central gas-fired boiler plants. Tall Oaks was evaluated for its potential to cost-effectively convert to a gas-fired hydronic system using innovative piping systems. A data-acquisition system was installed to gather operating parameters of the DHW system in order to accurately size the replacement equipment. Microbore, a small-diameter piping, was assessed for its potential to reduce labor costs through ease of installation.

FINDINGS AND CONCLUSIONS

Although microbore pipe is more flexible and easier to use, the project concluded that there was no economic benefit to using it in a conversion. Although the project's cost-benefit analyses indicated a payback of 7.6 years, the Tall Oaks management company has deferred its decision to convert to the proposed hydronic system.

REALIZED OR ANTICIPATED BENEFITS

The Tall Oaks complex comprises 150 units of 1- and 2-story townhouses in groups of from 3-23 units. The results of this project will be evaluated within a broader context to assess the replicability of the technologies to other similar low-income housing complexes in the State. The study concluded that the Tall Oaks facility could be converted to a gas-fired hydronic system with distributed boilers at a cost of $663,170. Annual savings were projected at $87,377, resulting in a payback of 7.6 years.

TECHNOLOGY TRANSFER ACTIVITIES

A comprehensive technology-transfer program that combines the results of several feasibility studies is anticipated in the next year.

FUNDING	TOTALS
NYSERDA	$64,778
EME (in-kind)	20,000
Related Management	26,000
TOTALS	$110,778

Contractor: EME Group
Site: Middletown, Orange County, and New York City, New York County
Contract Duration: 2/97 - 11/97
Key Words: electricity, low-income, multifamily
Project Manager: Norine Karins (519) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low-Income/Multifamily
Contract No.: 4522-IABR-BR-97

-> High-Efficiency, Low-NOx Boiler

Design, laboratory-test, and field-demonstrate innovative boiler that achieves both high efficiency and low levels of NOx and carbon monoxide emissions.

BACKGROUND
Heating equipment manufacturers are challenged to meet new U.S. Department of Energy (U.S. DOE) energy standards while reducing emissions of nitrogen oxides (NOx) and carbon monoxide (CO) to comply with expanding environmental regulations.

OBJECTIVE
To develop and demonstrate a high-efficiency, gas-fired boiler for residential and small commercial space-heating applications that produces low levels of pollutant emissions. The final product will be a boiler system capable of being manufactured and marketed commercially.

DESCRIPTION
This project will include the design, laboratory-testing, and field-demonstration of an innovative boiler that uses modern combustion and heat transfer technology to achieve both high efficiency and low levels (under 30 ppm) of NOx and carbon monoxide emissions to meet future U.S. DOE efficiency standards as well as environmental standards anticipated by 2000. A significant goal of the project is to reduce the manufacturing cost of the new boiler compared to currently available high-efficiency boilers.

BENEFITS
Large quantities of energy are consumed annually to heat buildings in New York State. Space-heating systems produce substantial emissions that contribute to such environmental problems as acid rain, ozone depletion, and global warming. Improved heating systems could significantly reduce energy consumption and emissions in the building sector.

SCHEDULE AND STATUS
Under Phase I, Utica Boilers developed a low thermal mass heat exchanger design which will significantly improve seasonal efficiency. Utica also lab-tested new burner designs that substantially reduce emissions. Under Phase II, which has just begun, the company will perform field testing, product certification, and initial commercialization tasks.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	$100,000	$500,000
Niagara Mohawk Power Corp.	150,000	0	150,000
Utica Boilers, Inc. (in-kind)	150,000	100,929	400,000
TOTALS	$550,000	$200,929	$1,050,000

Contractor: Utica Boilers, Inc.
Site: Utica, Oneida County
Contract Duration: 9/91 - 12/99
Key Words: product development, environmental, gas, heating, gas-fired heating equipment, NOx
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 1774-EEED-BES-92

-> High-Efficiency, Low-NOx Steam-Heating Boiler

Develop and demonstrate high-efficiency dual-fuel (oil-natural gas) boiler.

BACKGROUND
Heating equipment manufacturers must meet new U.S. Department of Energy (U.S. DOE) energy standards while reducing emissions of nitrogen oxides (NOx) and carbon monoxide (CO) to comply with increasingly stronger environmental regulations.

OBJECTIVE
To develop and demonstrate a high-efficiency, dual-fuel (oil/natural gas) low-pressure steam-heating boiler for large residential and commercial space-heating applications. The final product will be a boiler system capable of being manufactured and marketed commercially.

DESCRIPTION
This project will include the design, laboratory-testing, and field-demonstration of an innovative, low-pressure steam-heating boiler that uses modern combustion and heat-exchanger technology to achieve both high efficiency and low levels (under 30 ppm) of NOx and CO emissions to meet future U.S. DOE efficiency standards and environmental standards anticipated by 2000.

A significant goal of the project is to reduce the manufacturing cost of the new boiler compared to currently available high-efficiency steam-heating boilers.

BENEFITS
Large quantities of energy are consumed annually to heat buildings in New York State. Space-heating systems produce substantial emissions that contribute to environmental problems such as acid rain, ozone depletion, and global warming. Improved heating systems could significantly reduce energy consumption and emissions in the building sector. The success of this project will lead to a new product line for the contractor, a New York State manufacturer.

SCHEDULE AND STATUS
Laboratory testing is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$500,000
EASCO Boiler Corporation	73,574	0	500,000
TOTALS	$323,574	0	$1,000,000

Contractor: EASCO Boiler Corporation
Site: Bronx, Bronx County
Contract Duration: 9/95 - 12/99
Key Words: product development, environmental, gas, heating, gas-fired heating equipment, NOx
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4269-IABR-BR-96

-> Ultra-Low Emissions Ceramic Burner

Construct and laboratory-test ceramic burner for gas-fired heating equipment.

BACKGROUND

New York State is a major user of natural gas for heating, with approximately three million households (representing about one-half of the population) using natural-gas heat. Improved gas-fired heating systems offer the potential for significant energy and emissions savings. Several manufacturers of gas-fired heating systems also are located in New York State.

OBJECTIVE

To develop a new gas-fired ceramic burner technology with improved energy and environmental performance. The burner is expected to achieve NOx and carbon monoxide emission levels of under 20 ppm. The burner's multilayered design will increase flashback protection and modulation capacity compared to currently available ceramic burners.

DESCRIPTION

The project will include the construction and laboratory-testing of a ceramic burner for forced-draft/induced-draft gas-fired heating equipment. The project also will include a comprehensive field-testing and technology-transfer effort in cooperation with New York State manufacturers of gas-fired heating systems.

BENEFITS

The project will benefit consumers in New York State through the development of a new gas-fired burner technology. Economic development benefits also will be achieved through the manufacture of a new technology by a New York State company.

SCHEDULE AND STATUS

Field testing of the new ceramic burner is under way at several locations in New York State..

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$192,895	0	$192,895
National Fuel Gas Dist. Corp.	117,000	0	117,000
Hi-Tech Ceramics, Inc.	75,895	0	75,895
TOTALS	$385,790	0	$385,790

Contractor: Hi-Tech Ceramics, Inc.
Site: Alfred, Allegany County
Contract Duration: 9/95 - 9/99
Key Words: product development, environmental, gas burners, NOx
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4270-IABR-BR-96

-> Commercial Ceramic Burner

Construct and test ceramic gas-fired burner for commercial heating equipment.

BACKGROUND

New York State is a major user of natural gas for heating, with approximately three million customers (representing about one-half the population) using natural gas heat. Improved gas-fired heating systems offer the potential for significant energy and emissions savings. Several manufacturers of gas-fired heating systems are located in New York State.

OBJECTIVE

To develop a new commercial ceramic gas-fired burner with improved energy and environmental performance. The burner is expected to achieve NOx and carbon monoxide emissions of under 25 ppm. The burner will have a modulating capacity of 200,000 to 600,000 Btu/hr to match actual heating loads in commercial buildings and to achieve seasonal efficiency improvements of 5 to 10 percent compared to conventional on/off gas-fired burners.

DESCRIPTION

Phase I of this project will include the construction and laboratory testing of a ceramic gas-fired burner for commercial heating applications. Phase II will include comprehensive field-testing, product certification, technology transfer, and commercialization.

BENEFITS

The project will benefit building owners in New York State through the development of a new, high-efficiency, low-emission, gas-fired burner technology. Economic development benefits also will be achieved through the manufacture of a new technology by a New York State company.

SCHEDULE AND STATUS

The design has been completed and laboratory testing has begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$125,275	0	$250,000
Heat Wise, Inc.	125,275	0	250,000
TOTALS	$250,550	0	$500,000

Contractor: Heat Wise, Inc.
Site: Ridge, Suffolk County
Contract Duration: 9/96-9/99
Key Words: product development, gas burners, NOx
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4458-IABR-BR-97

-> Gas-Fired Flame-Quality Indicator

Develop flame-quality indicator for gas-fired heating equipment.

BACKGROUND

New York State is a major user of natural gas for heating, with approximately three million households (representing about one-half of the population) using natural-gas heat. Improved gas-fired heating systems offer the potential for significant energy and emissions savings. Several manufacturers of gas-fired heating systems also are located in New York State.

OBJECTIVE

To develop a flame-quality indicator that will improve energy and environmental performance of gas-fired heating equipment. The indicator will use an optical sensor to monitor combustion spectral characteristics over long periods of operation. The indicator will show when combustion cleanliness has begun to deteriorate, enabling technicians to adjust heating equipment during installation or servicing. The indicator also will enable gas utilities and heating contractors to monitor heating-system performance and safety through remote telecommunications.

DESCRIPTION

The project will include design and testing of a microprocessor-based production-model flame-quality indicator, a market study, initial production of commercial units, and market introduction.

BENEFITS

The project will benefit consumers in New York State through the development of a new gas-fired equipment technology. Economic development benefits also will be achieved through manufacture of new products by a New York State company.

SCHEDULE AND STATUS

Design and laboratory testing tasks have been completed. Construction and field testing of a production model unit is being performed at Fillmore Gardens apartment complex in Brooklyn.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$292,826	0	$442,826
Insight Technologies, Inc.	137,940	0	287,940
Brooklyn Union	192,826	0	292,826
TOTALS	$623,592	0	$1,023,592

Contractor: Insight Technologies, Inc.
Site: Bohemia, Suffolk County
Contract Duration: 9/95 - 12/99
Key Words: product development, environmental, gas burners
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4271-IABR-BR-96

-> Gas-Fired, Through-the-Wall Heating System - Phase I

Construct and test gas-fired, through-the-wall heating system for residential and commercial buildings.

BACKGROUND

Increasing electric utility rates are leading to a greater need in the residential and commercial building sector for economical, gas-fired heating technologies. High costs for electric resistance heating have become a burden for many residents and business owners. Increasing costs have also been incurred in electrically heated, federal- and State-supported public housing.

OBJECTIVE

To develop a new, gas-fired, through-the-wall, heating system for multiroom applications in residential and commercial buildings. The new system is intended to provide economical, high-efficiency, low-NO_x/CO emissions natural gas heating both for new construction and for electric-to-gas retrofit heating in existing buildings.

DESCRIPTION

The project will include the construction and laboratory-testing of a through-the-wall, gas-fired heating system that incorporates a utility closet design. The system will provide conditioned air to multiple rooms through supply openings in the enclosure, passages through adjacent common walls, and optional limited extensions of ductwork. The project will also include comprehensive field-testing and technology transfer.

BENEFITS

The project will benefit consumers in New York State by developing a new gas-fired heating technology. Economic development benefits also will be achieved through the manufacture of a new technology by a New York State company.

SCHEDULE AND STATUS

Phase I is under way. The market study and concept design tasks have begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$200,902	$401,000
EMI, Inc.	0	200,902	401,000
TOTALS	0	$401,804	$802,000

Contractor: EMI, Inc.
Site: Rome, Oneida County
Contract Duration: 12/97-12/99
Key Words: product development, gas heat, NO_x
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4462-IABR-BR-98

-> Advanced, Gas-Fired, Atmospheric Boiler - Phase I

Design, laboratory-test, and initially field-test innovative, aluminum, gas-fired, atmospheric, hydronic boiler that achieves both higher seasonal efficiency and lower levels of NO_x and CO emissions.

BACKGROUND

Higher efficiency (over 84% AFUE) boilers have had steady increases in sales and now comprise approximately 15-20% of the market. However, lower-cost, lower-efficiency, atmospheric boilers, which vent into galvanized metal or masonry chimneys, and which just meet U.S. Department of Energy standards with efficiencies of 80% or slightly higher, will continue to dominate the market for many years to come.

OBJECTIVES

To develop and demonstrate a higher-efficiency, low emissions, gas-fired, aluminum, atmospheric, hydronic boiler for residential and small commercial space-heating applications. The boiler is intended to be equal in cost, and thus compete, with cast iron sectional boilers in the low-cost, price-competitive, atmospheric boiler category. The boiler would thus achieve energy savings at no additional cost to the consumer or building owner. The final product will be a boiler system capable of being manufactured and marketed commercially.

DESCRIPTION

Phase I of this project will include design, laboratory-testing, and initial field-testing of an innovative boiler that uses an aluminum heat exchanger. The heat exchanger will be very light compared to cast iron boilers and will substantially reduce thermal mass and part-load cycling losses. The project will also seek to develop an atmospheric burner that achieves low emission levels (under 40 ppm) of NO_x and CO.

BENEFITS

Large quantities of energy are consumed annually to heat buildings in New York State. Space-heating systems produce substantial emissions that contribute to such environmental problems as acid rain, ozone depletion, and global warming. Improved heating systems could significantly reduce energy consumption and emissions in the building sector. The new boiler is expected to achieve actual seasonal efficiency improvements of several percent.

SCHEDULE AND STATUS

The market study and concept design tasks have begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$240,175	$490,000
Dunkirk Radiator Corporation	0	240,176	490,000
TOTALS	0	$480,351	$980,000

Contractor: Dunkirk Radiator Corporation
Site: Dunkirk, Chautauqua County
Contract Duration: 3/98 - 12/00
Key Words: product development, environmental, gas, heating, gas-fired heating equipment, NO_x
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4739-IABR-BR-98

-> Flame-Quality Indicator Oil Burner Control

Develop flame-quality indicator original-equipment manufactured oil burner control for new oil-fired heating equipment.

BACKGROUND

New York State is a major user of fuel oil for heating. Approximately three million households (some 50%) of the population in New York State use oil heat. New York State fuel-oil customers also represent 25% of the oil market in the United States. Improved oil-fired heating equipment offers the potential for significant energy and emissions savings in New York State, where several manufacturers of this equipment also are located.

OBJECTIVE

To develop and demonstrate a flame-quality indicator original-equipment manufactured (OEM) oil burner control that will improve the energy and environmental performance of new, residential and small commercial, oil-fired heating equipment. The control will replace conventional, cadmium sulfide cells and will be intended for direct integration into new oil burners and oil-fired heating systems during manufacturing. The control will monitor the quality of combustion in oil burners through infrared, optical sensing. The control will provide early warning through remote telecommunications of any loss of safe and efficient combustion and will provide for burner shutdown if unacceptable performance occurs. The control will incorporate the design concept of the retrofit flame-quality indicator developed under Agreement No. 4072-IABR-BR-95 for existing oil-fired heating systems.

DESCRIPTION

Phase I of the project will include design and laboratory testing. Phase II will include field-testing and commercialization tasks.

BENEFITS

The flame-quality indicator OEM oil burner control will enable service technicians to directly tune oil burners for optimal performance during heating equipment installation without the multiple, iterative flue gas analyses previously required. The new control will reduce energy consumption and pollutant emissions.

SCHEDULE AND STATUS

Phase II is under way. Field testing has begun on Long Island.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$203,580	$125,000	$453,423
Insight Technologies, Inc.	67,860	84,815	237,383
Heating System Mfrs	161,000	85,554	332,000
TOTALS	$432,440	$295,369	$1,022,806

Contractor: Insight Technologies, Inc.
Site: Bohemia, Suffolk County
Contract Duration: 9/96-12/99
Key Words: product development, oil burners, controls
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4459-IABR-BR-97

-> Advanced Oil-Burner Development and Demonstration

Develop and demonstrate energy-efficient, low-emission oil burner to be manufactured in New York State.

BACKGROUND

New York State is a major user of fuel oil for heating. Approximately three million households (representing about one-half of the population) in New York State use oil heat. New York State fuel-oil customers also represent 25 percent of the oil market in the United States. Improved oil-fired heating systems offer the potential for significant energy and emissions savings in New York State. Several manufacturers of oil-fired heating systems are located in New York State.

OBJECTIVE

To develop a new oil-burner technology with improved energy and environmental performance. A prototype model of the new burner has been developed by the Oil Heat Program at Brookhaven National Laboratory and uses fan pressure (instead of oil pressure) and recirculation of combustion gas to achieve atomization and vaporization of fuel. The prototype burner results in low NOx and carbon monoxide emission levels and should enable oil-fired heating systems to better maintain energy efficiency over long periods.

DESCRIPTION

Phase I of this project included the construction and laboratory-testing of a production-model fan-atomized oil burner. Phase II will include a comprehensive field-testing and technology-transfer effort with New York State manufacturers of oil-fired heating systems. This project will be conducted in parallel with Brookhaven National Laboratory (working under Agreement No. 3033-IABR-BR-95).

BENEFITS

The project will benefit consumers in New York State through the development of a new oil-burner technology. The new burner will allow the design of small-capacity furnaces suitable for modern energy-efficient homes. Economic development benefits also will be achieved through the manufacture of a new technology by a New York State company.

SCHEDULE AND STATUS

Field-testing and initial commercialization of the new burner are being performed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$450,000	0	$450,000
Heat Wise, Inc.	129,420	0	129,420
TOTALS	$579,420	0	$579,420

Contractor: Heat Wise, Inc.
Site: Ridge, Suffolk County
Contract Duration: 9/94-9/99
Key Words: product development, environmental, oil burners, NOx
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4006-IABR-BR-95

-> Advanced Commercial Water Heater

Develop and demonstrate high-efficiency, low-emissions commercial water heater.

BACKGROUND
Significant potential for commercial water heating energy savings exists in New York State.

OBJECTIVE
To develop and demonstrate a high-efficiency, low-emissions commercial water heater that achieves significant energy and environmental benefits in the commercial building sector. The target efficiency for the water heater will be 95%, with emissions of under 20 ppm for nitrogen oxides and carbon monoxide. The water heater will minimize standby losses by having little or no water storage and will maximize combustion efficiency by using a high turn-down ratio burner rather than conventional on/off control.

DESCRIPTION
Phase I of this project will include construction and laboratory-testing of a prototype commercial-size water heater. Phase II will include field installation and monitoring of a production model unit at a New York State demonstration site.

BENEFITS
The final product of this project will be a production-model commercial water heater that is capable of being manufactured and marketed by Fulton Boiler Works. The benefit to building owners will be the availability of an economical system for achieving high-efficiency use of natural gas. Economic benefits also would be derived from the manufacture of additional capital goods in New York State.

SCHEDULE AND STATUS
Field testing of several production model units is being performed in New York State.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	$150,000	$500,000
Fulton Boiler Works, Inc.	273,775	154,609	531,457
Niagara Mohawk Power Corp.	150,000	0	300,000
TOTALS	$673,775	$304,609	$1,331,457

Contractor: Fulton Boiler Works, Inc.
Site: Pulaski, Oswego County
Contract Duration: 10/93 - 12/99
Key Words: product development, environmental, water heaters, NOx
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 3004-EEED-BES-94

-> Oil-Fired Heating System Development and Demonstration

Develop new oil-burner technology with improved energy and environmental performance.

BACKGROUND

New York State is a major user of fuel oil for heating. Approximately three million households (representing about one-half of the population) in New York State use oil heat. New York State fuel-oil customers also represent 25% of the oil market in the United States. Improved oil-fired heating systems offer the potential for significant energy and emissions savings in New York State. Several manufacturers of oil-fired heating systems are located in New York State.

OBJECTIVE

To perform the advanced development of a new oil-burner technology with improved energy and environmental performance. The new burner has been initially developed by the Oil Heat Program at Brookhaven National Laboratory and incorporates air-atomization (instead of pressure-atomization), recirculation of combustion gas to achieve vaporization, and mixing of fuel with air prior to combustion. The prototype burner produces very low No_x and carbon monoxide emission levels and should enable oil-fired heating systems to maintain better energy efficiency over long periods.

DESCRIPTION

Phase I of this project will include the construction and laboratory-testing of a production-model air-atomized oil burner. Phase II will include a comprehensive field-testing and technology-transfer effort with New York State manufacturers of oil-fired heating systems.

BENEFITS

The project will benefit consumers in New York State through the development of a new oil-burner technology. Economic-development benefits also will be achieved through the manufacture of new technologies by New York State companies.

SCHEDULE AND STATUS

Phase II field testing of the new oil burner technology has begun at several demonstration sites on Long Island.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$149,648	0	$299,648
Brookhaven National Laboratory*	5,000	0	10,000
TOTALS	$154,648	0	$309,648

*in-kind services

Contractor: Brookhaven National Laboratory
Site: Upton, Suffolk County
Contract Duration: 3/95 - 9/99
Key Words: product development, environmental, oil burners, NOx
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 3033-IABR-BR-94

-> Two-Stage Firing Rate, Oil-fired, Hydronic Boiler

Develop and demonstrate high efficiency, two-stage firing rate, oil-fired boiler for residential and small commercial buildings.

BACKGROUND

New York State is a major user of fuel oil for heating. Approximately three million households (representing about one-half of the population) in New York State use oil heat. New York State fuel-oil customers also represent 25 percent of the oil heat market in the United States. Improved oil-fired heating systems offer the potential for significant energy and emissions savings in New York State. Several manufacturers of oil-fired heating systems are located in New York State.

Conventional oil-fired heating systems often are several times larger in capacity than necessary for residential and small commercial buildings due to the previous minimum firing rate of approximately 0.75 gph that was required by oil burners. Excessive oversizing of heating equipment is known to result in frequent cycling with significant energy penalties. A new, fan-atomized, oil burner technology recently developed by Heat Wise, Inc., can operate at firing rates as low as 0.3 gph with low/high modulation.

OBJECTIVE

This project will include the development of a compact, two-stage firing rate, oil-fired, hydronic, steel boiler for residential and small commercial buildings. The new boiler will incorporate low thermal mass and low/high firing rate capability to better match actual heating loads. The boiler will use the new, fan-atomized oil burner developed by Heat Wise, Inc., and will operate between 0.35 and 0.8 gph capacity. The boiler will achieve significant energy savings through improved steady state efficiency and reduced off-cycle losses.

DESCRIPTION

Phase I of this project will include the design, construction and laboratory testing of a prototype boiler. Phase II will include a comprehensive field-testing and technology transfer effort by the manufacturer. This project will receive technical assistance from the Oil Heat Program at Brookhaven National Laboratory.

BENEFITS

This project will benefit consumers in New York State through the development of a new, oil-fired boiler that reduces energy costs for space and domestic water heating. Economic development benefits also will be achieved through the manufacture of a new technology by a New York company.

SCHEDULE AND STATUS

The initial system design has been completed and laboratory testing is being performed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$113,098	0	$263,000
National Combustion Co., Inc.	113,098	0	263,000
TOTALS	$226,196	0	$526,000

Contractor: National Combustion Co., Inc.
Site: Jamaica, Queens County
Contract Duration: 9/96-12/99
Key Words: product development, environmental, oil heat, NOx
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4456-IABR-BR-97

-> Low-Firing-Rate, Oil-fired, Warm-Air Furnace

Develop and demonstrate high-efficiency, low-firing-rate, oil-fired warm-air furnace for residential and small commercial buildings.

BACKGROUND

New York State is a major user of fuel oil for heating. Approximately three million households (representing about one-half the population) in New York State use oil heat. New York's fuel-oil customers also represent 25 percent of the oil heat market in the United States. Improved oil-fired heating systems offer the potential for significant energy and emissions savings in the State. Several manufacturers of oil-fired heating systems are located in New York.

Due to the minimum firing rate of approximately 0.75 gallons per hour (gph) formerly required by oil burners, conventional oil-fired heating systems are often several times larger in capacity than needed for residential and small commercial buildings. Oversized heating equipment results in frequent cycling, with significant energy penalties. A new, fan-atomized oil-burner technology recently developed by Heat Wise, Inc. can operate at firing rates as low as 0.3 gph with low/high modulation.

OBJECTIVE

To develop a compact, low-firing-rate, oil-fired, warm-air furnace for residential and small commercial buildings. The new furnace will eliminate the large, refractory combustion chamber found in traditional oil-fired warm-air furnaces. The furnace will use the new, fan-atomized oil burner developed by Heat Wise, Inc., and will operate in the 0.35 to 0.8 gph capacity range. The furnace will achieve significant energy savings through improved steady-state efficiency and reduced off-cycle losses.

DESCRIPTION

Phase I of this project will include the design, construction, and initial laboratory testing of a prototype furnace. Phase II will include comprehensive laboratory- and field-testing, certification, and technology transfer by the manufacturer. This project will receive technical assistance from the Oil Heat Program at Brookhaven National Laboratory.

BENEFITS

This project will benefit consumers in New York State by reducing energy costs for space-heating. Economic development benefits also will be achieved through the manufacture of a new technology by a New York company.

SCHEDULE AND STATUS

Phase I is under way. A market study and concept design have begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$500,000
Utica Boilers, Inc.	256,860	0	500,000
TOTALS	$506,860	0	$1,000,000

Contractor: Utica Boilers, Inc.
Site: Utica, Oneida County
Contract Duration: 1/97-12/99
Key Words: product development, environmental, oil heat, NOx
Project Manager: Ray Albrecht (518) 862-1090 ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4457-IABR-BR-97

-> Efficient Non-Electric Flue/Vent Damper

Design, develop, demonstrate, and commercialize non-electric vent damper for commercial and residential use.

BACKGROUND

Most residential gas water heaters do not have flue/vent dampers. In the majority of installations, electric flue/vent dampers cannot be installed on gas residential water heaters because they require an expensive electrical hook-up that is not currently required. Today's flue/vent damper is also too expensive to justify common use, particularly in residential applications. In the commercial sector, while dampers are standard equipment, they are costly and energy-intensive. Bi-metallic dampers, a competing technology, can take as long as five minutes to open fully, dumping combustion products into the space around the appliance. Slow bi-metallic damper closing causes low efficiency.

OBJECTIVE

To design, develop and commercialize an efficient, low-cost non-electric flue/vent damper for use in commercial and residential applications.

DESCRIPTION

The contractor will (1) perform product design and development; (2) manufacture and test unit prototypes; (3) obtain product certification; (4) develop a marketing plan; and (5) engage in full-scale manufacturing and commercialization.

BENEFITS

The major benefit is energy savings projected at 20 percent of the energy normally consumed in the absence of a flue/vent damper, based on the manufacturer's tests on its own electrically operated dampers. Payback is expected to be one to two years. Also, manufactured cost will be reduced greatly and installation-cost savings will be approximately 80 percent. Economic benefits would accrue from growth of a New York State business. A positive environmental impact is expected because a reduction in energy consumed by the appliance is directly attributable to a reduction in burner firing time, thus reducing the amount of pollution generated by the heating appliance.

SCHEDULE AND STATUS

Product design tasks were nearing completion when an intention to sell the company was announced. Product development is currently on hold.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$162,465	0	$162,465
Flair International Corp.	167,465	0	167,465
TOTALS	$329,930	0	$329,930

Contractor: Flair International Corporation
Site: Hauppauge, Suffolk County
Contract Duration: 11/94 - 10/98
Key Words: product development, HVAC, buildings, residential, commercial, dampers
Project Manager: Mary Ann S. Bowers (518) 862-1090, ext. 3254
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4058-IABR-BR-95

-> High-Efficiency Indirect Water Heater

Develop and demonstrate high-efficiency indirect water heater.

BACKGROUND
Residential and commercial water heating offers the potential for significant energy savings in New York State buildings.

OBJECTIVE
To develop and demonstrate a high-efficiency indirect water heater that achieves significant energy benefits in the residential and small commercial building sectors. The water heater will minimize standby losses by increasing jacket insulation and reducing thermosyphon heat losses.

DESCRIPTION
Phase I of this project included the construction and laboratory-testing of a prototype indirect water heater with storage capacities of 40, 50, 60, 75, 90, and 115 gallons. During Phase I, increased jacket insulation was analyzed and tested, water supply and return connections were modified to reduce thermosyphon heat losses, and thermostat sensor designs were modified to maximize effective use of water-heater volume while minimizing associated boiler short-cycling operation. Phase II will include field installation and monitoring of six production-model units at New York State demonstration sites.

BENEFITS
This project will result in a production-model indirect water heater capable of being manufactured and marketed by Stor-Ex New York, Inc. Building owners will benefit from the availability of an economical system for achieving high-efficiency water heating. Economic benefits will be derived from the manufacture of additional capital goods in New York State.

SCHEDULE AND STATUS
Field-testing and initial commercialization have begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$214,500	$100,000	$464,500
Stor-Ex New York, Inc.	214,500	100,000	464,500
TOTALS	$429,000	$200,000	$929,000

Contractor: Stor-Ex New York, Inc.
Site: Ridgewood, Queens County
Contract Duration: 9/95 - 12/99
Key Words: product development, water heaters
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4272-IABR-BR-96

-> Venting System for High-Efficiency Heating Systems

Develop advanced venting system for high-efficiency gas- and oil-fired heating systems.

BACKGROUND

High-efficiency gas- and oil-fired heating systems produce low-temperature flue-gas exhaust. Low-temperature flue gases usually result in acidic condensate on the inside of the venting system. Masonry chimneys are not suitable for venting most high-efficiency heating systems due to deterioration of masonry blocks and mortar joints resulting from acidic attack.

Alternative materials have been developed for venting high-efficiency heating systems. High-temperature plastics initially were accepted, but have been discontinued by most users due to material deterioration and stress cracking. Stainless-steel materials also have been developed, but are expensive and have not demonstrated the level of corrosion resistance desired by the heating industry.

OBJECTIVE

To develop an advanced venting system that achieves higher corrosion resistance at a lower manufacturing cost than currently available stainless-steel venting systems. The venting system will incorporate a new, longitudinal butt-welding process and integral connection components. The welding process will result in smooth tubing seams and is expected to show superior performance compared to the conventional, overlap seam used by other venting system manufacturers.

DESCRIPTION

The project will include a market survey, design, and fabrication of a prototype venting system and manufacturing process; laboratory, product-certification, and field-testing; and technology transfer and commercialization.

BENEFITS

The new venting system will improve the economics of high-efficiency, gas- and oil-fired heating systems. Significant job creation could result in the new economic development zone in the south end of Albany.

SCHEDULE AND STATUS

Initial production began during late 1997. Larger-diameter sizes of the venting system are being designed and fabricated. The production facility has been nearly completed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$276,554	$150,000	$426,554
ProTech Systems, Inc.	229,523	150,219	379,742
Niagara Mohawk Power Corp.	0	150,000	150,000
TOTALS	$506,077	$450,219	$956,296

Contractor: ProTech Systems, Inc.
Site: Albany, Albany County
Contract Duration: 8/96 - 12/98
Key Words: product development, HVAC, heating
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4455-IABR-BR-97

Advanced Liquid-Desiccant System

Reduce electrical loads in buildings by using gas-fired cooling systems.

BACKGROUND
Desiccant dehumidification and cooling systems can replace conventional electrically driven compressor systems.

OBJECTIVE
To develop and demonstrate an advanced liquid-desiccant (glycol-based) cooling system with improved energy performance and reduced manufacturing cost for commercial space-cooling applications. The final product will be a desiccant system capable of being manufactured and marketed commercially.

DESCRIPTION
This project will include the design, laboratory-testing, and field-demonstration of an advanced liquid-desiccant system. The project will seek to develop a multistage regeneration technique with integral heat recovery to improve the efficiency of the desiccant system to 1.0 or above. New materials also will be investigated to reduce the manufacturing cost of the new desiccant system compared to currently available desiccant systems.

BENEFITS
Large quantities of energy are consumed annually to cool buildings in New York State. Most cooling systems for commercial buildings are electrically driven and contribute significantly to peak electrical-generating loads during the summer. Desiccant cooling systems can be operated with natural gas and could reduce summer electrical demand in the building sector.

SCHEDULE AND STATUS
Production model units have been installed at Fieldbrook Farms Ice Cream Company in Dunkirk, NY, and Hans 'n Gretel, Inc., in Brooklyn, NY. Field testing and evaluation are being performed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$750,000	0	$750,000
Niagara Blower Company	576,200	0	576,200
Brooklyn Union Gas	150,000	0	225,000
National Fuel Gas	100,000	0	100,000
Fieldbrook Farms (in-kind)	50,000	0	50,000
Brooklyn Demonstration Site Owner	0	$100,000	100,000
TOTALS	$1,626,200	$100,000	$1,801,200

Contractor: Niagara Blower Company
Site: Buffalo, Erie County
Contract Duration: 9/91 - 6/99
Key Words: product development, gas, cooling, gas-fired cooling, desiccants
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 1773-EEED-BES-92

-> Chlorofluorocarbon/Hydrofluorocarbon Refrigerant Separation Technology

Design, test, and commercialize an advanced separation technology for chlorofluorocarbon/hydrofluorocarbon refrigerant mixtures.

BACKGROUND

Recent U.S. Environmental Protection Agency regulations have banned the production of chlorofluorocarbon (CFC) refrigerants. Existing CFC-based air-conditioning and refrigeration systems must use banked or recycled CFC refrigerants for maintenance and repair. CFC shortages have begun to occur in the refrigerant market due to lower-than-expected recovery and recycling activities.

OBJECTIVE

To develop a new technology for separating mixed refrigerants. The new technology will use the liquid-extraction solvent technique to separate refrigerant mixtures that result from service errors in the field. Such errors customarily occur when cooling systems are not properly labeled or when refrigerant recharging of CFC-based cooling systems is performed with hydrofluorucarbon (HFC) refrigerants due to CFC shortages.

DESCRIPTION

Phase I included the design and laboratory testing of an advanced refrigerant-separation technology. Phase II will include product certification and commercialization tasks.

BENEFITS

The new technology will achieve environmental and economic benefits by enabling more cost- and technologically effective recovery and reclamation of refrigerants. The technology also will achieve energy benefits in existing cooling systems that continue to use CFCs by making it more economical to maintain efficient refrigerant-charge levels. The technology will be applicable to all presently occurring and expected-to-occur refrigerant-mixture combinations during the transition from CFC and HCFC refrigerants.

SCHEDULE AND STATUS

Phase II is under way. Small, pilot batch, system operation has begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$149,458	$100,000	$249,458
Refron, Inc.	149,458	108,384	257,842
TOTALS	$298,916	$208,384	$507,300

Contractor: Refron, Inc.
Site: Long Island City, Queens County
Contract Duration: 9/96-9/99
Key Words: product development, cooling, refrigerants, CFCs
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4460-IABR-BR-97

-> Innovative Refrigerant Circuit for Ground-Source Heat Pump

Evaluate refrigerant circuit for ground-source heat pump (GSHP) that provides space conditioning and domestic hot water.

BACKGROUND

Several GSHP manufacturers currently produce systems capable of providing both space-conditioning and domestic water-heating. These systems rely on a complicated series of controls and valves to direct the refrigerant for the various modes of operation. A new patented refrigerant circuit has been developed that minimizes the valves and controls required to direct the refrigerant for each of the operating modes, thereby improving system reliability and performance.

OBJECTIVE

To evaluate a new patented refrigerant circuit that allows GSHPs to provide both space-conditioning and domestic water-heating with simplified valving and controls.

DESCRIPTION

The contractor will (1) instrument five previously installed GSHP systems that use the patented refrigerant circuit; (2) monitor the systems for 12 months; (3) estimate the life cycle cost and seasonal and instantaneous performance and life cycle costs for the GSHPs and the refrigerant circuits; (4) perform a marketing analysis of competing GSHPs; (5) perform a manufacturing analysis to determine the most efficient method for producing the GSHP and refrigerant circuit; and (6) prepare a business plan for commercializing the GSHP and refrigerant circuit.

BENEFITS

The project will promote the use of a renewable technology that reduces the energy required for residential space-conditioning and water-heating. Homeowners will benefit by having lower energy bills and utilities will benefit by avoiding the need for new electricity-generating facilities. This project also will provide economic benefits by developing a new product for manufacture in New York State.

SCHEDULE AND STATUS

A business proposal and final report are being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$117,383	0	$117,383
Thermal Associates	117,384	0	117,384
TOTALS	$234,767	0	$234,767

Contractor: Thermal Associates
Site: Glens Falls, Warren County, and Saratoga County
Contract Duration: 11/93 - 6/98
Key Words: product development, HVAC, ground-source heat pumps, domestic hot water
Project Manager: Bob Carver (518) 862-1090, ext. 3242
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract Nos.: 3019-EEED-BES-94

-> Commercialization of Solarwall Air Heater

Establish manufacturing facility for unglazed solar-collecting system that heats ventilation air for buildings.

BACKGROUND

Conserval Systems, Inc. has developed an innovative air-heating system that uses an unglazed perforated solar collector. The system has been used successfully at several industrial buildings and high-rise apartment complexes. In spite of these successes, Conserval's ability to commercialize the Solarwall has been limited due to the fact that products must be made under contract with machine shops on a system-by-system basis.

SCOPE

To design and establish a New York State manufacturing facility dedicated to fabricating Solarwalls.

RESEARCH EFFORT

The contractor will: (1) design manufacturing equipment to efficiently fabricate systems; (2) evaluate the economic viability of constructing the designed equipment; (3) determine the requirements for a manufacturing facility to produce Solarwalls; (4) establish a manufacturing facility in the Buffalo area based on the designed equipment; (5) recruit and train production, sales, and marketing personnel; and (6) market the Solarwall to building owners, facility managers, architects, engineers, and ventilation contractors at appropriate trade shows and seminars.

BENEFITS

The Solarwall will use a renewable energy source to reduce the energy needed to warm ventilation air. Using the Solarwall will improve indoor air quality. A new manufacturing business also will be created in New York State.

SCHEDULE AND STATUS

The project has just begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$47,466	$47,466
Conserval Systems, Inc.	0	1,408,936	1,408,936
U.S. Department of Energy	0	1,240,638	1,240,638
TOTALS	0	$2,697,040	$2,697,040

Contractor: Conserval Systems, Inc.
Site: Buffalo, Erie County
Contract Duration: 3/98-6/00
Key Words: product development, HVAC, solar, heat recovery, buildings
Project Manager: Bob Carver (518) 862-1090, ext. 3242
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract Nos.: 4671-IABR-BR-98, 4681-IABR-BR-98, and 4681A-IABR-BR-98

-> Air-Infiltration and Ventilation Demonstration

Test and evaluate various ventilation systems in New York State homes.

BACKGROUND

NYSERDA, the California Institute for Energy Efficiency, and Lawrence Berkeley Laboratory (LBL) have completed a project to identify and analyze the effectiveness and energy impacts of various ventilation approaches for residential construction. These analyses also studied the interactions among ventilation, combustion appliances, safety, and moisture build-up. The results of these analyses have identified the most promising systems for New York State and California homes. A guidebook discussing the issues associated with ventilation and the most appropriate systems for New York State homes was developed from the results of these analyses.

OBJECTIVE

To field-test promising ventilation systems identified by LBL to verify which best balance the needs for indoor air quality and energy efficiency.

DESCRIPTION

The contractor will: (1) select a sample of eight New York State homes in which the most promising ventilation systems identified by LBL will be installed; (2) perform detailed testing on each home to establish its baseline infiltration, ventilation, and energy usage characteristics prior to installing a system; (3) repeat testing after the systems have been installed to measure any resulting changes in the homes' characteristics; (4) correlate the measured results of this detailed testing with LBL's expected results for each system; (5) develop a manual outlining acceptable practices for designing and installing ventilation systems; and (6) verify the effectiveness of this manual by performing quick diagnostic tests on a sample of 18 homes in which ventilation systems were designed and installed using the manual.

BENEFITS

A manual will be developed to assist architects and heating, ventilating, and air-conditioning (HVAC) contractors in designing and installing ventilation systems. The manual also will help ensure that installed systems meet current American Society of Heating, Refrigerating and Air-Conditioning Engineers standards for ventilation without compromising the home's energy efficiency. This work also could create economic opportunities for HVAC contractors due to increased installation of ventilation systems.

SCHEDULE AND STATUS

Installation of systems and detailed monitoring in seven of the first eight homes have been completed. Work in the remaining home receiving detailed monitoring is scheduled to end shortly. Work on the draft manual of acceptable design practices has begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$254,860	0	$254,860
U.S. Department of Energy	50,000	0	50,000
TOTALS	$304,860	0	$304,860

NOTE: Does not include $300,000 Phase I funding shown under agreement 1951-EEED-BES-93.

Contractor: Synertech Systems Corporation
Site: Syracuse, Onondaga County, and various locations in New York State
Contract Duration: 4/96 - 6/99
Key Words: product development, HVAC, buildings, residential, ventilation, infiltration, indoor air quality
Project Manager: Bob Carver (518) 862-1090, ext. 3242
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4413-IABR-BR-96

-> HFC Ductless Air-Conditioning System

Design, test, and demonstrate advanced commercial ductless non-chlorofluorocarbon air-conditioning system.

BACKGROUND

Recent U.S. Environmental Protection Agency regulations will restrict the use of hydrochlorofluorocarbon (HCFC) refrigerants in cooling equipment.

OBJECTIVE

To perform the design, laboratory-testing and field-demonstration of an advanced commercial ductless air-conditioning system that uses a hydrofluoro-carbon (HFC) refrigerant. The system will seek to improve efficiency while eliminating the use of conventional HCFC-22 refrigerant. The project will investigate the use of counterflow heat exchangers to take advantage of the variable boiling/condensing temperature characteristics of certain HFC refrigerant mixtures.

DESCRIPTION

Phase I will include the design, construction, and laboratory-testing of a counterflow heat exchanger for use in the condenser and evaporator components. Phase II will include the development and laboratory/field-testing of a complete HFC ductless air-conditioning system.

BENEFITS

Certain HFC refrigerants have shown the potential to achieve efficiency improvements of 10 to 15 percent compared to the conventional HCFC-22 refrigerant. The project also will include establishing heat-exchanger manufacturing at EnviroMaster's plant and will generate significant additional employment.

SCHEDULE AND STATUS

Phase II is under way. Field testing will begin during late 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	$250,000	$500,000
EnviroMaster International Corp.	258,864	255,931	514,795
TOTALS	$508,864	$505,931	$1,014,795

Contractor: EnviroMaster International Corporation
Site: Rome, Oneida County
Contract Duration: 12/95-12/98
Key Words: product development, cooling, refrigerants
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4295-IABR-BR-96

Evaluate and prioritize emerging technologies for energy efficiency.

BACKGROUND

In 1993, ACEEE published a study that examined emerging technologies recently commercialized or expected to be commercialized over the next decade. Technologies examined included: appliances, lighting, HVAC, water heating, drivepower, office equipment, and miscellaneous end-uses. The study will be updated in this project, and expanded to include: energy-saving practices, as well as technologies; technologies appropriate for various geographic areas; additional existing but underused technologies; fuel-switching technologies, and oil- and propane-saving technologies and practices.

OBJECTIVE

To identify new research and demonstration projects that could help advance high-priority emerging technologies, and to identify potential new targets for market-transformation activities.

DESCRIPTION

The 1993 study will be updated and expanded. Greater emphasis will be placed on non-utility follow-up activities for each technology (including research and development and commercialization and market transformation actions), and more extensive efforts will be made to present the project results to key research and program implementation organizations.

BENEFITS

This is a public-benefit project that will help to identify potential new market-transformation activities, and new research and development projects that could advance high-priority emerging technologies.

SCHEDULE AND STATUS

A preliminary review of more than 300 technologies has been completed. The final list of the most promising 76 emerging technologies has been determined. Detailed analysis of these technologies has begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$15,000	$15,000
U.S. Department of Energy	0	30,000	30,000
CIEE	0	15,000	15,000
Electric Power Research Institute	0	10,000	10,000
Energy Center of Wisconsin	0	5,000	5,000
Iowa Energy Center	0	5,000	5,000
MA Division of Energy Resources	0	5,000	5,000
Missouri EIRA	0	5,000	5,000
Washington State Univ. Energy Program	0	5,000	5,000
TOTALS	0	$95,000	$95,000

Contractor: American Council for an Energy-Efficient Economy
Site: Washington, DC
Contract Duration: 5/97 - 12/98
Key Words: product development, residential, commercial, technologies,
Project Manager: Bob Carver (518) 862-1090, ext. 3242
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4610-IABR-BR-98

Promote energy efficiency to reduce operating costs for New York's public sector.

BACKGROUND
Recently, there has been renewed interest in energy performance contracting for public sector entities in both New York State and the nation as a whole. A manual that addresses the salient and complex issues of energy performance contracting and combines the cumulative experience of many organizations is the motivation behind this project.

OBJECTIVE
To develop a comprehensive energy performance contracting manual to provide technical assistance to New York State agencies, local governments and municipalities, schools and public authorities, interested in using performance contracting as a means of implementing energy-efficiency improvements in their facilities.

DESCRIPTION
The manual will include topics such as: designing, developing, and evaluating competitive solicitations; types of procurement instruments; evaluation criteria; types of agreements; guarantees; financing arrangements; and a discussion of applicable State and local statutes. Four regional workshops will be conducted to introduce the manual.

BENEFITS
It is expected that the manual will clarify many of the more complex issues involved in, and encourage the use of energy performance contracting throughout New York State. This will allow implementation of energy-efficient measures in the public sector by effectively harnessing private-sector resources.

SCHEDULE AND STATUS
Revisions to all chapters are being prepared. The manual is expected to be completed in the summer of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$124,120	0	$124,120
TOTALS	$124,120	0	$124,120

Contractor: EUA/Citizens Conservation Services, Inc.
Site: Lowell, MA
Contract Duration: 12/95 - 7/98
Key Words: energy performance contracting, municipal
Project Manager: Norine Karins (518) 862-1090, ext. 3211
Program: Buildings
Subprogram: Low Income/Multifamily
Contract No.: 4367-IABR-BR-96

-> Advanced Thermal Fluid Heater

Develop and demonstrate advanced burner for gas-fired boilers and thermal-fluid heaters.

BACKGROUND

Heating system manufacturers need to meet stringent regulations for equipment efficiency and emissions of nitrogen oxide (NO_x) and carbon monoxide (CO).

ACCOMPLISHMENTS

This project developed and demonstrated two advanced burner technologies that achieve significant energy and environmental benefits in process heating applications. The first burner technology incorporates high-velocity combustion and a bluff body flameholder and is applicable to smaller thermal fluid heaters and boilers up to a few million Btu/hr capacity. The second technology incorporates the use of parallel pre-mixed gas/air flows that are respectively very rich (at the upper flammability limit) and very lean (at the lower flammability limit) and that are combined in the flame zone. The second technology eliminates the flame quenching that often occurs during the addition of secondary combustion air in conventional stage burners and is applicable to larger heating units.

FINDINGS AND CONCLUSIONS

The two burner technologies achieve NO_x and CO emission levels of under 20 ppm and thus meet the standards of the South Coast Air Quality Management District in California, the most stringent in the nation. The parallel-mix burner technology is also the first in the United States to combine ultra-low emissions with wide modulation capability (approximately 4:1 turndown ratio).

REALIZED OR ANTICIPATED BENEFITS

Commercial building owners and process heating users will benefit by having an economical way of achieving high efficiency and low emissions with natural gas. In addition, economic benefits will occur because Fulton Thermal Corporation will be manufacturing a new product.

TECHNOLOGY TRANSFER ACTIVITIES

The technologies are being manufactured and marketed on a limited-production basis by Fulton Thermal Corporation of Pulaski, New York.

FUNDING	TOTALS
NYSERDA	$440,353
Fulton Thermal Corporation	400,643
TOTALS	$840,996

Contractor: Fulton Thermal Corporation
Site: Pulaski, Oswego County
Contract Duration: 3/89-6/97
Key Words: product development, environmental, gas, heating, emissions, NO_x
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings Research
Subprogram: Heating and Cooling Systems
Contract No.: 1821-EEED-BES-92

-> Solar Domestic Hot Water Heating Technology Evaluation

Assess and demonstrate solar domestic hot water (SDHW) systems in New York State.

BACKGROUND

New York State is placing new emphasis on developing renewable energy technologies to avoid the need for new electricity-generating facilities, minimize the impact of energy use on the environment, and reduce petroleum imports. These considerations make it necessary to assess and evaluate the current status of SDHW systems and their possible role in meeting the State's future energy needs.

ACCOMPLISHMENTS

Twelve SDHW systems were installed in New York State and monitored for more than 12 months to determine their performance characteristics. The collected data allowed the energy savings and cost-effectiveness of these systems to be determined.

FINDINGS AND CONCLUSIONS

Nine of the 12 systems operated without any required maintenance during this demonstration. Three of the systems required replacement of either a drain-back pump or tank. The annual energy savings measured for the 12 systems ranged from 900 to 3,100 kWh, with the average annual energy savings being 1,980 kWh. The average annual coefficient of performance for these systems was calculated to be 1.36. During the summer, the SDHW systems were established to be able to reduce coincident demand by 90% compared to electric resistance hot water systems. This demand reduction was achieved without adversely affecting a utility's load factor. The energy savings, installation costs, and maintenance expenses were analyzed to determine the cost-effectiveness of SDHW systems for both homeowners and energy service providers. A homeowner could expect to receive a tax-free simple annual rate of return of 8% by installing a SDHW system in conjunction with an electric resistance hot water systems. An energy service provider could expect an after-tax internal rate of return of 11.8 percent by installing SDHW systems and selling hot water to homeowners with electric resistance hot water system for a monthly fee. These results would not be expected to be as favorable if other options were available to homeowners, such as natural gas or oil hot water systems.

REALIZED OR ANTICIPATED BENEFITS

This demonstration has confirmed SDHW systems can be viable alternatives in New York's downstate climate. The collected data will allow homeowners and others decision makers to objectively evaluate the suitability of using SDHW systems.

TECHNOLOGY TRANSFER ACTIVITIES

A small training session was conducted to educate contractors participating in this program in the proper installation procedures for SDHW systems. A technical paper has been submitted for presentation at an upcoming engineering conference.

FUNDING	TOTALS
NYSERDA	$463,894
TOTALS	$463,894

Contractor: Florida Solar Energy Center
Site: Shirley, Huntington Station, Lake Grove, and Southampton, Suffolk County; Mohegan Lake, Ossining, Yorktown Heights, and Croton-on-Hudson, Westchester County; Warwick and Florida, Orange County; and Spring Valley, Rockland County
Contract Duration: 5/92 - 12/97
Key Words: renewable, solar, demand-side management, residential, domestic hot water
Project Manager: Bob Carver (518) 862-1090, ext.3242
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 1824-EEED-BES-92

-> Fluorescent Refrigerant Leak Detection System

Develop and commercialize fluorescent leak-detection system for hydrofluorocarbon refrigerants.

BACKGROUND

Spectronics Corporation manufactures and markets a refrigerant leak-detection fluid (AR-GLO) for cooling systems that use CFC refrigerants and conventional lubricating oils. The product incorporates a fluorescent material in a mineral oil base. A small amount of AR-GLO is injected into a cooling system so leaks can be seen using an ultraviolet (UV) light, locating previously hidden leaks.

HFC refrigerants now are being used for medium- and low-temperature cooling applications, replacing CFC refrigerants in accordance with the Montreal Protocol. HFC cooling systems require polyalkylene glycol (PAG) or ester-based lubricating oils, however. Mineral oil-based leak-detection fluids cannot be used in HFC refrigeration systems due to chemical incompatibility with PAG and ester-based oils.

ACCOMPLISHMENTS

Spectronics Corporation developed a product for systems that use PAG or ester-based lubricating oils developed for alternative (non-CFC) refrigerants. The company developed, tested, and is now marketing AR-GLO 4PAG, a version of AR-GLO compatible with PAG lubricating oils, and AR-GLO 4E, a version of AR-GLO compatible with ester-based lubricating oils. The company also developed, tested, and is now marketing a plastic-infuser capsule to inject AR-GLO into a cooling system. Spectronics additionally developed, tested, and is now marketing a wafer technology for introducing the leak-detection fluid into new cooling equipment during manufacturing.

FINDINGS AND CONCLUSIONS

The new refrigerant leak-detection products have proven to be highly effective in enabling service technicians to identify leaks in refrigeration and air-conditioning systems.

REALIZED OR ANTICIPATED BENEFITS

Refrigerant leakage significantly decreases cooling efficiency, causing an estimated 20 trillion Btu (about 37 million barrels of oil) annual energy loss. Effective leak detection can reduce refrigerant loss by more than 50%.

TECHNOLOGY TRANSFER ACTIVITIES

Spectronics Corporation is now marketing the refrigerant leak-detection products developed under this project. Current sales are approximately $4 million per year.

FUNDING	TOTALS
NYSERDA	$600,000
Long Island Lighting Company	186,203
ESEERCO	186,000
Spectronics Corp.	892,607
TOTALS	$1,864,810

Contractor: Spectronics Corporation
Site: Westbury, Nassau County
Contract Duration: 4/91 - 6/97
Key Words: product development, environmental, HVAC, refrigeration, leak detection, refrigerant, R-134a, PAG oil, ester-based oil, fluorescent
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 1836-EEED-BES-92

-> Evaporative Condenser for Supermarkets

Designed, laboratory-tested, and field-demonstrated evaporative cooling system for supermarkets in northern climates.

BACKGROUND
The wholesale and retail food industry consumes 4-6% of the electricity used in New York State.

ACCOMPLISHMENTS
This project developed and demonstrated an advanced evaporative condenser system with improved energy performance for supermarket refrigeration applications.

FINDINGS AND CONCLUSIONS
This project included the design and laboratory-testing and field-testing of an evaporative cooling system for supermarkets in northern climates. The technology includes finned heat-exchanger tubes to achieve higher efficiency when operating in a dry, non-evaporative mode during winter months. Conventional evaporative condensers traditionally use bare heat-exchanger tubes that suffer large energy penalties during the dry operating mode.

REALIZED OR ANTICIPATED BENEFITS
Large quantities of energy are consumed annually for supermarket refrigeration in New York State. Most refrigeration systems in supermarkets use air-cooled condensers that contribute significantly to peak electrical generating loads during the summer. The evaporative condenser developed under this project saved approximately 10% in energy consumption compared to traditional, air-cooled condenser technology.

TECHNOLOGY TRANSFER ACTIVITIES
Niagara Blower Company of Buffalo will seek to manufacture the new technology and market it to the supermarket industry.

FUNDING	TOTALS
NYSERDA	$250,000
ESEERCO	150,000
Con Edison	100,000
Niagara Blower Company	127,225
TOTALS	$627,225

Contractor: Niagara Blower Company
Site: Buffalo, Erie County, and Greenburgh, Westchester County
Contract Duration: 12/92-6/97
Key Words: refrigeration, HVAC, supermarkets
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings Research
Subprogram: Heating and Cooling Systems
Contract No.: 1996-EEED-BES-93

-> Oil-Fired Flame-Quality Indicator

Develop flame-quality indicator that will improve energy and environmental performance of oil-fired heating equipment.

BACKGROUND

New York State is a major user of fuel oil for heating. Approximately three million households (almost 50% of the population) in New York State use oil heat. New York State fuel-oil customers also represent 25% of the oil market in the United States. Improved oil-fired heating equipment offers the potential for significant energy and emissions savings in New York State, where several manufacturers of this equipment are located.

ACCOMPLISHMENTS

This project developed a flame-quality indicator that improves the energy and environmental performance of oil-fired heating equipment. An original prototype had been developed by the Oil Heat Program at Brookhaven National Laboratory. The flame-quality indicator uses an optical sensor to monitor combustion spectral characteristics over long periods of operation. The indicator communicates to an outside central station at a fuel oil dealer or contractor when combustion cleanliness has begun to deteriorate to an unacceptable level. The indicator also communicates fuel oil tank levels and other key parameters to ensure reliable heating system operation.

FINDINGS AND CONCLUSIONS

The project included design and testing of a production-model flame-quality indicator that is microprocessor-based. The project also included a market study, initial production of commercial units, and market introduction.

REALIZED OR ANTICIPATED BENEFITS

The flame-quality indicator will benefit consumers in New York State through improvements in the energy and environmental performance of oil-fired heating equipment. Economic development benefits also will be achieved through a New York State company manufacturing a new technology..

TECHNOLOGY TRANSFER ACTIVITIES

Insight Technologies, Inc., of Bohemia, New York, has begun to manufacture and market the flame-quality indicator. Insight Technologies has also initiated work under agreement No. 4459-IABR-BR-97 to develop an original-equipment manufacturer version of the technology that would serve as a primary combustion safety control on newly manufactured oil burners.

FUNDING	TOTALS
NYSERDA	$132,401
Davis Aircraft Products Co., Inc.	131,130
TOTALS	$263,531

Contractor: Davis Aircraft Products Co., Inc.
Site: Bohemia, Suffolk County
Contract Duration: 9/94-9/97
Key Words: environmental, product development, oil burners
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings Research
Subprogram: Heating and Cooling Systems
Contract No.: 4072-IABR-BR-95

-> Optimized Variable-Speed Supermarket Compressor and Condenser-Fan Control

Develop and demonstrate more efficient variable-speed supermarket refrigeration system.

BACKGROUND

The wholesale and retail food industry consumes 4-6% of the electricity used in New York State. Optimized variable-speed refrigeration compressors and condenser fans offer significant potential energy savings compared to conventional variable-speed equipment.

ACCOMPLISHMENTS

This project developed and demonstrated a more efficient variable-speed supermarket refrigeration system. Project tasks included designing and installing a modified compressor and condenser system; optimizing inverter, motor, and compressor/condenser parameters; and monitoring system performance. The project included testing of both reciprocating and screw-type compressors.

FINDINGS AND CONCLUSIONS

The project achieved a fundamental technical benefit by discovering that new, screw-type compressors operate more efficiently at mid-range rather than full speed. Energy savings of approximately 12% were achieved with the variable speed compressor system. Similar savings were achieved with the variable-speed condenser fan system.

REALIZED OR ANTICIPATED BENEFITS

A typical New York State supermarket would save approximately 50,000 kWh of electricity per year (or $5,000 per year, depending on electric rates) with a payback period of 4-5 years. An optimized variable-speed condenser fan system will achieve additional electricity savings of approximately the same level, with payback periods of only 1-2 years.

TECHNOLOGY TRANSFER ACTIVITIES

The final report will be distributed to the public. A technical article will also be prepared.

FUNDING	TOTALS
NYSERDA	$298,850
ESEERCO	147,871
Hannaford Company (in-kind)	179,960
Carlyle Division/Carrier Corp.	65,000
Control Techniques Worldwide	21,000
Castrol North America	7,900
Eastern Heating and Cooling, Inc.	6,000
TOTALS	$726,581

Contractor: Aspen Systems, Incorporated
Site: Glens Falls, Warren County
Contract Duration: 11/94-12/96
Key Words: product development, refrigeration, variable-speed control
Project Manager: Ray Albrecht (518) 862-1090, ext. 3253
Program: Buildings
Subprogram: Heating and Cooling Systems
Contract No.: 4074-IABR-BR-95

-> Continuous Process Extruder for Insulated Sheathing

Develop equipment to extrude and face sheathing material made with recycled expanded polystyrene.

BACKGROUND

Shelter Enterprises, Inc. produces an insulated sheathing that is used underneath the siding of homes by molding expanded polystyrene (EPS) billets and slicing them with a hot wire cutter into one-inch-thick panels upon which foil facing is applied. The company could significantly reduce its manufacturing costs if these three processes could be performed in a single operation that also would allow more scrap EPS to be used because the hot wire cutter, which is the step most sensitive to contaminations, would be eliminated.

OBJECTIVE

To design and evaluate equipment for single-step extruding and facing of insulated sheathing material made with recycled EPS.

DESCRIPTION

The contractor will: (1) design and fabricate a 1/10-scale operating model of the extruding equipment; (2) use the model to determine the feasibility of extruding sheathing materials with different feed rates and amounts of scrap EPS; (3) test foam products manufactured with the model for strength, thermal conductivity, flame resistance, and water permeability; (4) determine the optimum raw material mixture and equipment set points; (5) perform a cost analysis to assess the economic feasibility of a full-scale extruder; and (6) design, fabricate, and evaluate a full-scale extruder if the testing and cost-analysis results based on the model are favorable.

BENEFITS

The new equipment potentially could reduce annual material and production costs for the insulated sheathing product by $1.5 million. The new equipment also will divert discarded EPS from landfills by developing a new beneficial use for the material. This product also will reduce the energy needed to heat and cool homes by increasing the R-value of a home's walls.

SCHEDULE AND STATUS

Construction of the prototype extruder has been completed. Foam samples made with the prototope extruder are being tested.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$192,138	0	$192,138
Shelter Enterprises, Inc.	192,139	0	192,139
TOTALS	$384,277	0	$384,277

Contractor: Shelter Enterprises, Inc.
Site: Cohoes, Albany County
Contract Duration: 3/96 - 12/98
Key Words: product development, buildings, insulation, recycling
Project Manager: Bob Carver (518) 862-1090, ext. 3242
Program: Buildings
Subprogram: Building Envelope Systems
Contract No.: 4380-IABR-BR-96

-> Development of New Smart-Window Technology

Develop windows with changeable light-transmission capability.

BACKGROUND

Approximately 15 percent of the energy needed to heat and cool buildings is due to the presence of windows. One strategy for reducing this penalty is to control the solar radiation entering a building by using smart-window technologies. Such windows have a electrochromatic or liquid-crystal layer enclosed in the glass that can change the window's light-transmission characteristics. The disadvantages of this strategy include absorbing the solar radiation, and thereby still heating the window's glass, and cost. A new class of liquid crystal (cholesteric liquid crystal, or CLC) has been developed that reflects, instead of absorbs, solar radiation, at a substantially lower cost. Reveo has previously produced a 1"x1" smart glass pane that can reflect nearly 100 percent of solar radiation.

OBJECTIVE

To develop and determine the feasibility of using CLCs for smart windows that are switchable between reflecting 100-percent light and transmitting 50-percent light.

DESCRIPTION

The contractor will: (1) optimize the composition of CLC for smart-window applications, (2) determine if CLCs can be produced that are switchable between reflecting 100-percent light and transmitting 50-percent light (3) optimize the techniques for producing CLCs, (4) determine if CLCs can be produced that reflect only specific bandwidths of radiation, (5) conduct long-term stability tests on small-scale samples, (6) investigate the effect of solar-radiation incident angle on CLC performance, (7) fabricate a 6"x6" CLC smart-window panel, and (8) conduct economic and energy analyses to determine the benefits of CLC smart windows.

BENEFITS

Preliminary estimates indicate air-conditioning energy usage could be reduced by 20 percent with the new smart window. The new product would also be more cost-effective than other available smart-window technologies. Manufacturing jobs in New York State could also be created if the new technology becomes commercialized.

SCHEDULE AND STATUS

Testing and analysis work have been completed. The final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$105,693	0	$105,693
Reveo, Inc.	$105,697	0	105,697
TOTALS	$211,390	0	$211,390

Contractor: Reveo, Inc.
Site: Hawthorne, Westchester County
Contract Duration: 3/97 - 6/98
Key Words: product development, windows, buildings, materials
Project Manager: Bob Carver (518) 862-1090, ext. 3242
Program: Buildings
Subprogram: Building Envelope Systems
Contract No.: 4520-IABR-BR-97

-> Foamed Structural Lumber

Develop plastic lumber products that incorporate coal-combustion fly ash.

BACKGROUND

Nearly 80 percent of the fly ash generated in the U.S. by coal-fired power plants is disposed of in slurry ponds, old mines, and landfills at a cost of $40 per ton. If a beneficial use could be found for this material, utilities could avoid this disposal fee. Central Hudson Gas & Electric Corp. has teamed with Ecomat, Inc. to develop a process to use fly ash to foam thermoset polystyrene into a product that could be substituted for lumber. A laboratory facility and prototype pilot plant would be sited in Central Hudson's service territory as a result of these efforts.

OBJECTIVE

To support the establishment of a pilot production facility for foamed-plastic structural lumber made with fly ash from coal-fired power plants.

DESCRIPTION

Ecomat and the National Association of Home Builders (NAHB) Research Center will: (1) identify potential lumber products to be made at the pilot production facility, (2) evaluate the use of various chemical formulations and reinforcing strategies to ensure potential lumber products have required material properties, (3) mold prototypes at the pilot production facility, (4) test prototypes to determine their abilities to meet structural and building code requirements, (5) produce and test final engineering prototypes of a composite structural beam and dimensional lumber replacement, (6) develop and evaluate a production process for the most promising prototype at the pilot production facility, and (7) complete marketing analyses for the most promising lumber products.

BENEFITS

Using plastic lumber could save energy for heating and cooling buildings by increasing the R-value of walls. A new beneficial use for fly ash would be developed, diverting this material from landfills. Jobs also would be created by establishing a new manufacturer in the State.

SCHEDULE AND STATUS

Fabrication of the final engineering prototypes has been completed. Testing of these prototypes is under way. The marketing analyses have begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$176,995	0	$176,995
Central Hudson Gas & Electric Corp.	$200,000	$85,000	285,000
NAHB	20,000	0	20,000
TOTALS	$396,995	$85,000	$481,995

Contractor: National Association of Home Builders Research Center
Site: Poughkeepsie, Dutchess County, and Upper Marlboro, MD
Contract Duration: 9/96 - 12/98
Key Words: product development, buildings, industrial waste, recycling
Project Manager: Bob Carver (518) 862-1090 ext. 3242
Program: Buildings
Subprogram: Building Envelope Systems
Contract No.: 4381-IABR-BR-97

-> Recycled Materials in Precast Concrete Wall Panels

Develop building products that make use of recycled glass and carpet fiber.

BACKGROUND

Research conducted by Columbia University found it technically feasible to replace a portion of the sand and cement in concrete blocks with recycled glass. The research also determined the economic scenarios under which substituting recycled glass for sand and cement in concrete blocks is viable. Based on favorable findings, Columbia is extending the use of this technology to precast concrete wall panels for residential basement foundations and architectural applications (e.g., curtain walls). In addition to incorporating recycled glass, Columbia will also evaluate using recycled carpet fibers in these panels. The benefit of using carpet fibers would be the potential increase in R-value in the final wall panel. Columbia has teamed up with Kistner Concrete Products, a precast concrete wall panel manufacturer in New York State, for this effort.

OBJECTIVE

To evaluate the technical and economic feasibility of using recycled glass and carpet fibers in precast concrete wall panels for residential and commercial buildings.

DESCRIPTION

The contractor will: (1) conduct a literature survey on the use of recycled glass and carpet fibers in building products; (2) research recycled-carpet fiber supply issues; (3) evaluate the thermal properties of carpet fibers; (4) test and optimize concrete sample mixtures containing recycled glass and carpet fibers for mechanical, thermal, and durability characteristics; (5) identify any manufacturing process changes necessary to produce precast concrete wall panels with recycled glass and carpet fibers; (6) manufacture and test full-size prototype wall panels; and (7) analyze the economic feasibility of using recycled glass and carpet fibers in precast concrete wall panels.

BENEFITS

The R-value of the resulting wall panels could be increased 10-15% by using recycled carpet fibers. A new beneficial use would be developed for the 225 million pounds of carpet fiber and 490 million pounds of recycled glass annually discarded in New York State.

SCHEDULE AND STATUS

The project has just begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$248,724	$248,724
Columbia University	0	159,153	159,153
Kean University	0	10,000	10,000
Kistner Concrete Products, Inc.	0	75,000	75,000
Steven Winter Associates, Inc.	0	25,000	25,000
Fox and Fowle Architects *	0	10,000	10,000
TOTALS	0	$527,877	$527,877

* In-kind services

Contractor: Columbia University
Site: New York, New York County; and East Pembroke, Genesee County
Contract Duration: 4/98-4/00
Key Words: product development, university, buildings, solid waste, recycling
Project Manager: Bob Carver (518) 862-1090, ext. 3242
Program: Buildings
Subprogram: Building Envelope Systems
Contract No.: 4710-IABR-BR-98

-> Air-Infiltration/Ventilation Evaluation Program

Identify and analyze ventilation approaches for New York State homes.

BACKGROUND

Over the past two decades, rising home-heating costs have increased efforts to construct homes that are better insulated and limit air infiltration. These efforts to build more energy-efficient homes have succeeded in reducing home-heating costs. However, these efforts also have inadvertently resulted in the construction of homes so "tight" they do not allow for adequate ventilation. Builders are now faced with the task of identifying and selecting products that will provide sufficient ventilation without having a significant impact on home energy usage.

ACCOMPLISHMENTS

Cost, performance, and installation data were collected and analyzed for various ventilation approaches. Air-infiltration and ventilation rates for New York State and California single-family detached homes were collected and analyzed. Detailed computer analyses were performed to determine the most promising ventilation approaches based on technical and economic criteria for New York State and California homes.

FINDINGS AND CONCLUSIONS

The collected data revealed New York State homes to be significantly tighter than the national average for new and existing homes. Less than half of New York State homes were found to meet the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) ventilation guidelines for acceptable indoor air quality. Computer analyses determined that heat-recovery ventilators and single- and multiport systems with outdoor air ducts were best able to meet ventilation guidelines in New York State on low infiltration days (e.g., days with moderate outdoor temperatures and low winds). Single- and multiport systems with intake louvers installed in bedrooms and common living areas were found to provide the best ventilation-air distribution between zones. The annual increase in energy usage due to added space conditioning and fan power ranged from $100 to $200 in New York State. Heat-recovery ventilators were found to have the lowest annual operating costs while single- and multiport systems with either outdoor air ducts or intake louvers had the highest annual operating costs. Single-port systems with energy-efficient fans and either outdoor-air ducts or intake louvers were found to have the lowest life-cycle costs in New York State. Multiport systems and heat-recovery ventilators were found to have the highest life-cycle costs in New York State.

REALIZED OR ANTICIPATED BENEFITS

This project will help ensure that ventilation products and approaches meet current ASHRAE standards without compromising the home's energy efficiency. This project also may stimulate economic benefits for New York State manufacturers, distributors, and installers of ventilation systems by promoting the use of such products.

TECHNOLOGY TRANSFER ACTIVITIES

A final report will be published. A Ventilation Guidebook that identifies and discusses appropriate ventilation approaches for home builders and heating, ventilating, and air-conditioning designers in New York State was developed for publication.

FUNDING	TOTALS
NYSERDA	$200,000
CA Institute for Energy Efficiency	100,000
U.S. Department of Energy Rebuild America Program	7,500
TOTALS	$307,500

Contractor: Lawrence Berkeley National Laboratory
Site: Berkeley, California
Contract Duration: 8/93 - 1/98
Key Words: buildings, residential, ventilation and infiltration, air quality, HVAC
Project Manager: Bob Carver (518) 862-1090, ext. 3242
Program: Buildings
Subprogram: Building Envelope Systems
Contract No.: 1951-EEED-BES-93

-> Stock Characterization of Air-Distribution Systems in Northern Homes

Assess energy losses attributable to air-distribution systems.

BACKGROUND

Recent studies have shown that energy losses due to air-distribution systems (ADS) average from 30-40% for southern homes. However, these losses cannot be assumed to be representative of northern homes due to differences in climate, duct materials, and construction techniques. To date, little data exists to quantify the magnitude of the energy losses attributable to air-distribution systems in northern homes, making it difficult to provide reasonable guidelines for home builders to design and construct energy-efficient duct systems.

ACCOMPLISHMENTS

More than 400 telephone surveys were completed for homes in New York State and Wisconsin to characterize ADS. A New York State builders; survey was also completed to characterize the ADS being installed in new homes. Detailed monitoring was completed in 28 homes to characterize the performance of ADS in New York State and Wisconsin. Nineteen of these homes received retrofits to determine the energy savings attributable to improving ADS.

FINDINGS AND CONCLUSIONS

The average seasonal delivery and distribution efficiencies for the existing homes were determined to be 49% and 76%, respectively. Sealing and insulating the ADS improved these values to 75% and 87%, respectively. These retrofits were found to reduce average basement temperatures by 5°F. Monitored data showed these retrofits reduced the energy needed to heat the homes by 9%. The costs for sealing and insulating the ADS averaged $780 per home. Eighty percent of these costs were attributable to labor expenses. The average savings-to-investment ratio (SIR) for the retrofits was calculated to be 0.63. Six of the 19 retrofitted homes were found to have SIRs equal to or greater than one. The average seasonal delivery and distribution efficiencies of the ADS in the new homes were determined to be 38% and 66%. The lower performance of the ADSs in the new homes was attributed to greater duct surface area, larger leakage flows, and ducts being located in attics instead of basements. SIRs were not determined for improving ADS in new homes, as retrofits were not performed.

REALIZED OR ANTICIPATED BENEFITS

Project results will help utility and weatherization organizations evaluate the feasibility of programs for improving ADS efficiencies. These results also provided input for American Society of Heating, Refrigeration and Air-Conditioning Engineers efforts to develop a quantitative method for calculating ADS performance.

TECHNOLOGY TRANSFER ACTIVITIES

A technical paper discussing the results of this effort was presented at the 1996 American Council for an Energy-Efficient Economy Summer Session. The Electric Power Research Institute will publish the final report for this effort.

FUNDING	TOTALS
NYSERDA	$119,000
Central Hudson Gas & Electric Corp.	50,000
Electric Power Research Institute	69,000
Wisconsin Center for Demand Side Research	94,000
TOTALS	$332,000

Contractor: Synertech Systems Corporation
Site: New York State and Wisconsin
Contract Duration: 6/96 - 12/96
Key Words: buildings, HVAC, residential, utilities, thermal distribution
Project Manager: Bob Carver (518) 862-1090, ext. 3242
Program: Buildings Research
Subprogram: Building Envelope Systems
Contract No.: 4024-IABR-BR-95

-> Encap™ Process for Foam Products

Develop process to manufacture building products with recycled plastics.

BACKGROUND

Using expanded polystyrene (EPS) as insulation in building construction offers significant energy savings. However, some disadvantages, such as low flame resistance and dimensional stability, limit its use. The Institute for Research, Inc. has developed a method (the Encap™ Process) to produce foam that not only overcomes these disadvantages, but also permits foam panels to be manufactured with recycled EPS and contaminated, commingled plastics. The Encap™ Process is at the stage where laboratory-scale foam panels have been produced and tested. Equipment for large-scale production also has been fabricated.

ACCOMPLISHMENTS

A pilot-plant manufacturing facility was established in Cohoes, New York. After initial set-up and training, the equipment was operated reliably by production workers with non-technical backgrounds.

FINDINGS AND CONCLUSIONS

Over 500 foam panels were fabricated at the pilot-plant facility. Panels were made of various sizes, shapes, and densities. Many 8'x 4' panels were produced that could readily be used for building applications. Many panels were produced with various facing materials, demonstrating the Encap™ Process could efficiently manufacture products such as stress-skin panels and fire doors. Market research revealed that insulation for buildings with steel-deck roofs is a very promising application for Encap™ panels. Economic analyses determined that foam insulation produced with the Encap™ Process is cost-competitive with other higher-value insulation products.

REALIZED OR ANTICIPATED BENEFITS

A new insulation product made with 100% recycled EPS was produced that had an R-value 25% higher than conventional foam insulation made with virgin EPS. The New York State Office of General Services is planning to use the Encap™ product in an upcoming roofing project.

TECHNOLOGY TRANSFER ACTIVITIES

A business plan has been developed for distribution to potential licensees. A video describing the Encap™ Process was produced. A workshop for building materials manufacturers and the recycling community was conducted in Schenectady, New York.

FUNDING	TOTALS
NYSERDA	$253,500
Institute for Research, Inc.	62,000
Rockwell International Corp.	166,000
Schenectady International, Inc.	22,238
Shelter Enterprises, Inc.	5,000
TOTALS	$508,738

Contractor: Institute for Research, Inc.
Site: Schenectady, Schenectady County; Cohoes, Albany County; and Houston, Texas
Contract Duration: 3/95 - 6/97
Key Words: product development, environmental, buildings, insulation, recycling
Project Manager: Bob Carver (518) 862-1090, ext.3242
Program: Buildings
Subprogram: Buildings Envelope Systems
Contract No.: 4109-IABR-BR-95

-> Recycled Glass in Concrete Blocks

Develop treatment process to permit use of recycled glass as aggregate in concrete blocks.

BACKGROUND

Despite recent efforts, mixed-color post-consumer glass still poses a challenge for recycling. One beneficial use for this waste stream has been aggregate in asphalt for road pavement. However, as the amount of recyclable glass is expected to increase in coming years, new uses will need to be developed for this waste stream. One possible use would be as aggregate in concrete. This concept has not been commercially viable because of an adverse chemical reaction among alkali in the cement, silica in the glass, and water in the concrete. Known as alkali-silica reaction (ASR), it can cause structural failures in the concrete.

ACCOMPLISHMENTS

A method was developed to process recycled glass so that ASR is minimized in concrete. Several hundred concrete blocks that had 10% of the sand replaced with recycled glass were satisfactorily produced by a Long Island block manufacturer. The economics for replacing sand with recycled glass were determined.

FINDINGS AND CONCLUSIONS

Finely grinding glass was found to be an acceptable procedure for minimizing ASR in concrete. Concrete samples made with particles ground to 0.012 inches or finer were found to be less reactive than samples made without any sand replaced. The color of glass was also found to affect ASR. While clear glass was found to be most reactive, green glass was found to act as an ASR suppressant. Testing determined that very finely ground glass (particles approaching 0.0015 inches) exhibited properties that made it suitable as a partial replacement for cement. Tests conducted on concrete block samples made with 10% recycled glass were found to retain 91% of the strength of a block made without recycled glass. Economic analyses determined that replacing natural aggregate with recycled glass is not cost-effective. However, these analyses determined that replacing cement with recycled glass can provide a cost savings to a block manufacturer. During the manufacture of these blocks with recycled glass, the feed rate of the machinery could be increased, providing additional cost savings.

REALIZED OR ANTICIPATED BENEFITS

A new beneficial use has been established for a waste stream that had little value in recycling markets. This research has attracted the attention of a Utah recycling company that is now considering establishing a facility in New York State. Use of concrete blocks made with recycled glass is being evaluated for use in a Manhattan skyscraper.

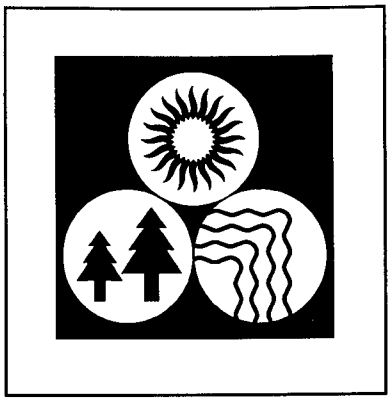
TECHNOLOGY TRANSFER ACTIVITIES

This project has been featured in several periodical articles. Columbia has presented the findings of this work at three engineering conferences. Papers are being prepared for submission to two engineering journals. This project was also featured on a CNN news broadcast.

FUNDING	TOTALS
NYSERDA	$230,790
Columbia University	189,135
Dyker Anderson Contracting Co.	20,000
TOTALS	$439,925

Contractor: Columbia University
Site: New York, New York County
Contract Duration: 3/95 - 6/97
Key Words: product development, university, environmental, buildings, solid waste, recycling
Project Manager: Bob Carver (518) 862-1090, ext. 3242
Program: Buildings Research
Subprogram: Building Envelope Systems
Contract No.: 4113-IABR-BR-95

ENERGY RESOURCES



Benefits and Rationale

There is a growing awareness across New York State and the nation that greater attention needs to be placed on the impacts of energy use on air quality and the global climate. Expanding the role of natural gas and the use of renewable resources is a strategy that can address environmental concerns and succeed within the framework of the evolving competitive market for energy. The Energy Resources program focuses on renewable and other indigenous resources, including biomass, photovoltaics, wind, hydro, and natural gas, at diverse locations throughout the State. (Other renewable resource projects, such as passive solar, daylighting, solar water heating, municipal wastes, and landfill gas, are supported in other NYSERDA program areas.)

Natural gas is a highly competitive fossil fuel and the role of the Energy Resources program is to increase the use of indigenous gas to keep a portion of the energy dollars spent on it within the borders of New York State. Electricity from renewable resources is relatively expensive but, some customers may elect to pay a premium for this "green power." NYSERDA's research program will strive to continue to help businesses in New York State develop, manufacture, and commercialize the renewable energy systems that can meet the demand for green power in New York and across the country.

Global demand for *solar photovoltaic* (PV) modules grew by 38% in 1997, with the majority of the demand in developing countries. Most of the market is for smaller-scale electric loads that are not connected to the utility grid, such as remote homes, lighting, monitoring, and communications, as well as consumer products. The scale of cost-effective PV applications and their market will continue to increase as the price of PV power is reduced. The goal of NYSERDA's PV program is to use New York's skilled labor and facilities to place it in a leadership position to develop and test innovative PV technology, products, and systems for New York markets and export. Future success in the PV area can be measured by the annual increase in the manufacture and sale of PV products made in New York; the development of a sustainable base of PV manufacturers; and a significant increase in the amount of high-value, and building-integrated PV installed in New York within five years.

New York offers opportunities for *wind* energy development in areas with moderate wind resources. Advances in turbine technologies have increased and will continue to increase wind energy's competitiveness due to lower installed costs, increased reliability, and improved performance at moderate wind speeds. Over the long term, NYSERDA's goal is to establish wind as a viable energy source for distributed and specialty power generation applications and to work with New York businesses to manufacture components for the small-scale wind turbine industry. Success in the wind area will be determined by the level of interest generation or energy service companies have in pursuing markets for wind power in New York and through the establishment of commercial enterprises in the business of manufacturing wind energy system components.

New York has considerable *biomass* supplies; more than 60% of the State's land is forested and more than 1.8 million tons of waste wood are generated annually across the State. Combustion of wood for residential heat, industrial applications, and utility production of electricity comprises 14% of New York's renewable resource use and is the second largest renewable resource contributor after hydropower. Co-firing wood with coal in large boilers offers an economical way to bring the greenhouse gas reduction benefits of renewable resources to the energy production sector. Converting industrial organic waste into high-value fuels and energy-intensive chemicals also has great potential. Innovative technologies are emerging that can turn waste, such as papermill sludge, into revenue-producing chemicals.

Future efforts in biomass will focus on three areas: (1) converting low-cost feedstocks, such as agricultural, manufacturing, and clean municipal wastes, into fuel and chemical products; (2) developing industrial technologies, such as enzyme manufacturing, that support New York's emerging biotechnology industry; and (3) expanding the use of willow plantations as both a source of energy and a crop for New York farmers. Within the next several years, the

biomass program will demonstrate sustainable operation of a levulinic acid facility in Glens Falls; demonstrate the value of co-firing wood in utility-scale pulverized coal power plants; create opportunities to make a competitive product from New York biomass resources; and establish 1,000 acres of willow plantations on private farmland.

New York has produced natural gas and petroleum since 1865. Today, *indigenous natural gas* provides New York with 1.5% of its natural gas demand. Though a small percentage, in-State natural gas production can have major economic impacts on localities. Production wells provide landowner royalties and provide schools and governments with property tax payments. Exploration activity in New York State has been slow due to the structure of the industry and the cost and risk associated with bringing new technologies here. New York's natural gas industry is comprised primarily of smaller independent exploration companies that lack the research staff and resources to exploit innovative technologies or identify new exploration targets. NYSERDA's role in these projects is to work with the industry to reduce the risk associated with using new technologies for exploration and drilling. NYSERDA collaborates with over 50 companies to increase their opportunities to develop and produce new resources. Beyond the evaluation of new technology, NYSERDA has initiated a technical seminar series with the Independent Oil and Gas Association of New York to broaden the reach of its research program. Success will be measured by an increase in the number of new exploration companies working in New York, the adoption of new exploration techniques by industry, and a measurable increase in the amount of natural gas produced annually from targeted formations.

New York and the Northeast have abundant potential *hydropower* generating capacity. Many hydropower plants were installed decades ago and face relicensing, which involves more stringent environmental requirements that can increase cost and decrease capacity because of the need to preserve the aquatic environment by allowing more water to be spilled. Also, restructuring the electric utility industry will have an impact on the competitiveness of New York State's hydropower facilities. The uncertainties make it more difficult to invest in new or existing hydropower capacity. NYSERDA is assessing ways to help keep hydropower competitive given this period of regulatory change.

Relationship to SBC. Under the R&D component of the SBC Program, NYSERDA is planning to continue the commercialization process through a partnership with green power marketers to demonstrate innovative renewable technologies, primarily photovoltaics and wind. A series of competitive solicitations, SBC funds will be used to partner with technology developers and green power marketers to share the risk of introducing innovative renewable systems.

Goals

- Maximize the use of renewable and indigenous energy resources in applications where the value to the end-user exceeds the cost of alternative solutions.
- Focus on New York's industrial and research strengths to increase the competitive advantage of State firms in supplying products to the growing New York State, national, and international market for renewable energy.
- Improve New York's economic climate by establishing strong coalitions to commercialize innovative energy resource technologies.

-> Photovoltaics for Utility-Scale Applications

Demonstrate electric-utility-connected photovoltaics.

BACKGROUND
Solar energy, through photovoltaics (PV), provides electric power on a renewable basis with minimal environmental impacts. This demonstration project provides New York State's electric utility industry with the opportunity to evaluate the long-term performance of PV systems.

OBJECTIVE
To demonstrate an 85-kW utility-grid-intertied PV system.

DESCRIPTION
An 85-kW PV system was installed on the SUNY/Farmingdale campus on Long Island. The system includes the following sub-systems: (1) a 23-kW roof-mounted module, (2) a 23-kW single-axis tracking system mounted on the ground, (3) a 23-kW concrete pier-mounted system, and (4) a 16-kW ground-mounted system installed as a demand-side management application next to the campus day care center. A data-acquisition system also was installed. The system is being operated, maintained, and monitored for two years, with results reported.

BENEFITS
Determining how local operating conditions influence performance will help in optimizing subsequent PV installations. The operating experience acquired by downstate building managers, electric utilities, code inspectors, performance contractors, engineers, construction contractors, and the PV industry will help implement photovoltaic projects at other sites. The project will help pave the way for extensive use of distributed photovoltaic systems in grid-connected applications on Long Island.

SCHEDULE AND STATUS
SUNY-Farmingdale's electric distribution lines have been repaired and troubleshooting of the PV systems is under way. System acceptance has not yet occurred.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$268,000	0	$639,603
Petroleum Overcharge Funds	500,000	0	500,000
PVUSA	178,625	0	178,625
TOTALS	$946,625	0	$1,318,228

Contractor: Integrated Power, Inc.
Site: East Farmingdale, Suffolk County
Contract Duration: 8/88 - 11/98
Key Words: renewable, university, solar, photovoltaic, utilities
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind, Petroleum Overcharge
Contract No.: 1784-ERER-ER-92; 1369-ERER-ER-89

-> Solar Radiation and Farmingdale PV Installation Monitoring

Monitor four solar photovoltaic systems at SUNY/Farmingdale.

BACKGROUND
As photovoltaic (PV) solar power becomes more economical, operational data from installed PV systems will be needed to calculate the cost-effectiveness of specific PV installations.

OBJECTIVE
To gather operational PV data by monitoring four PV installations at the SUNY/Farmingdale campus, and correlate the performance of the Farmingdale PV systems with Long Island Lighting Company's (LILCO's) system characteristics and customer usage patterns.

DESCRIPTION
The contractor will monitor and evaluate the performance of the four Farmingdale PV systems through December 1997. The contractor will automatically retrieve and archive data from the Farmingdale PV installations and summarize daily and monthly performance for each PV system. Farmingdale PV performance data will be used to evaluate the effects of PV generation on LILCO's power-generation and delivery system, on different classes of LILCO customers, and on Long Island's environment.

BENEFITS
The performance data from the Farmingdale PV systems provide planners with operational data from installed PV systems. Insolation and PV performance data will help determine the value of photovoltaic power to the utility system.

SCHEDULE AND STATUS
Project work is completed and a draft final report is being reviewed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$152,970	0	$152,970
Long Island Lighting Company	15,471	0	15,471
TOTALS	$168,441	0	$168,441

Contractor: Ascension Technology, Inc.
Site: East Farmingdale, Suffolk County
Contract Duration: 1/96 - 6/98
Key Words: renewable, electricity, photovoltaics, sunlight, solar energy, utilities
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 3006N-ERTER-ER-94

-> SUNY/Farmingdale and SUNY/Albany Photovoltaic Systems Maintenance and Monitoring

Monitor and maintain two utility grid-connected photovoltaic systems.

BACKGROUND

NYSERDA installed four photovoltaic (PV) systems totalling 85 kW at the SUNY/Farmingdale campus on Long Island in mid-1992. Problems have plagued start-up these systems and it has become apparent that NYSERDA needs independent technical representation to perform day-to-day maintenance, coordinate warranty repairs, monitor the systems, and train SUNY/Farmingdale personnel so they are prepared to take over system ownership in two years. This project will provide that service.

NYSERDA is installing a 16.6-kW PV system at SUNY/Albany's Center for Environmental Sciences and Technology Management, which is to be completed in 1997. This project also will provide the services described above for this PV system.

OBJECTIVE

To monitor and maintain the PV systems at SUNY/Farmingdale and SUNY/Albany.

DESCRIPTION

This project will: (1) maintain the Farmingdale and Albany PV systems, (2) gather data from the systems, and (3) provide hands-on training for SUNY/ Farmingdale and SUNY/Albany personnel.

BENEFITS

This project will ensure that the SUNY/Albany and SUNY/Farmingdale PV systems run reliably. It also will train campus maintenance personnel on operation of the systems to prepare them for system ownership.

SCHEDULE AND STATUS

The contractor is coordinating with the PV system installer for the SUNY CESTM building and is starting design of the data analysis system. New control software for the SUNY-Farmingdale PV inverters was installed in April 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$110,000	$110,000	$220,000
TOTALS	$110,000	$110,000	$220,000

Contractor: AWS Scientific
Site: Farmingdale, Nassau County, and Albany, Albany County
Contract Duration: 12/96 - 12/98
Key Words: renewable, university, solar, photovoltaic, utilities
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4500-ERTER-ER-97

-> New York State Police Radio Communication Photovoltaic Demonstration

Demonstrate and evaluate photovoltaics for powering two remote New York State Police radio communication stations.

BACKGROUND

The New York State Police (NYSP) operate and maintain a network of 98 radio base stations. The Governor's Task Force on Information Resource Management is overseeing a comprehensive upgrade of the State's radio communication. The upgrade, which will take place over the next 5-10 years, involves reexamining all existing radio communication stations and constructing new ones.

This project will integrate photovoltaics (PV) into the existing wind/propane generator systems at two NYSP communication sites to provide the operational and reliability data necessary for PV to be considered in the upgraded State radio communication system. The ability to use PV to power a radio communication system will allow the upgraded system to be designed for optimal radio coverage without being constrained to sites near existing power lines, allowing for a reduction in the number of towers (at $500,000 each).

OBJECTIVES

To: (1) establish operational characteristics and reliability of using photovoltaics integrated in a wind/engine-generator system as a high-reliability power source in the upgraded NYS radio communications system, and (2) determine the potential savings in using PV in the upgraded communications system.

DESCRIPTION

Two PV systems will be installed at two Adirondack mountaintop radio communication towers to augment the present wind/generator/battery systems. System performance will be monitored for 18 months.

The NYSP will be integrally involved in the program, transporting the systems to the sites via helicopter, providing installation and maintenance assistance, collecting data from the systems, and performing analyses on the effects of using PV in its upgraded radio communication system. The NYSP will lead two studies: one to determine the number of radio communication stations that could be saved in one zone (three to four counties) by locating the sites without regard to power availability, and the other to determine the cost difference between using PV power and extending line to a remote site. Results of these studies and the field demonstrations will be presented to key players responsible for designing and implementing the Statewide radio communication system upgrade.

BENEFITS

This project will foster the use of PV in NYS in a high-value application. It will also place Direct Global Power, a start-up New York company, in a leadership position for installing PV power for radio communication systems worldwide.

SCHEDULE AND STATUS

PV panels were installed at the Cathead Mountain site in September 1997 and at the Black Mountain site in October 1997. The PV panels at both systems worked well during the winter. The PV/wind system at Cathead mountain provided 100% of the energy needs during the winter. At Black Mountain, the PV reduced the use of propane, and the wind system was off-line because of vandalism.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$125,000	0	$125,000
New York State Police	136,000	0	136,000
Direct Global Power	24,230	0	24,230
TOTALS	$285,230	0	$285,230

Contractor: Direct Global Power
Site: Cathead Mtn., Hamilton County; Black Mtn., Washington County; and Schenectady, Schenectady County
Contract Duration: 3/97 - 2/99
Key Words: renewable, hybrid, solar, photovoltaic
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4502-ERTER-ER-97

-> Developing a Solar Load Controller

Develop load-control device designed to maximize coincidence between photovoltaic output and localized or regional electric loads.

BACKGROUND

Two important barriers to the widespread development of grid-connected PV in the United States are the cost of PV systems, which exceeds their value, and the fact that PV systems are not dispatchable and are generally assumed to provide only limited capacity to a user or to the local grid. The Atmospheric Scinces Research Center (ASRC) at the State University of New York/Albany proposes to develop a solar load controller (SLC) that addresses these barriers by maximizing the coincidence between PV output and localized or regional electric loads, in effect creating PV-dedicated loads, thereby maximizing PV's effective capacity.

OBJECTIVE

To maximize the effective capacity of grid-connected PV systems. The SLC will react to the availability of solar energy based on a signal generated locally or regionally by the utility.

DESCRIPTION

The SLC acts on the setting of building energy systems or end-use appliances by slightly modifying their operating thresholds or schedules. The project covers phase I, development and demonstration at the Center for Environmental Sciences and Technology Management building.

BENEFITS

The SLC applies information technology to unique characteristics of PV and optimizes the match between loads and output. The SLC will increase PV effective capacity and increase the level of PV penetration. For grid-connected customers with a 10kW PV system, the estimated payback of the SLC is less than one year. For remote residential applications, the SLC would result in more solar energy going directly to the load as opposed to going through battery storage with its associated losses.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$54,749	$54,749
AWS Scientific	0	5,000	5,000
National Renewable Energy Laboratory	0	45,000	45,000
ASRC	0	10,141	10,141
TOTALS	0	$114,890	$114,890

Contractor: The Atmospheric Sciences Research Center through the Research Foundation of SUNY
Site: Albany, Albany County
Contract Duration: 12/97 - 6/99
Key Words: solar, product development, university
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4694-ERTER-ER-98

-> Developing Solar-Powered Wireless Telephone Products

Develop and manufacture solar-powered energy systems and packaged telephone products.

BACKGROUND
The worldwide market for wireless telecommunications is growing geometrically, with hundreds of new wireless telecommunications networks to be developed within the next decade. SunWize Technologies is poised to participate in the worldwide, fast-growing communications market through a partnership with Protel.

OBJECTIVE
To develop and manufacture solar-powered energy systems and packaged telephone products that use wireless telephone technologies in areas with limited or no access to utility power lines. The products will be designed for use with many of the satellite and wireless local loop systems.

DESCRIPTION
SunWize will develop two product lines. The first will be a full-featured solar power system to provide continuous solar power to existing rural telephone equipment. This product will be developed in close collaboration with telephone equipment providers and will be marketed as an independent, stand-alone power system suitable for powering existing telephone equipment. The second product will be an integrated and packaged unit consisting of a solar-powered pay telephone system. This product will be manufactured by SunWize and marketed directly to service providers for remote telephone needs.

BENEFITS
The products developed under this project will contribute to the sustainability and potential growth of SunWize Technologies and will generate jobs in the Hudson Valley. The products have potential applications for remote parks, public areas, and other locations in New York State.

SCHEDULE AND STATUS
The project has just begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$72,605	$72,605
SunWize	0	157,377	157,377
TOTALS	0	$229,982	$229,982

Contractor: SunWize Technologies, Inc.
Site: Kingston, Ulster County
Contract Duration: 3/98 - 2/00
Key Words: product development, renewable, solar, photovoltaics
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4696-ERTER-ER-98

-> Photovoltaic Cellular-Phone Power Supply and Charger

Develop and manufacture urethane-encapsulated photovoltaic panels for cellular-phone power supply and charging.

BACKGROUND

NYSERDA has been working with SunWize to develop urethane-encapsulated solar cells. These solar cells are now sold commercially and ongoing R&D is improving manufacturing techniques and developing new product lines. SunWize has identified several complementary product and marketing strategies to commercialize the technology, including the development of personal photovoltaic (PV) chargers for cellular telephones.

The worldwide market for wireless telecommunications and portable electronics is growing geometrically. Cellular phones and radio-telephones are the technology of choice in both urban centers and rural areas of developing countries. This product will be marketed worldwide, especially in developing countries where new communication infrastructures are wireless.

This product will also be targeted to domestic customers who are in the field, such as insurance adjusters, field engineers, geologists, conservationists, surveyors, the military, emergency personnel, petroleum and mineral field personnel, and others.

OBJECTIVE

To develop a SunWize-brand PV cellular-telephone power supply and charger.

DESCRIPTION

Performance parameters and a conceptual design will be developed. SunWize will build and test a prototype and use the results to evaluate the manufacturing techniques, performance, and visual impact of the product. Manufacturing methods will be developed and production molds and other tools for volume production will be procured.

BENEFITS

The product will allow for cellular-phone operation where power is not accessible. It will be designed to operate a cellular phone directly (when used in direct sunlight), or recharge the batteries. This product is expected to generate up to 15 new jobs in the first two years.

SCHEDULE AND STATUS

A second generation foam model of the cellular telephone charger has been made and the design is almost finalized. Methods for injection-molding the PV modules are being optimized, and the power-electronic design is complete.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$196,193	0	$196,193
SunWize Technologies, Inc.	220,419	0	220,419
TOTALS	$416,612	0	$416,612

Contractor: SunWize Technologies, Inc.
Site: Kingston, Ulster County
Contract Duration: 3/97 - 7/98
Key Words: renewable, product development, solar, photovoltaics
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4552-ERTER-ER-97

-> Affordable, High-Efficiency, Small-Scale Solar-Electric Generator

Develop, fabricate, and test 2kW solar-thermal electric generator.

BACKGROUND
Clever Fellows has been working with NYSERDA to develop its Stirling engine technology. More recently, it has been working with NYSERDA under project 4425-IABR-IA-97 to develop a thermoacoustic (TA) converter. This project will run the TA technology on solar energy.

The TA technology costs less and is more reliable than the free-piston Stirling engine because it uses a standing acoustic wave instead of a mechanical reciprocator, thus reducing the number of moving parts. This technology is well-suited for converting heat energy generated by the sun to electrical energy. This project will address the issues involved in using solar energy to power the TA converter. It will also develop a concentrator suitable for coupling with the TA converter.

The remote markets being served by PV, wind, and diesel would be ideal for this technology. This technology is expected to cost less than PV installations for sizes as low as 1-2 kW.

OBJECTIVE
To develop the critical technologies for using the TA converter in solar applications.

DESCRIPTION
This project covers Phase 1 of a two-phase effort. In this project, Clever Fellows will design and fabricate a prototype 2kW TA/STAR solar-electric generator. The TA/STAR solar electric generator will be installed and tested on an existing test solar dish at Sandia National Laboratories. A low-cost concentrator suitable for the TA/STAR solar-electric generator will be designed and cost estimates for production will be prepared. Phase 2 will integrate the critical components into a commercial product.

BENEFITS
This project will develop a solar-electric generator that is expected to cost one-third less than a comparable PV system. Because markets for this product are similar to those for PV, and PV markets are growing at approximately 16% per year, significant markets for this technology are expected.

SCHEDULE AND STATUS
The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$193,778	$193,778
Clever Fellows Innovation Consortium, Inc.	0	81,088	81,088
Los Alamos National Lab	0	16,000	16,000
Sandia National Lab	0	80,000	80,000
NASA	0	59,100	59,101
TOTALS	0	$429,966	$429,966

Contractor: Clever Fellows Innovation Consortium, Inc.
Site: Troy, Rensselaer County
Contract Duration: 7/97 - 10/98
Key Words: product development, renewable, solar thermal
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4622-ERTER-ER-98

-> Solar Home System for the Chihuahua Rural Electrification Project

Develop and test photovoltaic systems to serve remote homes in Chihuahua, Mexico.

BACKGROUND

More than 7,000 villages within the State of Chihuahua, Mexico, have no access to basic electricity services for lights, radios, and small equipment. A revolving loan program will be established by the State of Chihuahua and the U.S. government to finance the purchase of photovoltaic (PV)-based energy systems for the rural population in Chihuahua. Applications will include electrification for rural homes, village power systems, water-pumping systems, and systems that support infrastructure and development.

SunWize presently offers a line of packaged PV power systems known as the SolaGen-Pac,™, consisting of a PV module, a sealed lead-acid battery, and a system controller housed in a lockable enclosure. These systems will be modified to produce a line of solar home-system products to meet the needs of this large Mexican market.

OBJECTIVE

To develop and test a PV/battery system to serve home-power needs in remote areas of developing countries.

DESCRIPTION

SunWize will design, specify, manufacture, test, and deliver 200 solar home systems based on a modification of SunWize's SolaGen-Pac™ product line. The systems will be pre-assembled and factory-tested, and feature state-of-the-art components, including a microprocessor-based controller with low-battery disconnect, sealed deep-cycle battery, single-crystal PV modules, and complete accessories in a lockable enclosure.

BENEFITS

This product will provide solar-generated home power for large markets in developing countries and smaller domestic markets. Developing this product for large-quantity sales in foreign markets will allow for bulk component purchases and more efficient manufacturing that will reduce costs for domestic systems. This product has potential applications for remote homes or cabins in New York State.

This project will create job growth and export opportunities for SunWize. The product's projected revenues are $200,000 in the first year, and up to $2.5 million in the fifth year.

SCHEDULE AND STATUS

A survey of potential customers is completed and design of the system is under way. The State of Chihuahua has decided that a non-government organization will own the systems, so the new organization must be identified and a site agreement negotiated with them, creating a delay of 6 to 8 months.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$114,495	0	$114,495
State of Chihuahua, Mexico	90,975	0	90,975
Sandia National Labs	99,000	0	99,000
SunWize Technologies	9,776	0	9,776
Siemens Solar Industries	3,990	0	3,990
TOTALS	$318,236	0	$318,236

Contractor: SunWize Technologies, Inc.
Site: Kingston, Ulster County, and Chihuahua, Mexico
Contract Duration: 2/97 - 2/99
Key Words: renewable, solar, photovoltaics, product development, international
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4533-ERTER-ER-97

-> Photovoltaic-Based Disaster Relief Products

Develop photovoltaic products to meet critical energy services during extended power outages.

BACKGROUND

After natural disasters, such as hurricanes, floods, and earthquakes, power outages can last for several weeks. Electricity provides a needed component of any rebuilding and response efforet in a post-disaster situation. Photovoltaic (PV) products offer practical solutions to this problem. "Dual use" PV products furnish energy to the utility system during normal conditions and are re-deployed to provide critical energy services throughout a utility's service area following disasters, making the best use of the PV energy.

OBJECTIVE

To develop dual-use photovoltaic products and systems for furnishing critical energy services during extended power outages following natural disasters. Products will be developed for residential and commercial customers.

DESCRIPTION

Three products will be developed: (1) a 30-40-watt PV system with a radio, two lights, and a cell-phone battery charger for residential use; (2) a trailer-mounted 2000-watt PV-hybrid system to provide power for critical small business fuel pumps, cash registers, refrigeration, etc.; and (3) a trailer-mounted ice-maker or water purification system.

BENEFITS

This proposal will result in new PV products being manufactured in New York State. The proposed products will increase effectiveness of disaster relief efforts and reduce dependence on small engine generators, which can be difficult to fuel during natural disasters.

SCHEDULE AND STATUS

The project just began.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$165,886	$165,886
Direct Global Power	0	132,253	132,253
Evergreen Solar	0	10,000	10,000
CHI	0	25,000	25,000
TOTALS	0	$333,139	$333,139

Contractor: Director Global Power, Inc.
Site: Schenectady, Schenectady County
Contract Duration: 2/98 - 2/99
Key Words: product, development, solar
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4695-ERTER-98

-> Photovoltaic-Hybrid System Demonstration

Evaluate photovoltaic-hybrid systems, develop an efficient controller, and integrate hybrid system with ice-maker.

BACKGROUND

Systems containing photovoltaics, batteries, and an engine-generator (PV-hybrid) or photovoltaics and batteries (PV) are cost-effective options for providing electricity to many remote loads. This project builds on a previous NYSERDA project to monitor PV-hybrid systems installed by the New York Power Authority, Niagara Mohawk Power Corp., and New York State Electric & Gas Corp. Two of these systems were manufactured by SunWize Technologies of Kingston.

OBJECTIVES

To: (1) determine the performance and reliability of skid-mounted PV-hybrid systems in different but replicable applications and geographic locations; (2) develop and test a "smart" photovoltaic/generator hybrid control system designed to improve energy efficiency by 20 percent or more; and (3) package a PV-hybrid system with an ice-maker to expand the markets for PV-hybrid systems.

DESCRIPTION

Under Phase I, SunWize will prepare site-selection criteria and help identify eight viable government and non-profit sites. The systems will be specified and constructed on an assembly line. SunWize will provide two years of maintenance and arrange for two years of monitoring for eight installations. The ninth system will be tested at an independent laboratory.

In Phase II, SunWize will develop and write PV-hybrid control-system software for more efficient operation. The control system will be installed, monitored, and evaluated in the existing New York State Electric & Gas hybrid system in Plattsburgh. The new control system will be integrated into the SunWize hybrid-system product line.

In Phase III, SunWize will integrate its existing WPVGEN1800 PV-hybrid system with an existing commercial ice machine of approximately 600-1000 lb/day capacity. This system will be fabricated, assembled, and tested at the SunWize manufacturing facility, and then tested at a fishing cooperative in Mexico.

BENEFITS

Phase I will identify new high-value applications for PV, increase technical understanding of PV-hybrid systems, familiarize government and non-profit organizations with PV, and reduce PV systems cost. Phase II will increase the market size for SunWize's New York-based production line through increased economic feasibility of the end-product and a competitive market advantage. Phase II will increase product sales through expanding markets.

SCHEDULE AND STATUS

Six PV-hybrid systems are installed in New York and two are being tested at independent laboratories. The Mexican PV-hybrid ice-making system is fabricated and is undergoing factory testing. Installation in Mexico is scheduled for June 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$506,272	0	$506,272
SunWize Technologies, Inc.	164,416	0	164,416
Sandia National Laboratory	66,582	0	66,582
State of Chihuahua, Mexico	41,000		41,000
TOTALS	$778,270	0	$778,270

Contractor: SunWize Technologies, Inc.
Site: Kingston, Ulster County
Contract Duration: 9/94 - 2/99
Key Words: renewable, solar, photovoltaics, hybrid, product development
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4041-ERTER-ER-95

-> Glass Ceramics for Thin-Film Photovoltaic Cells

Develop and evaluate glass-ceramic substrates for polySilicon-based thin-film solar cells.

BACKGROUND

Producing polySilicon (poly-Si)-based thin film solar cells requires transparent substrates that can be processed at high (700°C) temperatures, because a transparent substrate can be used as the cover glass, eliminating the need for a separate cover, and rapid, economical deposition of poly-Si is possible only on substrates heated to high temperature. No suitable substrate for this application currently exists.

Glass ceramics can be formulated to be transparent and resistant to high temperatures, and to match the thermal expansion of Si. The major commercial application of this material is in high-end electric kitchen stoves, where a glass ceramic plate is used to make a smooth top, with the coils located below. This project will develop glass-ceramic substrates for solar cells.

OBJECTIVE

To develop a low-cost, transparent, high-temperature substrate with a thermal expansion coefficient compatible with Si.

DESCRIPTION

The major technical challenge is to formulate a substrate that meets the technical requirements for solar-cell production and, in particular, that can be processed in conventional semiconductor-processing equipment without adversely affecting that equipment. The major economical challenge is to accomplish this at low cost. This project will address these challenges by surveying potential glass-ceramic substrates, studying the migration of glass-ceramic components, and developing and testing thin-film poly-Si devices on glass-ceramic substrates.

The development of a suitable glass-ceramic substrate requires synergistic cooperation between Corning, Inc. (capable of producing advanced glass-ceramics), Cornell University (capable of processing semiconductors on glass ceramics), and solar cell manufacturers such as AstroPower interested in evaluating such substrates for mass production of thin-film solar cells. The proposed approach incorporates all three elements required to demonstrate the applicability of glass ceramics to the fabrication of Si-based thin-film solar cells.

BENEFITS

The project will have a major impact not only on lowering the cost of poly-Si-based solar cells, also but on other large-area applications of poly-Si, such as active matrix liquid-crystal display and OLED (organic light-emitting diode) displays. The OLED displays are being developed by Eastman Kodak in Rochester.

SCHEDULE AND STATUS

Thin film transistors fabricated on fused silica substrated were made and the effect of deposition temperature is being investigated.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$99,164	$99,164
Corning, Inc.	0	139,587	139,587
TOTALS	0	$238,751	$238,751

Contractor: Cornell University
Site: Ithaca, Tompkins County
Contract Duration: 9/97 - 3/99
Key Words: product development, renewable, university, solar, photovoltaics, semiconductors
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4536-ERTER-ER-98

-> Photovoltaic Manufacturing Initiative

Develop techniques to manufacture photovoltaic panels encapsulated in urethane.

BACKGROUND

Most photovoltaic (PV) modules are somewhat fragile, which limits integrating them into products that require shaped, lighter-weight, or tougher PV modules. The capability to manufacture flexible or shaped PV modules will expand the market for them. Using urethane to encapsulate PV circuits produces modules that can be flexible and made to the shape and size specified by the customer. SunWize Technologies, Inc. (SunWize), a subsidiary of Besicorp, was created to develop and manufacture polymer-encapsulated PV modules from purchased PV cells.

OBJECTIVE

To lower the cost and increase the design flexibility of specialty photovoltaics.

DESCRIPTION

Manufacturing techniques will be developed that allow PV modules to be produced in sizes and shapes required by customers, making it possible to incorporate PV into more products. Module-encapsulation techniques will be improved and qualified, and tooling for the complete, precise interconnection of the solar-cell circuit in a fixture will be designed.

In Phase 1, SunWize will improve and test a new PV module-manufacturing technique that uses a clear urethane compound that is poured into a form containing the PV circuit and then cured. Several urethane materials will be tested to determine degradation mechanisms. SunWize also will design tooling for the complete, precise interconnection of the solar-cell circuit in a fixture, to both improve product quality and increase production automation.

In Phase 2, SunWize will design and build machinery to automate the interconnection of solar cells. Specifically, equipment to solder or bond individual cells into a circuit will be designed, and required automated methods will be developed to load and unload solar cells from this equipment. SunWize will also automate the urethane-dispensing system. An automated system will be developed to index interconnected modules under a multiple-head manifold system, dispense the urethane over the modules, and move them to a heated room for curing.

In Phase 3, SunWize will: (1) identify and test adhesives to improve and allow for better automation of mounting the PV circuits on the substrate, (2) retrofit automated equipment for tabbing multiple cell sizes to better automate the soldering of multiple cells into a circuit, and (3) identify and implement automated process controls for encapsulating the PV circuits with polymer.

BENEFITS

This project, a key factor in setting up a PV module-manufacturing facility in the Hudson Valley, will promote business growth and increase the number of viable PV products. The modules will be sold nationally and internationally for incorporation into consumer products, in addition to being integrated into PV products that SunWize is planning to manufacture.

SCHEDULE AND STATUS

Phase 1 is complete. SunWize is manufacturing and selling urethane-encapsulated solar cells. Equipment for automating the soldering process is being modified, and methods to improve polymer encapsulation are being developed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$332,470	$197,048	$529,518
Besicorp Group Inc.	504,704	199,406	704,110
TOTALS	$837,174	$396,454	$1,233,628

Contractor: Besicorp Group Inc.
Site: Kingston, Ulster County
Contract Duration: 3/94 - 12/00
Key Words: renewable, product development, solar, photovoltaics
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 3155M-ERTER-ER-94

-> PowerGuard™ -- Commercialization of Market-Ready Photovoltaic Roofing

Develop manufacturing processes and facilities to make PowerGuard™ roof tiles.

BACKGROUND

Power Light Corporation developed and demonstrated the PowerGuard™ technology, a building-integrated photovoltaic (PV) system consisting of tiles that act as both a roof and a solar power plant. The company's New York manufacturing partner, T. Clear Corporation, manufactures Lightguard Ballasted Roof Insulation™, which has a structure similar to PowerGuard™. Prototype testing is completed and the product has been demonstrated at six sites. This project will develop semi-automated manufacturing capability for the product. Markets for this product are promising, as grid-connected PV energy is approaching economic feasibility in selected locations, providing the focus is on customer-sited building-integrated PV. Southeastern New York has some of the best economics for grid-connected PV because of its retail electric rates, the coincidence between sunlight and peak electricity demands, and the fairly good solar resource.

OBJECTIVE

Phase 1: to develop a facility to manufacture PowerGuard™ roof tiles in Mount Marion, NY.
Phase 2: to increase automation and throughput of the facility and decrease product cost.

DESCRIPTION

In Phase 1, manufacturing processes and stations will be developed for manufacturing PowerGuard™at T. Clear's Mt. Marion facility. The project will address: semi-automated backerboard fabrication, weather-resistant coating application, cure-coating and cure-rack stations, and a vacuum lift to place the PV laminates on the backerboard for curing.

Phase 2 upgrades the backerboard fabrication, automates the protective coating application station, and develops methods to improve packaging for shipping. Equipment to fabricate j-boxes, T harnesses, quick connects, and PowerCurb will be designed and made.

BENEFITS

By saving the cost of the roofing material and eliminating the extra PV mounting costs, PowerGuard™ reduces the cost of grid-connected PV systems, expanding domestic markets. Passive energy savings occur from stand-off roof shading and R-10 polystyrene insulation. PowerGuard™ can be installed quickly and easily with no roof penetrations within existing roofing industry weight, wind speed, and seismic standards. This project will result in the development of a New York manufacturing facility, providing three jobs immediately, and 95 jobs over the next four years, as well as tax benefits. The projected revenues for the product are $6.9 million in the first year, increasing to $44.8 million in the fifth year.

SCHEDULE AND STATUS

The Phase 1 manufacturing line is installed and operational. Phase 2 is about to begin.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$199,960	$199,780	$399,740
Power Light Corporation	227,474	266,304	493,778
TOTALS	$427,434	$466,084	$893,518

Contractor: Power Light Corporation
Site: Mount Marion, Ulster County
Contract Duration: 3/97 - 5/99
Key Words: renewable, product development, solar, photovoltaics
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4534L-ERTER-ER-97

-> Small-Scale Photovoltaic Power Electronics Development

Develop series of electronic controllers for photovoltaic systems of up to 175 watts.

BACKGROUND

Most current small-scale and portable photovoltaic (PV) applications require careful matching of the PV modules to the application load to achieve reasonable PV performance. Improper matching results in the PV modules operating at suboptimal voltages, reducing efficiency. Standard electrical interfaces to match PV modules and small-scale application equipment do not exist; only costly custom designs are available.

SunWize has developed and completed testing of prototype controllers for applications up to 50 watts. SunWize controllers are innovative in that they also allow small PV modules to be used in relatively large power applications, contributing energy and extending battery life even when the module is not capable of powering the whole system.

OBJECTIVES

To: (1) investigate related power products and technologies; (2) develop methods to evaluate existing and proposed controllers; (3) develop product specifications; (4) develop new circuit designs; (5) build and test prototype circuit designs; (6) design, fabricate, and test prototypes for packaging and printed circuit boards; and (7) finalize the overall product design for the PV controller.

DESCRIPTION

SunWize prototypes and up to three other controllers will be tested and evaluated to establish cost and performance baselines. Based on this information, Automated Engineering Corporation will develop up to four new circuit designs for use in three applications such as laptop computers, cellular phones, SunWize specialty modules, and portable power systems. Cavalier then will source components and construct circuit prototypes that will be tested by Applied Testing Laboratories, and compared to baseline data. SunWize and Cavalier will develop the packaging and connectors. The final design of the PV controller will be tested for compliance with environmental and Federal Communications Commission regulations.

BENEFITS

If successful, a new renewable-energy product will be manufactured in New York. The product will have an immediate market, as it can be incorporated into some of SunWize's existing commercial products. In addition, potential markets exist outside the PV industry. The controllers also will be marketed to other PV systems integrators. The controller will make new portable PV applications feasible and reduce small-scale PV system costs.

SCHEDULE AND STATUS

The design and prototype have been completed for two controllers. The last controller is in progress.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$23,154	0	$23,154
SunWize	25,135	0	25,135
Cavalier	600	0	600
TOTALS	$48,889	0	$48,889

Contractor: SunWize Energy Systems, Inc.
Site: Kingston, Ulster County
Contract Duration: 3/96-8/98
Key Words: renewables, product development, solar, photovoltaics
Project Manager: Judy Jarnefeld (518) 862-1090, ext. 3293
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4360-ERTER-ER-96

-> Photovoltaic-Compatible Power-Conditioning System Development

Develop innovative inverter and power-quality enhancement system.

BACKGROUND

Niagara Mohawk Power Corporation is interested in developing a photovoltaic-compatible, robust power-conditioning system, called the Power Enhancement and Delivery System (PEDS), which will be used to support distribution systems and improve power quality for individual customers. Currently available inverters lack the robustness required for this application and do not have battery-charge-control capability. An East Greenbush feeder has been identified as a potential test site for the PEDS. The project was submitted under the Utility PV Group (UPVG) TEAM-UP (a Global Climate Change initiative) solicitation and was awarded $300,000 to support the PV panel costs.

OBJECTIVE

To develop and demonstrate PEDS, an innovative power-control, storage, and conversion unit.

DESCRIPTION

The PEDS will be designed to: (1) invert the power from the PV array and battery storage, (2) optimize power transfer from the photovoltaic array to the battery and utility system, (3) control charging and discharging of storage, and (4) eliminate voltage disturbances and outages downstream of its location. The PEDS design will be geared toward modularity based on ease of maintenance, high reliability, and utility system compatibility. A prototype PEDS will be constructed, and then installed at a test location and demonstrated with either a fuel cell or a PV system. The system will be monitored for one year.

BENEFITS

Components for this product will be manufactured in New York State. The PV market needs a reliable large-scale inverter. Power-quality and reliability features will enhance the market and value of this product. Because there will be widespread need for PEDS in power-quality applications, significant economies of scale are readily achievable.

SCHEDULE AND STATUS

Power Technologies, Inc. of Schenectady, NY is fabricating the prototype PEDS. One hundred kW of AstroPower's PV panels to hook into the PEDS have been installed near Albany, NY. The PEDS is fabricated and currently undergoing laboratory testing. Installation of the PEDS is scheduled for May 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$400,000	0	$400,000
Niagara Mohawk Power Corp.	663,000	$505,000	1,168,000
Astropower	0	120,000	120,000
TOTALS	$1,063,000	$625,000	$1,688,000

Contractor: Niagara Mohawk Power Corporation
Site: Syracuse, Onondaga County
Contract Duration: 1/96 - 5/99
Key Words: product development, photovoltaics, electricity, utilities, power quality, solar, renewable
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4156-ERTER-ER-96

-> Laminating Thin-Film Photovoltaics for Building-Integrated Applications

Develop facility to manufacture laminated thin-film photovoltaic panels for building-integrated applications.

BACKGROUND

Following the realization that potentially vast markets exist for multifunctional building materials, there has been an explosion of interest in building-related applications of photovoltaics (PV). These products not only protect against the weather and improve aesthetics, but also generate electricity for demand-side management and load-shifting functions. These applications can enormously reduce the economic barrier to grid-connected PV use. The availability of PV modules large enough to simplify installation and present an attractive appearance would help accelerate the introduction of building-integrated photovoltaics (BIPV).

Kiss + Cathcart is an international architectural firm that has a special interest and experience in developing BIPV. Energy Photovoltaics (EPV) is a PV cell manufacturer in Princeton, NJ. EPV's basic 2'x4' PV module of is too small for effective building integration. This project is aimed at developing an encapsulation process that could laminate several EPV modules to a larger glass substrate of up to 4'x8'. A New York manufacturing facility would be established to manufacture these modules for medium- to high-end commercial construction markets in NY, nationwide, and internationally. Any building using glass, metal, or stone curtain-wall construction could potentially use this product, as could buildings with skylights and atriums.

OBJECTIVE

To develop methods and equipment to manufacture opaque and semi-transparent BIPV panels.

DESCRIPTION

In Phase 1, develop manufacturing equipment and techniques will be developed to make large-area thin-film-based PV modules for the BIPV market. An encapsulation process will be developed to construct 4'x8' prototype modules for testing. The process would laminate four 2'x4' PV plates between two 4'x8' pieces of tempered glass.

In Phase 2, equipment and processes wil be deisnged and constructed to custom-pattern BIPV modules. Patterning capabilities will be developed that scribe the panels parallel to the cells, perpendicular to the cells, or in a dot pattern, depending on the customer's wishes.

In Phase 3, the feasibility of integrating PV into a Bronx courthouse will be evaluated.

BENEFITS

BIPV offers significant system-cost savings by replacing the building skin, and eliminating costs for land and a support structure. In highly developed areas, BIPV is the only way to deploy renewable energy when land is not available or is very expensive. Developing BIPV panels with transparency and custom-patterning will make the product appealing to architects. This project could also result in a PV-laminating plant and associated jobs in New York State.

SCHEDULE AND STATUS

Phase 1 has been successfully completed and Phase 2 just began.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$199,920	$206,014	$405,934
Kiss + Cathcart	199,921	202,578	402,499
TOTALS	$399,841	$408,592	$808,433

Contractor: Kiss + Cathcart
Site: New York City, New York County, and Princeton, NJ
Contract Duration: 4/97 - 5/99
Key Words: renewable, product development, solar, photovoltaics
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4537L-ERTER-ER-97

-> Building-Integrated Photovoltaic Modules at 4 Times Square

Demonstrate innovative New York-manufactured building-integrated photovoltaic modules.

BACKGROUND

Following the realization of potentially vast markets for multi-functional building materials, interest in building-related photovoltaic (PV) applications has grown. These products perform conventional functions such as protection from weather and improvement of aesthetics, but with the additional benefit of generating electricity for demand-side management and load-shifting functions. In this way, the economic barrier to grid-connected PV use can be enormously reduced. Availability of PV modules large enough to simplify installation and present an attractive appearance would help accelerate the introduction of building-integrated PV.

The Durst Organization is having a new building constructed at 4 Times Square in New York City that they intend to establish a new benchmark for environmental responsibility in commercial real estate. As part of this goal, they plan to install a building-integrated photovoltaic (BIPV) system on the building.

NYSERDA has a project with Kiss + Cathcart Architects (Contract No. 4537-ERTER-ER-97) to develop a manufacturing facility in New York to manufacture large-area (up to 4'x8') BIPV modules from Energy Photovoltaics' basic PV modules, which are 2'x4'.

OBJECTIVE

To demonstrate innovative New York-manufactured BIPV modules at 4 Times Square.

DESCRIPTION

This project will build on NYSERDA's previous project with Kiss + Cathcart and demonstrate its innovative BIPV modules at 4 Times Square. BIPV modules will be manufactured and sent to the curtain-wall manufacturer for incorporation into the building's curtain-wall, which will then be installed in the new 4 Times Square building. A brochure will be developed on the project.

BENEFITS

BIPV offers significant system-cost savings by replacing the building skin and eliminating costs for land and a support structure. In highly developed areas, BIPV may be the only way to deploy renewable energy when land is not available or is very expensive.

This project will demonstrate an innovative BIPV module in a highly visible building, increasing the future use of BIPV in the U.S. and throughout the world.

SCHEDULE AND STATUS

The manufacturing facilites are being developed under Project No. 4537-ERTER-ER-97.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$100,000	$299,920
Kiss + Cathcart	0	37,642	37,642
TOTALS	0	$137,642	$337,562

NOTE: See #4537 for a companion project.

Contractor: Kiss + Cathcart Architects
Site: New York, New York County
Contract Duration: 10/97 - 5/98
Key Words: renewable, product development, solar, photovoltaics
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4661-ERTER-ER-97

-> Innovative Mounting and Interconnection System for Single-Module PV Systems

Develop and manufacture mounting and interconnection systems for Evergreen Solar's single-module PV systems.

BACKGROUND

A substantial and growing segment of the international rural PV market is served with single-module systems consisting of one 20-60-watt module, simple control electronics, a battery, and a mounting system. As costs continue to decline and the market infrastructure matures, the large international markets will expand rapidly. Current PV modules are designed for multimodule systems and are over-designed for single-module use. Single-module systems do not need the full frame strength nor the structural and electrical flexibility provided by existing module frames and junction boxes, providing opportunities for cost-reduction.

Evergreen Solar, a PV module manufacturer based in Massachusetts, and Jefferson Shingleton, a New York State consulting engineer, recently developed new, stronger PV module back-skin material that opens up new possibilities for producing lower-cost single-module systems without compromising performance. This project will develop the new panels into a commercial product, focusing on mounting systems for pole- and wall-mounting and necessary electrical connections.

OBJECTIVE

To develop and manufacture mounting methods for Evergreen Solar's single-module PV systems.

DESCRIPTION

This project will develop a single-module PV product, complete with mounting system and electrical connections. Module-lamination methods have been developed, so this project will develop mounting systems for pole- and wall-mounting and necessary electrical connections. Conceptual designs will be developed and reviewed with key industry players and customers. Prototypes will be designed, fabricated, and evaluated; final prototypes will be designed, fabricated, and tested, resulting in a fully commercial product.

BENEFITS

This product will serve large and rapidly growing markets. It will be a high-quality product that costs less than competing modules with conventional frames and junction boxes. The innovative mounting systems developed in this project will be manufactured in New York, resulting in new jobs.

SCHEDULE AND STATUS

Design concepts are being considered.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$94,562	0	$94,562
Evergreen Solar, Inc.	79,432	0	79,432
Direct Gain	15,129	0	15,129
TOTALS	$189,123	0	$189,123

Contractor: Evergreen Solar, Inc.
Site: Waltham, MA; Schenectady, Schenectady County; and Auburn, Cayuga County
Contract Duration: 3/97 - 10/98
Key Words: renewable, product development, solar, photovoltaics
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4535-ERTER-ER-97

-> Improved Poly- and Single-Crystalline Silicon Solar Cells with Deposition of Emitter Layers by Glow-Discharge Processing

Develop computer model to design silicon solar cells with deposited emitters and make and test cells based on computer designs.

BACKGROUND

Deposited emitters have the potential for improving the efficiency and reducing the production costs of solar cells. NYSERDA's recent photovoltaic (PV) materials projects have been largely experimental in nature. This project focuses on computer modeling of solar cells and uses experimental devices to validate the models.

OBJECTIVE

To produce an optimal and validated design for improved solar cells based on a novel design principle using ultra-thin amorphous or microcrystalline silicon-emitter layers deposited on a conventional crystalline-silicon substrate.

DESCRIPTION

The solar-cell design will be optimized with a model-simulation-fabrication testing cycle using improved concepts to describe electron transport and new simulation methods to enhance the optimized design. Fundamental numerical descriptions of electronic transport in amorphous and micro-crystalline silicon will be developed using Monte Carlo statistical descriptions. Silicon films will be fabricated and their characteristics compared to model predictions. The model then will be expanded to describe simple solar-cell structures. Solar cells will be designed, tested, and optimized with the help of the model. A partner will be sought to commercialize the computer model.

BENEFITS

The contractor claims this technology will reduce the cost of polycrystalline and crystalline solar cells by 20 percent by using low-cost manufacturing processes and improving performance. Research results will lead to development of a novel power transistor and a new New York State business to manufacture this transistor.

SCHEDULE AND STATUS

Progress is being been made in applying the 3-dimensional hopping transport to amorphous silicon. Substantial improvement was seen when the crystallized amorphous silicon emitter case was used instead of amorphous silicon. Technology developments in this project will be used to commercialize a power transistor in the near term.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$148,120	0	$148,120
SUNY/Stony Brook	145 436	0	145,436
Biota Corporation	44,436	0	44,436
TOTALS	$337,992	0	$337,992

Contractor: The Research Foundation of SUNY on behalf of SUNY/Stony Brook
Site: Stony Brook, Suffolk County, and Locust Valley, Nassau County
Contract Duration: 7/95 - 6/98
Key Words: product development, renewable, university, solar, photovoltaics, semiconductors
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4213-ERTER-ER-96

-> Toroidal Accelerator Rotor Platform Wind-Energized Independent Light System

Develop and test remote street-lighting system that operates on wind energy.

BACKGROUND
Many regions of New York State have sufficient wind to meet the demands of outdoor lighting units, with the cycle of darkness-periods-per-day also tending to vary in phase with annual wind availability. The Toroidal Accelerator Rotor Platform (TARP) is an obstruction-flow concentrator and amplifier that creates high-kinetic wind-energy regions at the turbine blades.

OBJECTIVE
To demonstrate the viability of the TARP Wind-Energized Independent Light (TWILIGHT) system by constructing a prototype and testing it at a site in New York State. The results of the test will be discussed at a workshop when the study is finished.

DESCRIPTION
The project includes design, fabrication, and assembly of the TWILIGHT system, including mechanical/structural, electrical, and data-acquisition systems; site testing and data-collection; and technology transfer.

BENEFITS
Potential users that could benefit from this technology include municipalities, State and local departments of transportation and parks and recreation, forest services, and electric and telephone utilities.

SCHEDULE AND STATUS
All components have been reinstalled following mechanical problems and vandalism. The system suffered major damage during a winter storm in 1996. The contractor is attempting to make as many repairs as possible given the limited budget remaining. The project will be closed in the summer of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$231,650	0	$231,650
P.W. Scott Associates	185,650	0	185,650
TOTALS	$417,300	0	$417,300

Contractor: P.W. Scott Associates
Site: Belleayre Mountain State Ski Area, Highmount, Ulster County
Contract Duration: 8/92 - 12/97
Key Words: renewable, wind, lighting, product development
Project Manager: Jeff Peterson (518) 862-1090, ext. 3288
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 1912-ERER-ER-93

-> 6-MW New York Wind Plant Demonstration Program

Install and test six megawatts of wind turbines in New York State.

BACKGROUND

Over the past 10 years, the cost of electricity from wind has decreased significantly and the reliability of wind machines has increased, with availabilities of more than 95 percent. Wind-power plants are producing energy that costs between 4.5 and 5 cents per kWh in high wind regimes. These improvements in wind technology were necessary to make wind an attractive option in New York's moderate wind regimes. Demonstration of wind turbines in New York is the next step necessary to commercialize utility-scale wind turbines in the State. This project is part of the National Renewable Energy Laboratory/Electric Power Research Institute Turbine Verification Program, where participating utilities install six MW of advanced-design domestic wind turbines and share their experiences.

OBJECTIVES

To: (1) provide operational experience with utility-scale wind-power plants in New York State in terms of turbine reliability, maintenance requirements, and other performance issues; (2) evaluate new advanced wind-turbine technologies appropriate for New York's wind resource; (3) address siting, environmental, and public-acceptance issues that large wind plants are likely to encounter in New York; (4) assess the economics and capacity-value of wind plants in New York's wind regime; and (5) investigate potential impacts on power quality and grid-system stability.

DESCRIPTION

Six megawatts of wind turbines (12-20 utility-scale turbines) will be installed at a site in New York State. Analysis of wind speeds and interconnection costs has been ongoing in two areas of the State, the Tug Hill Plateau and the Cattaraugus Highlands; candidate communities in those areas will be identified. Outreach to the local communities will occur throughout the project siting process. Once the final candidate sites have been selected, wind leases will be negotiated with landowners and environmental permits will be sought. Purchase and installation of wind turbines will be bid competitively. Factors for selecting the wind turbines include: (1) innovativeness, (2) projected energy cost in New York wind conditions, (3) anticipated maintenance requirements and reliability in New York's weather, (4) environmental impacts, (5) ease of maintenance, (6) vendor support and corporate philosophy, and (7) turbine effects on utility-grid power quality. Once selected, the wind turbines will be installed and monitored.

BENEFITS

The experience gained in siting, operating, and integrating wind generation into the utility system will help wind become a viable generation option when capacity is needed in New York.

SCHEDULE AND STATUS

Site environmental and wind resource studies are under way. Installation of the turbines is on hold and NMPC is negotiating a new contract with EPRI for a reduced size of the wind installation.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$400,000	0	$1,500,000
National Renewable Energy Lab.	700,000	0	1,500,000
Niagara Mohawk Power Corp.	3,695,000	0	12,000,000
TOTALS	$4,795,000	0	$15,000,000

Note: Appropriations of co-funders based on their fiscal years.

Contractor: Niagara Mohawk Power Corporation
Site: Albany, Albany County, and Syracuse, Onondaga County; wind site to be determined
Contract Duration: 3/96 - 12/02
Key Words: renewable, wind, utility, electricity
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4012-ERTER-ER-95

-> Commercialization of Variable-Reluctance Wind Generators

Demonstrate and commercialize variable-reluctance generator for wind turbines.

BACKGROUND

Variable-reluctance-generator (VRG)-based wind turbines are expected to be more reliable and produce lower-cost energy than induction-based variable-speed wind generators. Control electronics for the VRG were developed and tested, and the concept of incorporating the VRG into advanced wind-conversion systems was proven at the bench level in a previous project with Rensselaer Polytechnic Institute and Atlantic Orient Corporation.

OBJECTIVES

To: (1) fabricate and laboratory-test two prototype 20kW VRGs (Phase 1) and (2) commercialize the technology, including production engineering, pre-production prototype fabrication and field-testing, final design, and arranging for system manufacture (Phase 2).

DESCRIPTION

In Phase 1, two prototype VRGs with power-electronic utility/generator interfaces will be built and tested. The first machine will be tested in a laboratory and will serve as input to optimize the design of the second machine. Laboratory testing will verify the mechanical integrity of the VRG and confirm all control functions of the electronics. A second prototype VRG will be designed, fabricated, and tested based on results from the first VRG. To bring the VRG system to market, options for partnership opportunities with a wind turbine manufacturer will be examined. Phase 2 will involve a design review and production engineering assessment. Based on these results, two pre-production prototype VRGs will be fabricated and tested in the laboratory and in the field.

BENEFITS

This project is the catalyst to establish Advanced Energy Conversion (AEC), a New York start-up company that will develop and construct VRGs and associated power electronics. The VRG will fill a market void by developing a small-scale (20kW) variable-speed wind turbine for use in New York, national, and foreign markets. This lower-cost, small-scale wind system will make wind power more feasible for New York end-users.

SCHEDULE AND STATUS

The power electronics and generator for the first prototype VRG have been fabricated and tested. A design review of the first VRG recommended modifications for the second prototype VRG. AEC and NYSERDA are modifying the contract to accommodate the changes and develop two pre-production VRGs.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$147,710	$85,112	$402,420
Advanced Energy Conversion	94,370	85,112	349,081
Atlantic Orient Corporation	53,340	0	53,340
TOTALS	$295,420	$170,224	$804,841

Contractor: Advanced Energy Conversion, LLC
Site: Glens Falls, Warren County
Contract Duration: 6/95 - 09/00
Key Words: renewable, electricity, wind, variable-reluctance, product development
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4236L-ERTER-ER-96

-> Photovoltaics with Porous Silicon

Prepare, demonstrate, and optimize photovoltaic devices based on porous silicon.

BACKGROUND

Low-cost solar cells are not efficient enough to generate electric power competitively. Porous silicon, produced when silicon is immersed in an acidic solution through which a constant direct current is passed (anodization), promises to be an inexpensive, efficient material from which to manufacture photovoltaic devices. Anodization produces micron-high silicon columns as thin as 5 or 10 nanometers. These columns are thought to give porous silicon unusual properties, such as visible photoluminescence; however, many properties of porous silicon have not been established.

ACCOMPLISHMENTS

The contractor grew porous-silicon samples in an electrochemical chamber using lasers and optics to monitor and control growth. Relevant characteristics, including photon absorption, luminescence. carrier lifetime and collection, bandgap, and absorption coefficient, were examined using photoluminescent spectroscopy, Raman scattering, time-resolved pump and probe spectroscopy, and dark and photo-conductivity. The results were used to design, manufacture, and test experimental photovoltaic cells.

FINDINGS AND CONCLUSIONS

Porous silicon solar cells were made having an efficiency of better than 10%. Optical and electrical properties of the devices as a function of porosity have been measured.

REALIZED OR ANTICIPATFD BENEFITS

Porous silicon was demonstrated to be an effective material for making solar cells. By lifting off porous silicon layers from the silicon substrate, it was demonstrated that inexpensive porous silicon solar cells can be manufactured on substrates such as glass.

TECHNOLOGY TRANSFER ACTIVITIES

Numerous papers were written and presentations were given.

FUNDING	TOTALS
NYSERDA	$265,000
Rochester Gas and Electric Corp.	190,000
AT&T (in-kind)	28.800
Xerox (cash and in-kind)	20,000
CVC (in-kind)	10,000
TOTALS	$513,800

Contractor: University of Rochester
Site: Rochester, Monroe County
Contract Duration: 1/93-10/97
Key Words: renewable, university, solar, federal, photovoltaics, semiconductors, utilities
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 1901-ERER-ER-93

-> Remote Residential Photovoltaic Hybrid Monitoring

Monitor and evaluate performance of photovoltaic hybrid systems at remote residences.

BACKGROUND

More than 500 rural New York State residences are not connected to the utility grid. Homeowners more than 500 feet from a utility power line must pay high-priced line-extension costs to interconnect with the utility. Utilities locally and nationally have expressed interest in offering standardized, self-contained power systems that contain photovoltaic (PV) as well as a generator (PV hybrid system) as an alternative to expensive line extensions. Several technical questions are relevant before utilities can develop remote PV hybrid service programs.

ACCOMPLISHMENTS

The project gathered operational data from three PV hybrid systems that provide electricity to three remote residences.

FINDINGS AND CONCLUSIONS

The project provided data on the performance of the three PV hybrid systems. Each PV hybrid system consisted of a PV array, battery, engine-generator, control system, inverter, and equipment shelter. The two SunWize systems performed reliably, with 99.3% and 96.7% availabilities for the entire test period. The Northern Power system also performed reliably with a 99.7% availability after a re-design of the system.

REALIZED OR ANTICIPATED BENEFITS

The data showed that PV hybrid systems can be a reliable option for providing electricity to remote, off-grid homes. The data also provided insight into system performance that was used to improve future designs.

TECHNOLOGY TRANSFER ACTIVITIES

Presentations on the results have been given at workshops, and the results have been used by SunWize to improve its PV hybrid system.

FUNDING	TOTALS
NYSERDA	$102,504
New York Power Authority	20,700
New York State Electric & Gas Corp.	25,000
Niagara Mohawk Power Corp.	70,000
TOTALS	$218,204

Contractor: Board of Regents, New Mexico State University, Southwest Technology Development Institute, Las Cruces, New Mexico
Sites: Essex, St. Lawrence, and Clinton counties
Contract Duration: 10/93-6/97
Key Words: renewable, solar, photovoltaics, hybrid, utilities
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 3109-ERER-ER-94

-> Combining Satellite and Ground Measurement Resources

Develop methods to access and validate satellite-based solar radiance data.

BACKGROUND

Solar insolation data are needed for system designers and sophisticated photovoltaic (PV) consumers to determine the most efficient PV system for specific applications. For example, such data helps to optimize PV system location, orientation, and tilt angle, and helps to evaluate the need for a tracking system. Ground solar radiation monitoring stations accurately monitor solar radiation; however, the satellite is the most accurate option for determining solar radiation.

ACCOMPLISHMENTS

The contractor developed and tested ways to provide high-density solar radiation resource capability for specific locations using satellite data. Solar radiation data gathered since 1990 from southeastern New York by NYSERDA and the New York Power Authority validated the approaches.

FINDINGS AND CONCLUSIONS

The contractor assembled an 11-station set of ground-truth data covering southeastern New York and part of Massachusetts. All data were subjected to quality control and to calibration, verification, and correction. Satellite images for the same period were acquired. Algorithms that compare satellite with ground-network data were implemented, and methods to correct inconsistencies were developed. A method to convert satellite image pixels into global and other irradiance methods was implemented and tested. The contractor collaborated with the National Renewable Energy Laboratory to plan and hold a workshop from a solar data user's perspective.

REALIZED OR ANTICIPATED BENEFITS

Satellites are very powerful instruments for delineating localized differences in solar resources and can be used to produce highly defined solar resource potential maps that provide considerably better information than is currently available.

This data can be used to optimize the design of PV systems, passive solar buildings, etc.. It also can help utilities determine the interaction between PV systems and site- and time-specific load requirements.

TECHNOLOGY TRANSFER ACTIVITIES

An international workshop on Satellites for Solar Energy Resource Information was held in April 1996. The contractor presented the results of this project at numerous conferences and meetings.

FUNDING	TOTALS
NYSERDA	$65,857
National Renewable Energy Lab.	163,073
SUNY/Albany	23,244
TOTALS	$252,174

Contractor: Research Foundation of SUNY, SUNY/Albany
Site: Albany, Albany County
Contract Duration: 3/95 - 6/97
Key Words: renewable, university, electricity, photovoltaics, sunlight, solar energy
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4146-ERTER-ER-95

-> Develop, Build, and Test a Solar Photovoltaic SOLARWALL® Building System

Incorporate photovoltaics in commercial SOLARWALL® wall-cladding for fresh-air solar heating.

BACKGROUND

When photovoltaic (PV) cells produce energy from sunlight, some of the sun's energy is lost in the form of heat. Very little has been done to recover the thermal energy. Conserval Systems, Inc. has a commercial SOLARWALL® air-heater that preheats ventilation air using low-temperature solar thermal energy. The SOLARWALL® air-heating system represents a major breakthrough, reducing the cost of solar energy by eliminating glazing and using common wall construction.

ACCOMPLISHMENTS

Conserval designed and fabricated a prototype PV SOLARWALL® test panel and sent it to CANMET for a flash test (standard method of testing PV panels) and the National Solar Test Facility for thermal and electrical tests.

FINDINGS AND CONCLUSIONS

Combining PV with the SOLARWALL® thermal panel will improve the efficiency of the PV panel. While the thermal efficiency of the combined panel is slightly lower than on the standard SOLARWALL®, overall efficiency is greater. Further improvements should increase the thermal efficiency of the combined panel.

REALIZED OR ANTICIPATED BENEFITS

There are considerable cost and energy benefits with PV building integrated systems when the thermal energy is used. Compared to efficiencies of 12% for PV-only systems, PV SOLARWALL® has a total solar combined efficiency of 50%, with little or no increase in capital cost. Once the product is commercialized, manufacturing jobs will be created in New York State.

TECHNOLOGY TRANSFER ACTIVITIES

Conserval Systems displayed its prototype PV SOLARWALL® at the 1997 Solar Energy Forum.

FUNDING	TOTALS
NYSERDA	$112,455
Conserval (in-kind)	20,955
Bechtel (in-kind)	20,000
CANMET (cash & in-kind)	36,500
Sandia National Lab. (cash & in-kind)	35,000
TOTALS	$224,910

Contractor: Conserval Systems, Inc.
Site: Buffalo, Erie County; Toronto, Canada; San Francisco, CA
Contract Duration: 4/95 - 6/97
Key Words: renewable, product development, solar, photovoltaics
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4150-ERTER-ER-95

-> Improved Photovoltaic Systems Using Diamond-Like Nanocomposite Films

Develop coating to protect solar cells.

BACKGROUND

The use of photovoltaic technology (PV) for large-scale generation of electricity and other more cost- and lifetime-sensitive applications is limited by several factors, including long-term environmental stability, efficiency, and cost. Advanced Refractory Technologies, Inc. (ART) has been developing a diamond-like nanocomposite (DLN) technology and has established a state-of-the-art facility for large-area deposition. DLN technology could be used to replace current encapsulation approaches, resulting in greater PV product-design flexibility, reduced cost, and improved efficiency.

ACCOMPLISHMENTS

The project: (1) demonstrated the feasibility of coating various types of cells with DLN coatings without physical degradation, (2) studied environmental-protection effects of the coatings, (3) designed and fabricated multilayer anti-reflective coatings to improve coupling and measure transmission, and (4) studied the effect of coatings on spectral and photovoltaic response.

FINDINGS AND CONCLUSIONS

ART demonstrated the ability to tailor and customize the DLN films for PV cells. The DLN coating technology provides coatings that are intrinsically hard and impervious, strongly adhere to a variety of substrate materials, and can withstand oxygen-containing environments up to 400°C. The coatings have unique optical properties and the refractive index can be tailored, making them suitable for anti-reflection. By doping the DLN structure with metals during the deposition process, the electrical, mechanical, and optical properties can be tailored for specific applications. Use of DLN as an encapsulant and anti-reflective coating was demonstrated on commercial solar cells with good cell stability and at least a 30% increase in cell current density and efficiency. Improvements in the fill factor of solar cells was also observed.

REALIZED OR ANTICIPATED BENEFITS

ART is seeking PV manufacturers to use and participate in further development of the DLN technology. Any commercialization arrangements will bring revenues and high technology jobs to New York State. ART has already added four positions related to DLN technology during the last year, and plans to add more.

TECHNOLOGY TRANSFER ACTIVITIES

ART is seeking customers for the technology through direct mailings and telephone calls.

FUNDING	TOTALS
NYSERDA	$99,788
Advanced Refractory Technologies	23,558
Golden Photon	20,000
SUNY/Buffalo	6,758
Direct Gain	7,500
Conserval	7,500
TOTALS	$165,104

Contractor: Advanced Refractory Technologies, Inc.
Site: Buffalo, Erie County
Contract Duration: 3/96 - 3/97
Key Words: product development, solar, renewable, photovoltaics, coatings
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4306-ERTER-ER-96

-> Titanium Dioxide Photovoltaic Cell Product and Market Development

Identify products that can incorporate new type of solar cell.

BACKGROUND

A new type of solar cell based on titanium dioxide (TiO_2) was developed at the Ecole Polytechnique Fédérale de Lausanne, Switzerland. This solar cell is based on technology more closely related to photosynthesis than solid-state electronics. This technology is promising for solar cells because the materials required are low-cost, very little material is needed, and the cells are easy to make in the laboratory. In addition, TiO_2 solar cells can be made in a variety of colors and levels of transparencies to meet customer requirements.

ACCOMPLISHMENTS

Potential markets, products, and partners were identified and developed. Because of the current state of TiO_2 technology, the focus was on developing small, indoor applications with relatively short lives. These applications can be commercialized in the very near term. As long-term outdoor stability is demonstrated and improved, larger outdoor applications can be developed. Direct Global Power identified four New York Firms with the potential for integrating TiO_2 solar cells into their products.

FINDINGS AND CONCLUSIONS

This project determined that there are strong markets for TiO_2-based solar cells.

REALIZED OR ANTICIPATED BENEFITS

This project is expected to result in several New York State-manufactured products incorporating TiO_2 solar cells. It may also lead to manufacturing TiO_2-based solar cells in New York State.

TECHNOLOGY TRANSFER ACTIVITIES

This project contacted 638 New York companies to determine the potential of incorporating TiO_2-based solar cells into their products.

FUNDING	TOTALS
NYSERDA	$ 50,000
Direct Global Power	30,000
Standish	50,000
National Renewable Energy Lab.	300,000*
TOTALS	$430,000

* While a CRADA with NREL was never signed, NREL performed the anticipated work developing the TiO_2 technology.

Contractor: Direct Global Power, Inc.
Site: Cottekill, Ulster County, and Schenectady, Schenectady County
Contract Duration: 2/96 - 5/97
Key Words: renewable, product development, solar, photovoltaics
Project Manager: Jennifer Harvey (518) 862-1090, ext. 3264
Program: Energy Resources
Subprogram: Solar/Wind
Contract No.: 4348-ERTER-ER-96

-> Energy and Material Conservation in the Forest Products Industry

Develop applied research program that investigates energy issues affecting New York State's forest products industry.

BACKGROUND
The forest products industry is a major one in New York State. By addressing the energy-efficiency and production needs of the industry, economic benefits can accrue to the State.

OBJECTIVES
To: (1) establish a manageable multidisciplinary research program that meets the high research standards of the academic community, provides a foundation for education, and addresses the defined needs of the funding organizations; (2) administer an integrated program that offers long-term stability to those performing the research (3) strengthen research in science and engineering to enhance future industrial technological opportunities; (4) improve the linkages between universities and industrial firms; and (5) stimulate the development and commercialization of university technologies through a partnership with the State, the university, and business/industry.

DESCRIPTION
The program is designed to support three to four major projects the first year; a series of small exploratory research projects for concept definition, technology proof-of-concept, and technology support; and information-transfer events. Two scoping workshops were held: one to explore the market potential of biofuels and one to identify the needs/opportunities for new energy technologies for the pulp and paper industry.

BENEFITS
Bringing the research capabilities of the State University of New York College of Environmental Science and Forestry to bear on the energy and environmental needs of New York's significant forest products industry can provide the State with substantial economic development benefits.

SCHEDULE AND STATUS
The final project for the program was approved. The objective of the work is to evaluate the effects of applying chicken manure to willow plantations at Wegmans egg farm.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$620,000	$4,500	$624,500
Niagara Mohawk Power Corp.	600,000	0	600,000
SUNY-ESF (in kind)	115,198	0	115,198
Northeast Regional Biomass Program	49,231	0	49,231
TOTALS	$1,384,429	$4,500	$1,388,929

Contractor: State University of New York College of Environmental Science and Forestry
Site: Syracuse, Onondaga County
Contract Duration: 7/92 - 12/98
Key Words: university, assist business, biomass
Project Manager: Jeff Peterson (518) 862-1090, ext. 3288; Judy Jarnefeld, ext. 3293
Program: Energy Resources
Subprogram: Biomass
Contract No.: 1719O-ERER-ER-92

-> Levulinic Acid Demonstration Pilot Plant

Produce high-value chemicals from biomass.

BACKGROUND

Biofine, in cooperation with NYSERDA, has developed a technology to convert lignocellulosic biomass to the chemical intermediate levulinic acid, with furfural, formic acid, and lignin as coproducts. Using proven chemical routes, levulinic acid can be converted to a wide range of marketable, high-value chemicals such as tetrahydrofuran and succinic acid. Formic acid and furfural have established commodity markets. Lignin can be used as a boiler fuel or possibly converted to a marketable product such as a soil additive. Waste fibers from pulping and paper-making operations appear to be ideal feedstocks for the Biofine process, as they are finely divided, available as a dilute slurry, and predominately cellulosic.

OBJECTIVE

To design, build, and operate a prototype plant to demonstrate the commercial feasibility of Biofine's technology. Construction will be completed in the first year. Biometics, Inc. will manage the project; Biofine, Inc. will supply the technology; and Great Lakes Chemicals will provide analytical services and a market for the products.

DESCRIPTION

This three-year project will: (1) design; (2) procure; (3) construct; and (4) operate a small (one-dry-ton/day paper sludge) prototype plant to convert wastepaper sludge to levulinic acid, furfural, and combustible tars; (5) optimize the plant with operating data, (6) project economic data for a commercial-scale plant; and (7) perform market assessments. In new work, the plant will be operated with MSW-derived feedstock. Also, product from the plant would be sent to Pacific Northwest National Laboratory for development of a method to convert the levulinic acid to methyltetrahydrofuran (MTHF), a potential fuel additive. In a related project, NYSERDA is working with Biofine and the National Renewable Energy Laboratory to develop new uses for chemicals derived from levulinic acid. This Cooperative Research and Development Agreement will help support the overall effort to establish a levulinic acid manufacturing facility in New York State.

BENEFITS

Economically converting papermill-waste fibers to high-value chemicals could offer significant benefits to New York State, including a waste-management alternative to landfilling, potential displacement of materials that otherwise would be derived from petroleum, and a new biomass industry. The Biofine technology may give New York State paper mills a competitive advantage.

SCHEDULE AND STATUS

Construction at a site in South Glens Falls was completed in May 1997. The plant is operating. Demonstration with MSW feedstock is scheduled for the spring of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$559,000	$100,000	$659,000
U.S. Department of Energy	2,553,100	0	2,553,100
Biofine	700,000	0	700,000
Pencor	0	160,000	160,000
Northeast Regional Biomass Program	0	60,000	60,000
Great Lakes Chemicals	1,055,000	0	1,055,000
TOTALS	$4,867,100	$320,000	$5,187,100

Contractor: Biometics, Inc., Waltham, MA
Site: South Glens Falls, Saratoga County
Contract Duration: 11/95 - 11/99
Key Words: product development, renewables, biomass
Project Manager: Judy Jarnefeld (518) 862-1090 ext. 3293
Program: Energy Resources
Subprogram: Biomass
Contract No.: 4204-ERTER-ER-96

-> Development of High-Value Derivatives for Levulinic Acid

Support levulinic acid markets.

BACKGROUND

Biofine, Inc. of Waltham, Massachusetts, patented a process to convert biomass into levulinic acid (LA). Biofine, with support from NYSERDA, the U.S. Department of Energy, Great Lakes Chemical Corporation, and Biometics, Inc., is building a one-ton-per-day demonstration plant to manufacture LA in upstate New York.

Levulinic acid is a highly versatile chemical intermediate, sold at $4-6 per pound. As the scale of LA manufacturing increases, production costs will drop from $0.32 to $0.04 per pound. In the short term, LA could be sold as is or converted through proven routes to higher-value derivatives such as diphenolic acid, succinic acid, pyrrolidines, pyrrolidones, ketals, and agricultural chemicals such as delta amino LA. Over the longer-term, Biofine would produce larger-volume chemicals such as 1, 4 butanediol, gamma butyrolactone, and tetrahydrofuran. Ultimately, LA at $0.04 to $0.05 per pound could be used to produce the gasoline oxygenate additive methyl tetrahydrofuran. LA's high price has inhibited large-scale use. The overall effort to establish an LA manufacturing facility in NYS, therefore, supports work on the conversion of LA into derivative chemicals. To fulfill obligations under our Cooperative Research and Development Agreement (CRADA) with the National Renewable Energy Laboratory (NREL), NYSERDA will join forces with Biofine to explore LA derivatives.

OBJECTIVES

To: (1) develop and optimize methods for producing derivative chemicals from LA and develop new market applications for the derivatives, resulting in an expanded market.

DESCRIPTION

NREL will provide in-house services in a separate agreement. NYSERDA's and Biofine's portion of the work will occur in two overlapping parts. Part I will study markets. In Part II, a university or company will be selected with a Request for Proposals (RFP) to optimize synthesis routes. In Part I, the contractor will: (1) identify potential end-use applications for value-added derivatives of LA; (2) perform a preliminary check on the viability of manufacturing processes and costs for the products; (3) visit major product users and prospects; and, (4) help to refine the RFP goals and select research partners. The Part II contractor will: (1) identify new market applications for derivatives selected in Part I and (2) optimize processes or new technologies to produce these derivatives from LA.

BENEFITS

Economically converting biomass to high-value chemicals could offer significant benefits to New York State, including a waste-management alternative to landfilling, potential displacement of materials that otherwise would be derived from petroleum, and new jobs in our emerging biomass industry.

SCHEDULE AND STATUS

NREL has made progress on making derivatives of levulinic acid. Diphenolic acid was selected as the derivative in Part I and Rensselaer Polytechnic Institute was selected and has begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$40,000	0	$150,000
NREL*	160,000	0	160,000
Biofine	40,000	0	110,000
TOTALS	$240,000	0	$420,000

* The $160,000 provided by NREL is part of the CRADA among the three parties.

Contractor: Biofine, Inc., Waltham, MA
Site: Statewide
Contract Duration: 11/96 - 8/98
Key Words: product development, biomass, renewables
Project Manager: Judy Jarnefeld (518) 862-1090, ext. 3293
Program: Energy Resources
Subprogram: Biomass
Contract No.: 4487-ERTER-ER-97

-> Feasibility of Biomass-Based Chemical Manufacturing at the former Miller Brewery

Produce high-value chemicals from biomass at site with existing infrastructure.

BACKGROUND

Biofine, in cooperation with NYSERDA, has developed a technology to convert lignocellulosic biomass to the chemical intermediate levulinic acid, which can be converted to a wide range of marketable, high-value chemicals.

A large facility in theCity of Fulton was used to brew Miller Beer until 1993. The 423-acre property is now unused and for sale or lease. It has extensive infrastructure, including utilities, service roads, railroad lines, a power boiler complex, and a wastewater treatment plant. A stand-alone 100,000-square-foot building on the property would be suitable for housing a 500-ton/day levulinic acid manufacturing facility.

OBJECTIVE

To develop part of the property to manufacture levulinic acid at commercial scale, using existing infrastructure to the extent possible. On-site use of the solid fuel by-product would create excess energy that could be used by other co-locating tenants.

DESCRIPTION

Phase One objectives include identifying and investigating: (1) the quantities, qualities, and costs of the biomass waste available for use in the facility, including investigation of long-term biomass supply contracts. Potential biomass sources are agricultural wastes, waste wood, cellulosic wastes such as paper mill sludge, and municipal sludges. Samples of promising feedstocks will be obtained; (2) permitting needs; (3) on-site wastewater treatment capabilities; (4) the feasibility of restarting a dormant, on-site boiler to supply steam and burn the solid by-product; (5) the feasibility of installing a steam line from the power generation building to the proposed manufacturing building; (6) economic incentives available from the property owner or government; and (7) a likely time line for Phase Two and commercialization.

Phase Two, which is not part of this project, would determine the optimum feedstock mix based not only on cost and supply issues, but also on the ratio of levulinic acid product (from cellulose in feed) to furfural by-product (from hemicellulose). Phase Two may also include market evaluations of the potential to convert the levulinic acid into derivatives on site. Completion of Phase Two would include engineering and market development, as well as preparation of pro formas that would be used to obtain financing for a full-scale facility.

BENEFITS

Economically converting biomass to high-value chemicals could offer significant benefits to New York State, including a waste-management alternative to landfilling, potential displacement of materials that otherwise would be derived from petroleum, and a new biomass industry. The Biofine technology may give New York State paper mills or other generators of waste biomass a competitive advantage.

SCHEDULE AND STATUS

A pilot plant is operating in South Glens Falls. The final report is in progress.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$15,000	$15,000
Pencor Environmental Ventures, Inc.	0	15,000	15,000
TOTALS	0	$30,000	$30,000

Contractor: Pencor Environmental Ventures, Inc.
Site: Fulton, Oswego County
Contract Duration: 11/97-6/98
Key Words: renewables, biomass
Project Manager: Judy Jarnefeld (518) 862-1090 ext. 3293
Program: Energy Resources
Subprogram: Biomass
Contract No.: 4679-ERTER-ER-98

-> Using Diphenolic Acid to Prepare Polymers

Explore large-volume, short-term applications for diphenolic acid.

BACKGROUND

This effort is intended to fulfill obligations under NYSERDA's Cooperative Research and Development Agreement (CRADA) with the National Renewable Energy Laboratory (NREL) and Biofine, Inc. to study derivatives of levulinic acid. The goal is to explore large-volume, short-term applications for diphenolic acid (DPA), particularly to displace currently marketed bisphenol A BPA products.

OBJECTIVE

To explore DPA/BPA copolycarbonate and copolyarylate combinations that could partially or wholly displace BPA formulations. Within these combinations, the researchers will also study the effect of dibrominated DPA with respect to its potential use in fire retardants.

New uses for DPA will focus on two products: a highly branched polyester and ionomers. The highly branched polyester is expected to be more soluble and less viscous than linear polyester, and would be produced using documented polymerization processes. Ionomers would be formed by introducing thermally reversible cross-links that could enhance a product's strength and impact resistance.

DESCRIPTION

Phase One includes: (1) preparation of DPA/BPA copolycarbonates, copolyarylates, and branched polyesters; (2) a comparison of the properties of DPA/BPA combinations with the properties of relevant BPA products such as Dupont's Arylon or GE's Lexan; (3) a preliminary evaluation to determine the practical aspects of polymerization, including control of molecular weight, economics, practicality of the process, and resultant properties; (4) Preparation and evaluation of brominated derivatives of promising DPA/BPA copolymers, particularly through use of dibromoDPA, and evaluation of potential fire-retardance properties; (5) preparation of ionomers; (6) literature review; and (7) Preparation of samples of the most promising candidates for evaluation by potential customers. Phase Two includes: (1) preparation of DPA/BPA copolysulfones; (2) preparation of DPA/BPA copoly(ether-ether-ketone)s; and (3) refinements to the most promising candidates in either Phase One or Phase Two, including fine-tuning BPA/DPA percentages and performing long-term exposure testing.

BENEFITS

Identification of expanded market opportunities for DPA would create growth opportunities for the Biofine levulinic acid technology, leading to economic development in NYS, better use of waste biomass, and potential displacement of materials that otherwise would be derived from petroleum.

SCHEDULE AND STATUS

Synthesis of DPA compounds has begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$112,772*	$112,772
Rensselaer Polytechnic Institute	0	32,506	32,506
TOTALS	0	$145,278	$145,278

*Includes only a portion of NYSERDA's $150,000 commitment to the CRADA. Does not include commitments of other CRADA members: $150,000 from NREL and $110,000 from Biofine.

Contractor: Rensselaer Polytechnic Institute
Site: Troy, Rensselaer County
Contract Duration: 10/97 - 10/99
Key Words: renewable, university, biomass, industrial, product development
Project Manager: Judy Jarnefeld (518) 862-1090, ext. 3293
Program: Energy Resources
Subprogram: Biomass
Contract No.: 4682-ERTER-ER-98

Identify high-value uses for biomass.

BACKGROUND

A recent National Renewable Energy Laboratory report identifies a number of high-volume chemicals that could be produced from biomass and compete in the current market. Expanding these to include specialty chemicals and other low-volume, high-value products would make energy, environmental, and economic sense for New York State. NYSERDA's biomass program focuses on converting low-cost feedstocks into energy-intensive chemicals. Producing levulinic acid from paper sludge is one opportunity NYSERDA has identified as having the potential to support an emerging biomass industry. Our goal is to find other chemical products that could be produced from New York State biomass.

OBJECTIVES

To further the biomass-to-chemicals industry in New York State. Specific objectives are to: (1) identify potential high-value uses for selected biomass wastes and (2) identify companies capable of investing in research and commercialization activities, such as construction of manufacturing facilities. The result will be a listing of New York State biomass companies and a description of promising biomass-based chemicals.

DESCRIPTION

The contractor will: (1) search databases such as Chemical Abstracts for information on state-of-the art technologies for producing chemicals from biomass, (recognizing that choices of products/technologies are linked to biomass feedstocks); (2) search patents for potential product opportunities; identify new business opportunities to produce specific value-added chemicals, especially from cellulosic biomass such as wood, paper sludge, or low-value scrap paper; (3) perform a preliminary assessment of target costs for these chemicals; (4) identify New York State companies that use biomass in chemical manufacturing; (5) identify New York State companies in supporting industries such as biotechnology or enzyme manufacturing; (6) identify New York State companies producing chemicals that could be manufactured from biomass or using bio-processes to manufacture chemicals, or out-of-State manufacturers of biomass-derived chemicals that could manufacture those chemicals in New York State; (7) delineate the products made by those companies; (8) determine New York State companies' interest in investing in new technologies; and (9) analyze New York State companies' capabilities. An important product of the work will be a list of New York State companies that includes key contact names, financial performance records, status of R&D departments, and a measure of in-house innovation compared to others in the industry.

BENEFITS

Economically converting waste biomass to high-value chemicals could offer significant benefits to New York State, including a waste-management alternative to landfilling, potential displacement of materials that otherwise would be derived from petroleum, and new jobs in our emerging biomass industry.

SCHEDULE AND STATUS

Work so far has centered on database and patent searches. Some companies have been identified. A draft report is expected in the summer of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$15,000	0	$15,000
CONEG	30,000	0	30,000
TOTALS	$45,000	0	$45,000

Contractor: A. A. Pope and Co.
Site: Stanfordville, Dutchess County
Contract Duration: 6/96 - 7/98
Key Words: biomass, renewables
Project Manager: Judy Jarnefeld (518) 862-1090, ext. 3293
Program: Energy Resources
Subprogram: Biomass
Contract No.: 4400-ERTER-ER-97

-> Beneficial Use of Sludge through Production of E-fuel

Construct and operate commercial-scale plant for E-fuel pellets as alternative to stoker coal.

BACKGROUND

The 1990 U.S. Clean Air Act Amendments aim to reduce sulfur dioxide (SO_2) emissions by electric utilities. One way to do so is to use low-sulfur fuel such as paper-mill sludge, a renewable resource. E-fuel pellets, made from a mixture of coal fines and paper sludge, may be less costly than correctly sized stoker-grade coal.

OBJECTIVES

To construct and operate a commercial-scale E-fuel plant that can provide an economical alternative to coal for New York State's stoker boilers.

DESCRIPTION

The contractor will: (1) demonstrate the pilot-scale production and use of E-fuel with paper-mill sludge as a component; (2) evaluate the cost of E-fuel production in New York State; (3) evaluate boiler emissions during E-fuel use, as well as potential emission reductions; (4) develop a market for E-fuel; and (5) construct a commercial-scale E-fuel plant.

BENEFITS

Potential benefits to New York State include lower fuel costs for stoker boilers, lower paper-mill sludge-disposal costs, and the retention of up to 10 direct and 10 support jobs in New York State for each facility using 25,000 tons per year of paper sludge to make 30 tons per day (100,000 tpy) of pellet fuel. Liability for long-term sludge disposal would be reduced, and 3,000 tons per year of imported fossil fuels displaced. It is anticipated that emissions of SO_2, and nitrogen oxides (NO_x) would be reduced by 26% and 12%, respectively. In addition, 66,000 cubic yards of landfill space would be saved each year.

SCHEDULE AND STATUS

A draft report has been submitted for Phase One.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$500,000	0	$500,000
New York State Electric & Gas Corp.	1,377,641	0	1,377,641
Paper mill TBD	6,760	0	6,760
CQ, Inc.	1,228,661	0	1,228,661
TOTALS	$3,113,062	0	$3,113,062

Contractor: New York State Electric & Gas Corp. (subcontractor: CQ, Inc.)
Site: Greenidge Station, Yates County
Contract Duration: 10/96 - 2/99
Key Words: renewable, assist business, biomass
Project Manager: Judy Jarnefeld (518) 862-1090, ext. 3293
Program: Energy Resources
Subprogram: Biomass
Contract No.: 4282-ERTER-ER-96

Use cellulose hydrolysis as waste-treatment alternative for packaging materials.

BACKGROUND
Solid waste planners are not always aware of new technologies or options for disposal. Some waste streams have special problems (e.g., gable-top paper milk cartons cannot be recycled easily because the paper is typically coated with plastic, making fiber-recovery difficult). Cellulose hydrolysis may be used to treat these waste streams.

OBJECTIVE
To inform solid-waste planners about cellulose hydrolysis, a potential alternative to treat cellulosic packaging materials.

DESCRIPTION
The contractor will: (1) collect information on cellulose hydrolysis of packaging materials and (2) present the information to the solid waste community so they can determine the viability of cellulose hydrolysis as a disposal option for their particular situations.

BENEFITS
New York State would benefit from improved disposal options for cellulosic packaging wastes such as paper milk cartons.

SCHEDULE AND STATUS
The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA Petroleum Overcharge Funds	$150,000	0	$150,000
TOTALS	$150,000	0	$150,000

Contractor: Rochester Institute of Technology
Site: Rochester, Monroe County
Contract Duration: 11/94 - 10/98
Key Words: renewable, biomass
Project Manager: Judy Jarnefeld (518) 862-1090, ext. 3293
Program: Energy Resources
Subprogram: Biomass
Contract No.: 4241-ERTER-POP-96

-> Producing CMA from Waste Cellulosic Biomass

Produce high-value chemicals from renewable energy resources.

BACKGROUND

Using chloride salts for roadway deicing causes serious corrosion and environmental problems in "frost belt" areas, damaging automobiles, concrete, asphalt, bridges, and underground cables. Calcium magnesium acetate (CMA), a biodegradable deicing salt, may replace sodium chloride for selected applications with less or no negative side effects; however, CMA, which is currently expensive to produce, requires substantial quantities of acetic acid derived from natural gas.

OBJECTIVE

To commercialize CMA production. The Ohio researchers hope to develop a $265/ton CMA system; the Arkansas researchers are aiming for $137/ton.

DESCRIPTION

Two projects, one at Ohio State University and one at Bioengineering Resources, Inc. in Arkansas, completed Phase I, and attempted to meet Phase-II funding criteria, which included involving New York industries. The Ohio project derives acetic acid from cheese whey, while the Arkansas project uses sewage sludge. Both processes are adaptable to other biomass-waste streams. While both use anaerobic fermentation to produce the acetic acid, the Ohio project uses a co-culture and a novel immobilized-cell continuous bioreactor, while the Arkansas project uses a pure culture of a novel organism (ERI2). The Arkansas researchers use sludge gasified with traditional technology. The syngas (CO, CO_2, and H_2) then is fermented into acetic acid using a proprietary process. Phase I of each project included laboratory optimization in small reactors (0.5-L and 2-L for Ohio and Arkansas, respectively). In Phase II, researchers will design and construct a process-development unit to produce pound quantities of CMA.

BENEFITS

A CMA-production facility in New York State would promote economic development, provide an alternative use for cheese whey or other waste biomass, and supply CMA deicing salt for the "frost belt." Using CMA would avoid the adverse side effects of sodium chloride application.

SCHEDULE AND STATUS

Phase I work has been completed on both projects. NYSERDA and the Federal Highway Administration (FHA) are each separately sponsoring Phase II of the Ohio project, while the FHA alone will support the Arkansas project in Phase II. The Ohio project has gained significant support from the New York dairy industry. Phase II work in Ohio is near completion. A draft final report has been submitted.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$135,000	0	$135,000
Ohio State University	73,643[1]	0	73,643
Glitsch Technology Co.	35,000	0	35,000
Kraft General Foods	65,000	0	65,000
Other industry (Phase II)	25,000	0	25,000
Federal Highway Administration	146,627	0	146,627
TOTALS	$480,270	0	$480,270

[1] Does not include in-kind contributions from industrial sponsors in Phase I.

Contractor: Ohio State University (Phase II)
Site: Columbus, Ohio
Contract Duration: Phase I: 5/93 - 4/94; Phase II: 4/95 - 7/98
Key Words: renewable, biomass, environmental, fermentation, high-value chemicals, CMA, industrial process
Project Manager: Judy Jarnefeld (518) 862-1090, ext. 3293
Program: Energy Resources
Subprogram: Biomass
Contract No.: 4161-ERTER-ER-95

-> Biomass Fuel Processing and Drying

Prepare biomass for co-firing with coal through drying and particle-size reduction.

BACKGROUND

The 1990 Clean Air Act Amendments aim to reduce SO_2 emissions by electric utilities. One way to do this is to use low-sulfur fuel such as wood biomass, a renewable resource with a sulfur content of less than 0.1 percent. This project will attempt to increase the availability of wood feedstocks appropriate for a pulverized-coal boiler by preparing previously unacceptable wood through drying and particle-size reduction. This project will complement an ongoing project to modify a pulverized-coal plant to accept pulverized-wood fuels.

OBJECTIVE

To expand on previous research conducted by the Electric Power Research Institute (EPRI) and explore new applications of existing processing technologies. The goal is to inform other pulverized-coal units about technical limitations and required modifications to convert to wood/coal-blended fuels. Currently, suitable pulverized-wood fuel is limited to sawmills and manufacturing facilities that produce wood waste with a fine particle size. This project could lead to wider availability of wood feedstocks. Ultimately, the goal is to design an optimized system for wood-fuel preparation and handling in pulverized-coal boilers.

DESCRIPTION

The contractor will: (1) identify processes and vendors for size-reduction equipment used by the pulp and paper, fiber- and particle-board industries, evaluating it for its suitability to the power industry; (2) study new applications of drying technologies, with particular emphasis on using existing energy sources in the power plant, including steam, flue gases, or hot air, (3) select vendors for a demonstration system to be installed at New York State Electric & Gas Corp.'s Greenidge Station; (4) run the demonstration facility for six months to gather data on maintenance, reliability, cost-effectiveness, energy efficiency, and the logistics of using this equipment in a new application.

BENEFITS

New York State would benefit from improved disposal options for wastes from the forest-products industry. In previous work, adding wood fuel to pulverized-coal boilers reduced sulfur and NO_x emissions. Currently, suitable pulverized-wood fuel is limited to sawmills and manufacturing facilities that produce wood-waste with a fine particle size. This project could lead to reductions in wood-waste disposal.

SCHEDULE AND STATUS

Processing equipment was selected and installed. Drying equipment was not economical. Test burns on wood, including fast-growing willow, were conducted to gather data on the effectiveness of the size-reduction equipment. A dust collection system was installed. The final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$100,000	0	$100,000
Electric Power Research Institute	183,015	0	183,015
ESEERCO	100,000	0	100,000
New York State Electric & Gas Corp.	100,000	0	100,000
TOTALS	$483,015	0	$483,015

Contractor: Electric Power Research Institute (subcontractor: NYS Electric & Gas Corp.)
Site: Greenidge Station, Yates County
Contract Duration: 9/95 - 6/98
Key Words: renewable, assist business, biomass
Project Manager: Judy Jarnefeld
Program: Energy Resources (518) 862-1090, ext. 3293
Subprogram: Biomass
Contract No.: 4155-ERTER-ER-96

-> Empire Biopower Consortium -- Biomass Systems Implementation

Prepare for commercial introduction of biomass plantations.

BACKGROUND

NYSERDA has been a major supporter of short-rotation forestry using both willow and hybrid poplar. The concept of dedicated willow plantations is now ready for commercial introduction. A consortium of New York State Electric & Gas (NYSEG), Niagara Mohawk Power Corporation (NMPC), NYSERDA, and others has been funded by the U.S. Department of Energy (U.S. DOE). U.S. DOE will contract with NMPC. NYSERDA will sign a contract with SUNY-ESF.

OBJECTIVES

To enhance New York State's ability to produce biomass on a large scale, ensure a long-term supply, and mitigate environmental concerns about harvesting forests. Specifically, to: (1) evaluate potential problems with scale-up when planting many acres of willow, (2) determine the costs and benefits of co-firing willow or waste wood blends in a pulverized coal boiler, and (3) establish a private cooperative to manage the plantations and provide wood to power plants.

DESCRIPTION

Phase One is a six-month preparation for Phase Two that involves final engineering design and organization of the venture. In Phase One, SUNY-ESF will: (1) explore fuel supplies for NYSEG's power stations, (2) continue crop research, (3) develop an outreach program for Phase Two growers, (4) provide field trial support, and (5) provide support for overall risk management. Phase Two is site preparation and planting of approximately 100 acres of willows by 1998 on private farm land, with up to 3,000 planted acres targeted by the year 2000. NYSEG will complete its investigation of wood/coal co-firing, and install a full-scale wood-handling and preparation system at Greenidge Station. A private cooperative venture will be established to manage the wood-supply infrastructure. To support further planting, NYSEG will offer the farmers a fixed price per acre of willow regardless of productivity levels. SUNY- ESF will supply the technical support necessary to prepare, plant, and manage the willow sites.

BENEFITS

Supporting the market for biomass such as willow will allow New York's farmers to add willow fiber to their list of viable cash crops. Environmental benefits are associated with reducing the coal consumption at New York's power plants. In addition, although willow plantations are not as diverse as natural forest, the National Audubon Society feels willow can add diversity for birds and wildlife compared to traditional crops. In particular, willow plantations can serve as connections between forested areas.

SCHEDULE AND STATUS

The project is under way. Growers are being identified.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$80,000	$90,000	$400,000
Niagara Mohawk Power Corp.	224,000	0	2,402,000
SUNY-ESF	55,330	46,917	561,700
New York State Electric & Gas Corp.	0	0	1,310,000
U.S. Department of Energy	0	336,942	4,959,000
U.S. Department of Agriculture	0	0	1,200,000
Other Consortium members	0	0	2,907,300
TOTALS	$359,330	$473,859	$13,740,000

Contractor: SUNY-ESF (NMPC contracts with U.S. DOE)
Site: Syracuse, Onondaga County
Contract Duration: 10/96 - 7/02
Key Words: assist business, renewable, biomass
Project Manager: Judy Jarnefeld
Program: Energy Resources (518) 862-1090, ext. 3293
Subprogram: Biomass
Contract No.: 4163L-ERTER-ER-97

-> Effects of Air Quality on Ecosystems for the Commercial Forest Resource of the Adirondack Mountains

Determine impact of acidic precipitation on forest ecosystem of New York's Adirondack region.

BACKGROUND

The impact of acidic precipitation on the forest ecosystem has been a major issue for the past 10 years. This project is experimentally manipulating four sites across the Adirondacks for a period of three years. Various levels of nitrates, sulfates, and base cations will be added to the forest system and the resulting impact measured.

OBJECTIVE

To ascertain the response of the forest to an increase in acidic deposition and, through monitoring the system as it recovers, determine the recovery rate of the ecosystem with a decrease of acidic deposition.

DESCRIPTION

At each of four sites in the Adirondacks, 27 test plots were located and, following a predetermined design, sulfur, nitrogen, base cations, and litter were added in different amounts. Acidic inputs were assessed by examining foliar nutrient status on control and fertilized plots. These results will be examined further using information from models that predict how changing inputs will affect forest health and acidification of lakes. In the final year of the study, when chemical additions have been terminated, the systems' recovery times from the acidic additions will be evaluated.

BENEFITS

Wood is one of the primary sources of renewable energy in New York State, the long-term availability of which can be ensured through a greater understanding of the forces that have an impact on it. Also, because the products of combustion are considered to be precursors to acid precipitation, it is important to understand the forest ecosystem and the impact acid precipitation has on it, watersheds, and lakes. This experiment will verify models developed to predict forest ecosystem impacts.

SCHEDULE AND STATUS

A conference, *Adirondacks and Beyond: Understanding Air Quality and Ecosystem Relationships -- A Conference to Explore Science and Policy Linkages*, was held on November 12-13, 1997. Proceedings will be published this summer. The draft final report for the project has been reviewed and will be published in the fall.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$596,840	0	$596,840
ESEERCO	620,000	0	620,000
Nat'l. Comm. on Air & Stream Improvement	50,000	0	50,000
SUNY-ESF	582,713	0	582,713
TOTALS	$1,849,553	0	$1,849,553

Contractor: State University of New York College of Environmental Science and Forestry (ESF)
Site: ESF, Onondaga County; Huntington Forest, western Essex and eastern Hamilton counties; Pack Demonstration Forest, Warren County; Woods Lake and Pancake-Hall Creek, Herkimer County
Contract Duration: 1/90 - 12/97
Key Words: university, environment, utilities, biomass
Project Manager: Jeff Peterson (518) 862-1090, ext. 3288
Program: Energy Resources
Subprogram: Biomass
Contract No.: 1513Q-ERER-ER-91

-> Upgrading Poplar Biomass to Industrial Polysaccharides

Investigate producing useful polysaccharides from wood.

BACKGROUND

Converting biomass to useful chemicals has been one of NYSERDA's long-term focuses. Advances in process engineering have provided novel avenues to refine lignin, cellulose, and hemicellulose (xylan). The later heteropolymeric material is of little commercial value, but can most readily be depolymerized into its constituent components, notably xylose, xylose oligomers, and other less predominant hexoses and pentoses. Considering that xylan comprises approximately 20-30% of the dry weight of most woody plant species, this project focused on the bioconversion of xylose to microbial polysaccharides.

ACCOMPLISHMENTS

The research activities demonstrated that the selection and use of specific bacterial strains can mediate the biosynthesis of potentially valuable, water-soluble, high-molecular-weight, anionic heteropolysaccharides from hemicellulose. Such materials possess rheological properties that can make them applicable to the food, cosmetic, pharmaceutical formulation, and fertilizer delivery industries.

FINDINGS AND CONCLUSIONS

The bioconversion studies have demonstrated the production of extracellular polysaccharide (EPS) from xylose and xylose-rich hemicellulose. *Pseudomonas* EPS is currently being investigated at the Tennessee Valley Authority for fertilizer pellets, to delay or sustain fertilizer release in the environment.

REALIZED OR ANTICIPATED BENEFITS

The research team made important strides in understanding the conversion of hemicelluloses to useful products. Realization of this work's full benefits will not be felt until the techniques are transferred to the private sector.

TECHNOLOGY TRANSFER ACTIVITIES

Eight papers were published in refereed journals as a result of this research. The project team continues to visit biotechnology firms in New York State to explore moving the work from academic to industrial laboratories.

FUNDING	TOTALS
NYSERDA	$312,332
Niagara Mohawk Power Corp.	20,000
Tennessee Valley Authority	10,000
SUNY-ESF	341,757
TOTALS	$684,089

Contractor: State University of New York College of Environmental Science and Forestry (SUNY-ESF)
Site: Syracuse, Onondaga County
Contract Duration: 2/89 - 6/97
Key Words: university, biomass
Project Manager: Jeff Peterson (518) 862-1090 ext. 3288
Program: Energy Resources
Subprogram: Biomass
Contract No.: 1026-ERER-ER-89

Evaluate intensive willow tree cultivation to provide feedstock for producing energy.

BACKGROUND

The State University of New York College of Environmental Science and Forestry began studying the potential of willows for bioenergy in 1987. The short-term objective was to develop technology for growing willows that would be burned directly or gasified for energy production, or made into high-value chemicals. The long-term objective was to develop a willow biomass production and use industry. Willows were selected because of their rapid juvenile growth rates, ease of propagation, ability to resprout after cutting, and lack of susceptibility to Septoria canker, which caused serious damage to hybrid poplars in New York that were harvested on 5-10-year rotations.

ACCOMPLISHMENTS

Numerous experiments were completed with willows, and many more are still in progress. Studies on willow coppice physiology provided information to guide coppice timing for optimum regrowth. A study of preemergent herbicides that was done because forestry uses were excluded from the simazine label, the herbicide of choice for willows, helped to identify simazine alternatives. A spacing-fertilizer study with one willow clone showed there was no production advantage in planting at spacings denser than 1.5 ft. by 1.5 ft. A study of 300 willow clones representing eight species that showed large clonal variation in biomass production potential led to identification of native North American willow species with desirable characteristics for bioenergy production. This study currently serves as a clone bank. Continuing experiments include clone-fertilizer, spacing/cutting cycle, irrigation, clone-site, and genetic screening studies.

FINDINGS AND CONCLUSIONS

With fertilization, the most productive clone (SV1) yielded 16.4 oven-dried tons per hectare during the 5th (1991) growing season; this level was nearly attained during the 9th growing season. Large clonal variation in biomass production potential was observed annually, indicating that proper clone selection is critical. Fertilization with nitrogen, phosphorus, and potassium significantly ($P<0.05$) increased the rate at which trees attained their maximum production potential, with fertilized trees reaching their maximum one year earlier than non-fertilized trees. Large clone-by-fertilizer treatment interactions were observed. However, averaging all clones, fertilization did not result in a statistically significant increase in maximum annual production; most clones' survival was reduced by fertilization.

REALIZED OR ANTICIPATED BENEFITS

The project buildt the strong foundation of research data necessary for commercial introduction of short-rotation forestry.

TECHNOLOGY TRANSFER ACTIVITIES

Numerous technical papers have been published, as has a handbook to educate landowners about energy plantations. The program is being supported by the U.S. Department of Energy, Niagara Mohawk Power Corp., New York State Electric & Gas Corp., NYSERDA, and others in an effort to plant 1,000 acres of willow over the next five years.

FUNDING	TOTALS
NYSERDA	$227,826
ESEERCO	227,825
SUNY-ESF	350,988
Niagara Mohawk Power Corp.	20,000
TOTALS	$826,639

Contractor: SUNY College of Environmental Science and Forestry
Site: Tully and Syracuse, Onondaga County
Contract Duration: 11/91 - 6/97
Key Words: renewable, university, biomass, utilities
Project Manager: Jeff Peterson (518) 862-1090, ext. 3288
Program: Energy Resources
Subprogram: Biomass
Contract No.: 1737-ERER-ER-92

-> Modular Inclined-Screen (MIS) Demonstration - Green Island Hydroelectric Generating Station

Demonstrate technology to mitigate primary environmental impact of hydroelectric facilities.

BACKGROUND

The modular inclined screen (MIS) is a fish-diversion technology that provides flexibility for existing hydroelectric facilities. This is particularly important in New York, where half the State's hydroelectric sites will need to be relicensed by 2000. These facilities will be required to offer some form of fish-diversion technology to qualify for relicense.

OBJECTIVE

To demonstrate a technology that may economically mitigate a documented environmental impact associated with hydroelectric facilities.

DESCRIPTION

The MIS provides flexibility at any type of water intake and with different flow rates. The project includes design, fabrication, installation, and hydraulic and biological testing of the demonstration-scale MIS and strobe-light barrier. Green Island was selected due to the blueback herring's semiannual migration. The results of this demonstration will be used to assess the technology and its commercial potential. The test module is a half-size unit consisting of an entrance with trash racks, dewatering stop-log slots, an inclined wedgewire screen set at a shallow angle to the flow, and a bypass to direct diverted fish to a transport pipe. The test module is completely enclosed and designed to operate at water velocities ranging from 2-10ft/sec, depending on the species and life stages to be protected.

Testing includes hydraulic measurement, diversion capabilities of the strobe assembly, and biological performance of the screen. The MIS will be evaluated in terms of percent of fish diverted live (immediate survival), injury rates, and delayed mortality. Testing will occur over two seasons.

BENEFITS

Commercializing this technology may improve the environmental performance of New York State's hydroelectric industry while maintaining existing power-production levels.

SCHEDULE AND STATUS

The project has completed its second year of diversion-testing. The module was removed in the fall of 1996. The report has been prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$200,000	$100,000	$300,000
Niagara Mohawk Power Corp.	1,669,000	0	1,669,000
Electric Power Research Institute	763,000	0	763,000
ESEERCO	200,000	0	200,000
New England Electric System	50,000	0	50,000
California Dept. of Water Resources	50,000	0	50,000
TOTALS	$2,932,000	$100,000	$3,032,000

Contractor: Niagara Mohawk Power Corporation
Site: Green Island, Albany County
Contract Duration: 6/96-6/98
Key Words: renewable, utilities, product development, hydropower, regulations
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4035M-ERTER-ER-95

-> Gas-Operated Automatic Lift (GOAL) Petro Pump Demonstration

Demonstrate new technology to remove brine and other by-products from existing New York State natural-gas wells.

BACKGROUND

Many oil and gas wells were developed in southwestern New York during the early 1980s, when tax laws and oil and gas prices were more favorable for the operators. Those wells are now in the waning years of their economic life due to natural depletion, the decline in oil and gas prices, and normal increases in labor and other operating costs. The majority of gas wells drilled during that time were completed in the Whirlpool/Medina formations. They were generally equipped with 1-1/2" tubing that was set near the top of the perforated interval. The tubing served as a siphon string to help keep water off the formation. During the early life of these wells, this technique worked effectively. However, as the formation pressures deplete with time, the technique becomes less effective.

OBJECTIVE

To thoroughly evaluate the GOAL Petro Pump to determine its ability to improve productivity and extend the economic life of New York oil and gas wells.

DESCRIPTION

The GOAL Petro Pump's ability to increase the productivity, and extend the economic life, of two wells in Chautauqua County will be tested. As designed, the pump operates within the production casing of the well, removing well-bore fluids from the completed formation and lifting them to the surface. The efficient removal of well-bore fluids reduces back pressure on the producing formation, allowing it to readily release additional fluids into the well bore. The tool uses the well's own pressure to provide the lifting force, requiring no external forms of energy and thereby reducing operating costs. Records will be kept of pressure and production-rate data. A pre-engineering analysis of design changes required for application in New York will be completed. A report will be made available to other well operators through copies supplied by NYSERDA or at annual Independent Oil and Gas Association events.

BENEFITS

The tool should provide a cost-effective way to increase production from existing Medina, Queenston, and Bass Islands wells in New York State. Increased well productivity will help New York producers compete, increase property tax revenues, and provide indigenous natural gas to meet New York State demand.

SCHEDULE AND STATUS

The units are complete and are undergoing additional field-testing.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$49,995	0	$49,995
BEDCO, Inc.	102,336	0	102,336
TOTALS	$152,331	0	$152,331

Contractor: Brandywine Energy & Development Company, Inc. (BEDCO, Inc.)
Site: Chautauqua County (multiple sites)
Contract Duration: 4/96 - 10/98
Key Words: assist business, gas, production
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4319L-ERTER-ER-96

-> Natural Gas Liquefaction by Linear-Motor Pulse-Tube Refrigerator

Develop commercially viable cryogenic unit for well-site application.

BACKGROUND

The contractor has developed a reciprocating motion/AC electricity transducer called STAR™. The contractor's partner, Cryenco, is developing the orifice pulse-tube refrigerator (OPTR) for high-reliability, small-scale, cryogenic liquefaction. The resulting combination creates an electricity-run liquefier with only one moving part, making the package extremely reliable. The product has passed the proof-in-concept stage.

The natural gas industry relies on an economic model that must cover the cost of a gas-gathering system into a distribution pipeline. Lower-volume or remote wells may not justify the cost of a gathering system. This technology may offer an alternative to gathering systems.

OBJECTIVE

To develop a commercially viable cryogenic unit for well-site and other applications.

DESCRIPTION

The overall development plan for the STAR™-OPTR is divided into three phases: initial demonstration with system definition; first-generation full-scale prototype development; and a second-generation pre-production, multiunit test sequence leading to product sales. This project enables timely progress from laboratory demonstration of STAR™-OPTR's feasibility to a full-scale operating gas-liquefaction system. Phase 1 includes system definition, prototype construction, and field-demonstration.

BENEFITS

The company plans to produce the STAR™ motor in New York State. New York's indigenous natural gas industry will benefit from applying the technology to producing fields that require alternative transportation methods, which ultimately may increase the use of indigenous gas.

SCHEDULE AND STATUS

The unit is complete and undergoing performance testing.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$96,898	0	$96,898
Clever Fellows Innovation Consortium, Inc.	22,716	0	22,716
Cryenco	95,080	0	95,080
Gas Producer	2,000	0	2,000
TOTALS	$216,694	0	$216,694

Contractor: Clever Fellows Innovation Consortium, Inc.
Site: Troy, Rensselaer County, and Denver, Colorado
Contract Duration: 3/97-7/98
Key Words: product development, natural gas
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4493-ERTER-ER-97

-> St. Lawrence Lowlands Geologic Investigation

Investigate hydrocarbon potential of St. Lawrence Lowlands.

BACKGROUND

The St. Lawrence Lowlands, along with the upper Champlain Valley, form the southern edge of the St. Lawrence paleorift basin. Although there is natural gas production in Quebec, little exploration has been done in the New York zone.

OBJECTIVE

To assess the potential for economic accumulations of hydrocarbons in the St. Lawrence Lowlands region.

DESCRIPTION

This study will investigate the regional geology, hydrocarbon potential, past oil and gas industry activity, and technical and economic implications of future drilling and production activity. The project will: (1) collect and analyze relevant well data, including, but not limited to, drill reports, well logs, and well tickets; (2) collect and analyze remote-sensing data to identify hydrocarbon accumulations; (3) collect and analyze anecdotal information to assist in characterizing potential producing formations in the study area; and (4) prepare summary reports and presentations of the results of the investigation, with emphasis on geologic, engineering, and economic implications.

BENEFITS

If the study indicates the potential for hydrocarbons, the project may lead to further indigenous natural gas exploration and production activity.

SCHEDULE AND STATUS

The final report is being prepared. The results were presented at the IOGANY-NYSERDA Technical Seminar in September 1997.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$9,980	0	$9,980
TOTALS	$9,980	0	$9,980

Contractor: Dan Billman
Site: St. Lawrence, Franklin, and Clinton counties
Contract Duration: 1/96-5/98
Key Words: natural gas, exploration
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous
Contract No.: 4550-ERTER-ER-97

-> Chenango County Gas Exploration

Evaluate potential for natural gas production in Chenango County.

BACKGROUND

Recent advances in processing and interpretation techniques have demonstrated the feasibility of identifying and delineating stratigraphic oil and gas objectives worldwide. In particular, using improved surface-consistent statics, migration before stacking (Radial Transform), and detailed velocity analysis has enhanced the ability to image stratigraphic dip facies changes, allowing more detailed sequence stratigraphic interpretation of the subsurface. Data quality and display are vastly improved since the 1970s. Chenango County offers a number of potential hydrocarbon objectives, including the Marcellus Shale, the Oriskany Sandstone, Onondaga Limestone pinnacle reefs, and the Helderberg Sandstone.

OBJECTIVE

To determine the existence of target reservoirs for natural gas development in an area of Chenango County, New York using advanced reprocessing of existing seismic data and geologic reinterpretation.

DESCRIPTION

This project will acquire, reprocess, and reinterpret vintage 1973 vibroseis 24-fold Amoco seismic data in Chenango County using recent advancements in digital processing in the search for subtle stratigraphic anomalies (unconformities, reefs, channels, shoats) with an integrated processing/ interpretation approach to parameter selection (velocity analysis, phase correction). The stratigraphic lateral detail achieved allows for microsequence stratigraphic interpretation of facies changes associated with reservoir characteristics and, in some cases, direct hydrocarbon indication.

BENEFITS

The project will: (1) test the potential for natural gas production in Chenango County where current production is minimal, and (2) test the viability of reprocessing commercially available older seismic data to identify missed opportunities. With literally thousands of miles of seismic data available for New York State, successful application of this methodology could lead to increased exploration.

SCHEDULE AND STATUS

The project analysis is complete. A presentation is planned for July 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$49,995	$49,995
Kevin Cruz	0	48,649	48,649
TOTALS	0	$98,644	$98,644

Contractor: Kevin Cruz
Site: Chenango County
Contract Duration: 6/97-7/98
Key Words: natural gas, exploration
Project Manager: John Martin, (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous
Contract No.: 4620-ERTER-ER-98

-> Improved Recovery in the Naturally Fractured Queenston Formation Using Geologic/Engineering Analysis and Deviated-Well Technology

Demonstrate several advanced natural-gas production technologies in existing gas reservoir.

BACKGROUND

The Auburn field taps into the "tight" sandstone beds of the Queenston Formation in Central New York. The Upper Ordovician Queenston Shale formation includes red shale, red siltstone, and red sandstone. The formation was created as part of a large delta as the last recorded event of the Ordovician era in New York. Rocks of the Silurian Medina Group sit unconformably on top of the Queenston. The New York State Geological Survey estimates the reserves of the Queenston at 580 billion cubic feet. Much Queenston production is now considered marginal at best, partly due to the inconsistency of production from existing wells. Evidence suggests that the natural fracturing of the formation is the reason for this variability. Encountering natural fractures is the key to whether a well is economic or not.

OBJECTIVE

To apply advanced engineering/geologic analysis and directional drilling techniques to enhance well productivity in the Queenston Formation by intersecting natural fractures. Using these technologies will allow the contractor to characterize and improve production from the Formation.

DESCRIPTION

The project team will develop a geologic/engineering model to describe the matrix and natural fracture components of the Queenston Formation; identify step-out and infill new well locations in the Auburn Field through geologic interpretation; carry out reservoir engineering and statistical analysis; and drill and test a deviated well in the best location to encounter significant, undepleted natural fractures. Following well completion, the team will determine the recommended completion and stimulation procedures for fixture-deviated wells, determine incremental reserves and economic benefit of drilling deviated vs. vertical wells, and identify and determine the technology's application in other New York State formations.

BENEFITS

The project will apply several innovations to a New York State gas field, including advanced geologic/engineering analysis of tight sands (pioneered by the Gas Research Institute (GRI) and applied in Wyoming, Texas, and Colorado), deviated-well technology (new to New York), and application of GRI's FRACTPRO™ model. Results will be transferred to other New York State operators.

SCHEDULE AND STATUS

The deviated well has been completed. The final report is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$40,000	0	$40,000
Meridian Exploration Corp.	160,000	0	160,000
TOTALS	$200,000	0	$200,000

Contractor: Meridian Exploration Corp.
Site: Seneca and Cayuga counties
Contract Duration: 9/95 - 6/98
Key Words: assist business, gas, exploration
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4307-ERTER-ER-96

-> Bass Islands Stimulation Project

Demonstrate viability of hydraulically fracturing carbonate oil and gas reservoir.

BACKGROUND

The Bass Islands trend in Chautauqua County is an anticlinal structure with both oil and natural gas production. The Onondaga Limestone, the primary zone of completion associated with the trend is typically stimulated using matrix acid treatments. This increases communication with the fracture system, but is often short-lived and must be repeated. Hydraulic fracturing with a proppant has been used successfully in many sandstone formations, but has been applied infrequently to carbonates in New York State.

OBJECTIVE

To determine the viability, both from a cost and recoverable-reserve standpoint, of applying the existing technology of hydraulic fracturing to a geologic horizon typically stimulated by matrix acid treatments.

DESCRIPTION

This project will apply foamed-acid fracturing to the Onondaga Limestone "Bass Island" formation. The project will include both existing wells and a newly completed or recompleted well. After the stimulation program is complete, these wells will be compared to those completed with standard matrix acid treatment.

BENEFITS

If successful, this process could increase oil and gas production from existing Bass Island wells and offer a better way to complete future ones.

SCHEDULE AND STATUS

The Contractor has identified stimulation prospects. Work is expected during the summer drilling season, 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$70,195	$70,195
Well operators and service companies	0	73,630	73,630
TOTALS	0	$143,825	$143,825

Contractor: Bradley Gill
Site: Chautauqua County
Contract Duration: 5/97-9/98
Key Words: natural gas, production
Project Manager: John Martin, (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4619-ERTER-ER-98

-> Improved Recovery through Infill Drilling in the Queenston Formation in Cayuga County

Demonstrate potential for infill drilling in existing natural gas field.

BACKGROUND

Natural gas reserve estimates continue to increase, even though few new large-scale fields have been located. Infill drilling in existing natural gas fields can increase existing field recovery by 30 percent or more. To date, no systematic infill-drilling program has occurred in New York State.

A systematic approach to finding a site for infill-drilling is required to optimize well location. Also, infill wells often are closer together than allowed by State regulations and require a variance. Engineering analysis offers the clear evidence required for a spacing variance.

The West Auburn field in Cayuga County produces gas from 292 wells from the Queenston sand/shale at a depth of 2,000 ft. In 1994, field production totaled 1.4 billion cubic feet. The contractor operates 260 of these wells on continuous acreage.

OBJECTIVE

To demonstrate an innovative technology, "moving domain" analysis for estimating the optimal infill-well locations and reserves in the contractor's West Auburn Field.

DESCRIPTION

This project will quantify the typical reserve and drainage areas of the existing wells, in addition to estimating recoveries for infill wells using moving-domain analysis. The moving-domain analysis uses a combination of engineering analysis and statistical characterization. Also, the analysis will help evaluate the recommended completion and stimulation procedures for the infill wells. Finally, the project will identify the technology's applicability to other New York State formations and disseminate the results quickly to operators. The project will demonstrate a methodology to identify the best location within other existing fields to drill infill wells and maximize well/field economics. If successful, new well-drilling could experience a resurgence throughout the State's gas industry as the study results become publicized and evaluated in other formations.

BENEFITS

Systematic infill-drilling offers the potential for increased natural gas production in New York's existing natural gas fields, many of which are similar tight sands with matrix porosity. If successful, this methodology could be used at many of these fields. A full infill-drilling program in the West Auburn field could increase production by 400 MMcf per year (roughly 30%).

SCHEDULE AND STATUS

The initial geologic and moving domain analysis is complete. Five identified well sites are now being permitted. Final report preparation continues.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$48,000	0	$48,000
Meridian Exploration Corp.	277,500	0	277,500
TOTALS	$325,500	0	$325,500

Contractor: Meridian Exploration Corp.
Site: Cayuga County
Contract Duration: 10/96-8/98
Key Words: assist business, gas, production
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4481-ERTER-ER-97

Demonstrate advanced drilling technology.

BACKGROUND

The Bass Islands trend in Chautauqua County is an anticlinal structure with both oil and natural gas production from the Onondaga Limestone. Current drilling and production techniques reflect second-generation technology, such as vertical rotary drilling and standard acid-breakdown completion treatments. Third-generation technology, such as horizontal drilling, has proven to be more cost-effective and efficient in other formations. Horizontal wells can be newly drilled or recompleted from existing vertical ones. The second approach costs significantly less than the first.

OBJECTIVE

To demonstrate the downhole motor method of short-radius drilling for recompleting an existing drilled well.

DESCRIPTION

The project well was originally drilled to a depth of 2,927 ft., encountering a fault in the Onondaga at 2,723 ft. with a show of oil and a large amount of salt water. Production casing was run and cemented in the hole to prepare for a future completion attempt in the fault. The drilling planned here will come uphole to 2,653 ft. and drill horizontally approximately 230 ft., encountering the fault above the oil/water contact in the reservoir. Short-radius horizontal drilling will be accomplished in three steps:

(1) A cement plug will be set in the vertical well bore; the top of the plug will be dressed and a pilot hole drilled to the kickoff point. If the kickoff point is behind casing, a window will be in the casing prior to setting the plug.

(2) A special downhole package with a motor will be run into the hole, tested, oriented, and the curve drilled. The curve will run 0 to 90 degrees, with a minimum curvature radius of 80 ft.

(3) A packed hole assembly will be run into the hole with the downhole motor and the horizontal portion of the well will be drilled to the target (directional surveys will be run frequently during this and the previous step).

BENEFITS

The technology may increase hydrocarbon-production rates and ultimate recovery of oil and gas from the reservoir. If replicated, this may increase energy reserves, ultimate recovery, and production from similar formations in the State.

SCHEDULE AND STATUS

The well recompletion is expected during the summer drilling season, 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$91,500	$91,500
Resource America, Inc.	0	64,300	64,300
TOTALS	0	$155,800	$155,800

Contractor: Resource America, Inc.
Site: North Harmony Township, Chautauqua County
Contract Duration: 7/97-10/98
Key Words: natural gas, production
Project Manager: John Martin, (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4571-ERTER-ER-98

-> Drilling and Well-Core Analysis of the Upper Theresa of Western New York

Collect and analyze well cores, and advanced logging suite for deep well in western New York State.

BACKGROUND

The Cambro-Ordovician section has been the target for exploratory drilling in Ohio for more than a decade. With this increase in drilling, oil and gas production directly associated with Cambro-Ordovician reservoirs has increased significantly. Geology and stratigraphy of the Cambro-Ordovician section in New York is similar to Ohio, with similar potential for hydrocarbons. NYSERDA is funding advanced exploration techniques such as aeromagnetic and three-dimensional (3D) seismic surveys targeting the Upper Cambrian Theresa of western New York. To gain a better scientific understanding of reservoir characteristics, production analysis such as well logs and cores are necessary, particularly for the first major drilling effort.

OBJECTIVE

To generate detailed geologic information on the producing segments of the Cambrian Theresa sandstone of western New York.

DESCRIPTION

The project is a follow-on to the 3D seismic study (4207-ERTER-ER-96). The 3D results have completely altered the currently held view of the Theresa in this area; this project will further enhance the technical understanding of this important reservoir. The contractor will collect and analyze logs and cores from the target well. A research firm or institution will interpret and report the results. Core analysis will be used to describe the geological characteristics of the Theresa formation as compared to similar producing formations in Ohio. Results will be transferred to industry. Producers then will use this information to increase indigenous production from this formation.

BENEFITS

The well core is expected to yield critical information, including specific permeability and porosity figures, hydrocarbon and water saturation, and full rock evaluation. Broad distribution of this information will help other producers and researchers interested in this formation. If the well is successful, the information may lead to significant increases to New York State's reserve base and production levels.

SCHEDULE AND STATUS

The geologic analysis was presented at the IOGANY-NYSERDA Technical Seminar in September 1997. The final report is being prepared. A presentation of the final report results is planned for October 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$87,600	0	$87,600
U.S. Energy Development Corp.	241,405	0	241,405
TOTALS	$329,005	0	$329,005

Contractor: U.S. Energy Development Corporation
Site: Arcade, Wyoming County
Contract Duration: 10/96-7/98
Key Words: assist business, gas, production
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4378-ERTER-ER-96

-> Demonstration of Advanced Tight Sand Evaluation Technologies for Optimal Development of the Medina Formation in New York

Test, modify, and validate application of technologies developed in the Rockies to New York's Medina formation.

BACKGROUND

Successful development of tight sand resources in the U.S. has presented a technical challenge. Research by the Gas Research Institute, U.S. Department of Energy, and others has resulted in significant technology improvements, particularly in the area of hydraulic fracturing. More recently, with an evolving understanding of the role of reservoir quality on well performance and its variability across a given play, greater focus has been given to the advancement of reservoir-characterization methods to promote the efficient development of tight sand fields in terms of spacing, location, and completion intervals for optimal reservoir exploitation.

OBJECTIVE

To test, modify, and validate application of technologies developed in the Rockies to the Medina formation of New York.

DESCRIPTION

Reservoir characterization tools, including advanced well-log analysis and advanced production analysis via newly developed type curves, will be tested on a Medina field in southwestern New York. Publicly available or other pre-existing analyses held by Belden and Blake Corp. on natural fracture patterns (including NYSERDA data) will also be incorporated into the reservoir quality assessment. Based on the results of this analysis, a new infill or step-out test well will be drilled, stimulated, and produced.

BENEFITS

The analysis may justify drilling at least one new production well in New York. Three of New York's primary producing formations (Medina, Queenston, and Oriskany) are considered tight sands, so these technologies have great applicability to other operators in New York.

SCHEDULE AND STATUS

The project is ongoing.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$49,996	$49,996
Belden and Blake Corp.	0	120,000	120,000
TOTALS	0	$169,996	$169,996

Contractor: Advanced Resources International, Inc.
Site: western New York and Arlington, VA
Contract Duration: 2/98-1/99
Key Words: natural gas, production
Project Manager: John Martin, (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4715-ERTER-98

-> Magnetic Resonance Logging Device Demonstration in Medina Gas Wells, Western New York

Demonstrate new logging tool and compare it with traditional tools.

BACKGROUND

Since the turn of the century, thousands of Medina wells have been drilled in Western New York to recover pipeline-quality natural gas. The Medina in New York State is a Lower Silurian Age Group of sandstone, siltstone, and shale formations often referred to as a "blanket sand" because it is present over a broad area from central Ohio (where it is referred to as the Clinton Group) to central New York and across Lake Erie into part of Ontario. In Western New York, the Medina ranges from about 100-155 feed, consisting of interbedded red or white sandstones, siltstones, and red-grey or green shales originally deposited in a low-energy deltaic environment. The deltaic nature of the Medina accounts for the variability in the sand/shale ratio evident from well to well. This variability in turn affects reservoir quality and ultimately the total volume of natural gas recoverable from any one well. Most Medina wells are stimulated by hydraulic fracturing, which has the effect of greatly multiplying the natural gas production during the initial production years. Total recovery of gas is not increased, but the overall time frame for recovery is substantially reduced with a positive effect on cash flow. Most Medina wells would not be economic without stimulation. Operators, however, must make the decision on whether to hydraulically fracture a well based on incomplete information, knowing only porosities. This may lead to either prematurely abandoning a well or incorrectly decide to invest more into a poorly performing well.

OBJECTIVE

To compare and contrast the information derived from both sources to better derive completion and stimulation parameters, and thereby improve natural gas recovery.

DESCRIPTION

Ardent Resources, Inc. proposes to run a magnetic resonance (MR) logging device in each of five Medina gas wells to be drilled in Western New York. This device will be run in conjunction with the "standard" log suite used in most new Medina wells. The project will: combine standard logging data with that derived from an MR tool for a complete evaluation of reservoir characteristics, (2) assess the value of this information in the decision-making process of completion and stimulation, (3) compare and contrast the decisions that would have been made with standard logs versus those made with the added advantage of MR data, and, assuming MR changes the decision-making process, (4) assess the results intervals of gas-production performance) across the five Medina well candidates.

BENEFITS

The MR tool offers New York State operators a potentially economically productive solution to the problem of assessing permeability and water saturation in a primary gas-producing formation.

SCHEDULE AND STATUS

Identification of target wells has been extended. Testing is expected during the summer drilling season, 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$28,500	0	$28,500
Ardent Resources, Inc.	621,500	0	621,500
TOTALS	$650,000	0	$650,000

Contractor: Ardent Resources, Inc.
Site: Buffalo, Erie County, and Chautauqua County
Contract Duration: 2/97 - 10/98
Key Words: natural gas, exploration
Project Manager: John Martin, (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4547-ERTER-ER-97

-> Integrating Landsat Lineaments, Soil Gas Anomalies, and Fracture Intensification Domains

Combine Landsat lineaments, advanced computational fracture analysis, and soil gas geochemistry into integrated analysis.

BACKGROUND

The importance of structural control on oil and gas reservoir quality and even the presence of a play itself is well-known. In the case of the Bass Island Trend, the presence of the reservoir depends entirely on fracturing the Devonian and Silurian units. Although high-resolution seismic is generally regarded as an excellent method for delineating major thrusts in a structurally controlled play, seismic interpretations can be unreliable, misleading, cost-ineffective, or provide insufficient data in a number of situations. These include glacial cover, new exploration areas with insufficient data, regions with significant along-strike variations, exploration for cross-strike discontinuities, and fault zones comprising low-offset faults. One approach to the problem consists of several rapid, relatively inexpensive techniques that delineate subsurface structure. New york State's subsurface structure's surface expression can be recognized by a combination of lineament analysis, fracture analysis, and soil gas surveys.

OBJECTIVES

The project will: (1) use and validate the Landsat lineaments identified by NYSERDA in project 4538-ERTER-ER-97; (2) verify the relationships among surface fractures, lineaments, and subsurface structure using advanced techniques of surface fracture characterization; (3) use surface soil gas anomaly technology to delineate subsurface structure; and (4) use all the techniques to define the importance of structural control on oil and gas reservoir quality in a structurally controlled play.

DESCRIPTION

The project will involve collection of Landsat remote-sensing data, soil gas anomaly data, and fracture-intensification domain identification in Cattaraugus County, New York. The three methodologies will be compared individually and integrated into a single analysis. The project will also analyze the structure interpretation in a part of Cattaraugus County by synthesizing the three types of data, (fractures, soil gas, and lineaments) to characterize the bedrock structure where faults have not previously been proposed. This synthesis will provide the basis for evaluating the potential of this area as an oil and gas reservoir, and will demonstrate the usefulness of these techniques to the oil and gas industry.

BENEFITS

If successful, the project will prove in concept the validity of remote-sensing as an exploration tool in New York and identify whether a proven oil and gas play extends into a new area. Quest Energy is ready to develop any prospects identified.

SCHEDULE AND STATUS

The project is ongoing.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$49,896	$49,896
Quest Energy, Inc.	0	26,000	26,000
SUNY Buffalo	0	36,288	36,288
TOTALS	0	$112,184	$112,184

Contractor: SUNY/Buffalo Rock Fracture Group, Quest Energy, Inc.
Site: Cattaraugus County
Contract Duration: 4/98-7/99
Key Words: natural gas, exploration
Project Manager: John Martin, (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4712-ERTER-ER-98

-> Integrating High-Resolution Hyperspectral Remote-Sensing Data, Soil Gas Surveys, and Fracture Intensification Domains

Combine high-resolution hyperspectral analysis, advanced computational fracture analysis, and soil gas geochemistry into an integrated analysis.

BACKGROUND

The presence of hydrocarbons in soils can produce reducing conditions instead of normal oxidizing conditions. This changes the mineralogy and the color and spectral response of surface soils. Due to changes in soil chemistry, stressed vegetation will also result in detectable changes in the spectral response. In the area of the Clarendon-Linden fault, many fracture zones have surface expressions less than 100m wide. An instrument with a spatial resolution of much less than 100m is required to accurately identify these features.

OBJECTIVES

To demonstrate the usefulness and applicability of: high-resolution hyperspectral data with ground-truthing based on soil gas analysis and advanced surface-rock fracture analyses for locating and characterizing structures related to both the north-south striking Clarendon Linden Fault System and northeast-southwest thrusts similar to the major fracture-controlled Bass Islands play.

DESCRIPTION

The project will involve collecting hyperspectral remote-sensing data, soil gas anomaly data, and fracture-intensification domain identification. The subcontractor, GER Corp., has extremely high-resolution equipment (3m vs. 30m for TM and 80m for multispectral scanner Landsat data) with 37 multiple bands (compared to 7 for TM and 4 for multispectral Landsat). This should allow precise recognition and definition of small hydrocarbon seeps from subsurface structurally controlled lineaments. The hyperspectral survey will be compared with ground-data collection of soil gas anomalies and fractures.

BENEFITS

The integration of the GER hyperspectral analysis with SUNY/Buffalo's Rock Fracture Group's analysis methodology will allow precise testing of each technique against other methods and help identify potential oil and gas targets in the region. Also, GER, a New York-based firm, can market this application of its technology worldwide.

SCHEDULE AND STATUS

The project is ongoing.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$49,998	$49,998
GER Corp.	0	25,750	25,750
SUNY/Buffalo	0	30,648	30,648
TOTALS	0	$106,396	$106,396

Contractor: SUNY/Buffalo Rock Fracture Group (GER Corp., subcontractor)
Site: northern Allegany and southern Wyoming counties
Contract Duration: 2/98-6/99
Key Words: natural gas, exploration
Project Manager: John Martin, (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4713-ERTER-ER-98

-> Applying Advanced Stimulation Technology to New York State Oil and Gas Reservoirs

Improve production or reduce stimulation costs in hydraulically fractured wells.

BACKGROUND

Advanced stimulation technology (AST) is a methodology that has been very effective in optimizing hydraulic fracture treatment results. Its emphasis is on understanding hydraulic fracturing fundamentals and critical concepts, using 3D fracture-propagation models, conducting diagnostic tests for model calibration, collecting and using treatment data on site and in real time, and conducting post-fracture evaluation. The enabling technology that allows this methodology to be routinely practiced is the advanced 3D fracture model. Using actual treatment data to drive the model in real time allows the engineer to properly diagnose, evaluate, and execute hydraulic fracturing treatments with improved success.

OBJECTIVE

To demonstrate advanced stimulation technologies to the New York oil and gas industry. The project will attempt to improve oil and gas production and decrease stimulation costs through improved hydraulic fracture design, implementation, and benefits analysis.

DESCRIPTION

The project will collect and analyze historical data, provide training to participating companies on data-building and 3D fracture-modeling, and perform real-time hydraulic fracture analysis on multiple wells. The contractor will provide hands-on training to both operator and stimulation service company personnel. Training materials developed for the Gas Research Institute (GRI) will serve as the basis for this activity. Operator application will then be developed and tracked. Upon project completion, case histories will be developed to further disseminate the technology to additional operators in New York State.

BENEFITS

Based on actual GRI field results, AST can have a significant impact on well productivity and completion costs. Companies have documented fracturing-cost savings of 5-50% and well-performance improvements on the average of 25%. The results of this project will help the New York State Department of Environmental Conservation evaluate well-spacing requirements in tight sands.

SCHEDULE AND STATUS

The project is ongoing

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$50,000	$50,000
Well operators	0	900,000	900,000
TOTALS	0	$950,000	$950,000

Contractor: S.A. Holditch & Associates, Inc.
Site: western New York
Contract Duration: 1/98-7/99
Key Words: natural gas, oil, production
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4714-ERTER-ER-98

-> Using Surface Geochemistry to Enhance Hydrocarbon-Finding Success Rates

Demonstrate advanced geochemical exploration methods to identify new natural gas resources.

BACKGROUND

Surface geochemical exploration methods have been used for more than 50 years. Only in the last decade or so, however, have sampling and analytical methods and the tools for evaluating the results come into existence. New analytical methods have been developed to significantly lower detection limits, so hydrocarbons can be detected at low parts per billion and high parts per trillion levels. This allows the detection of C2-C5 hydrocarbons undetected in the 1980s and C5+ hydrocarbons that were not even known to exist in the environment. In addition, a variety of statistical techniques have been developed to afford better compound and mixture identification and comparison of complex mixtures.

OBJECTIVES

To: (1) establish geochemical characteristics of a model area (Stagecoach Field in Tioga County) and (2) apply these characteristics to a prospect region (the Devonian clastic wedge of eastern New York).

DESCRIPTION

This project will combine an analysis of existing well data and surface geochemical data collection to define a model of the Stagecoach Field in Tioga County. Using this model as a guide, surface geochemical samples will be collected in an unexplored area in eastern New York State in the region covered by the Devonian clastic wedge sediments to assess its hydrocarbon potential. The reasons for these selections include the amount and quality of information available on the Stagecoach Field and the attractiveness but underexplored condition of eastern New York.

BENEFITS

The technique may prove to be a cost-effective screening mechanism for identifying new natural gas prospects in New York State, particularly in little-explored eastern New York. The collection of more than 400 geochemical samples will advance the knowledge of the hydrocarbons that exist in this potentially productive area. The partnership is connected with exploration firms willing to test a possible prospect.

SCHEDULE AND STATUS

The project is ongoing.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$49,670	$49,670
Direct Geochemical, Inc.	0	56,746	56,746
Pyron Consulting	0	10,000	10,000
TOTALS	0	$116,416	116,416

Contractor: Direct Geochemical, Inc.
Site: Tioga County, counties in eastern New York State
Contract Duration: 4/98-5/99
Key Words: natural gas, exploration
Project Manager: John Martin, (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4741-ERTER-ER-98

-> IOGANY Marginal Well Evaluation

Evaluate marginal and shut-in natural gas wells for innovative ways to bring them back into production.

BACKGROUND

In 1994, New York State produced more than 20 billion cubic feet of gas and 200,000 barrels of oil from 23 counties. The New York State Department of Environmental Conservation (DEC) estimates that 60,000 wells have been drilled in New York State and that the State has over 13,000 producing wells. Current low prices for oil and gas have resulted in a high percentage of operating wells being only marginally profitable. Operators often do not have the time or resources to systematically evaluate every marginal well they control. This project offers the first systematic way for producers to look at these wells again in an effort to return them to a productive state.

OBJECTIVE

To field-test and evaluate 150 to 200 marginal and shut-in wells to determine the potential for additional natural-gas production through future rehabilitation and application of new technologies.

DESCRIPTION

The project will establish an industry-sponsored initiative to bring shut-in wells back to economic production through the creation of systematic methodologies for subsequent field-demonstration. A number of different firms will provide 100-200 candidate wells. Participating producers, along with industry experts from DEC, the Petroleum Technology Transfer Council (PTTC), and the U.S. Department of Energy will help develop the testing and methodology necessary to evaluate these wells. The proposed evaluation model will be subjected to review using PTTC's World Wide Web site to allow oil and gas experts throughout the U.S. to provide input and comments. The wells will be systematically evaluated for productivity enhancement. NYSERDA and the Independent Oil and Gas Association of New York (IOGANY) will hold a workshop outlining the developed model and detailing its results to the New York oil and gas community. Results also will be posted on PTTC's home page.

BENEFITS

Because it is much less expensive to recomplete an existing well than to drill a new one, the project may help increase economic natural-gas production in the State, improving both the operator's revenue and tax collections by municipalities. The project will help avoid plugging potentially productive wells, thus avoiding lost resources (once a well is plugged, it is lost). Finally, this project should help DEC continue its effort to plug nonproductive wells with the help of the industry, creating a positive working environment between government and industry.

SCHEDULE AND STATUS

Well testingwas completed in June 1997. Results were presented at the September 1997 IOGANY-NYSERDA Technical Seminar. Final report preparation continues. An industry workshop is planned for July 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$48,547	0	$48,547
IOGANY and participating producers	68,045	0	68,045
TOTALS	$116,592	0	$116,592

Contractor: Independent Oil and Gas Association of New York
Site: Chautauqua, Erie, Wyoming, Cayuga, Seneca, Cattaraugus, Allegany, and Livingston counties
Contract Duration: 4/96-7/98
Key Words: assist business, gas, production
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4335-ERTER-ER-96

-> Implementation of a Model-Based Neural System for Wireline Well-Log Analysis

Develop and commercialize advanced well-log interpretation system.

BACKGROUND

Well logs are curves of amplitude versus depth obtained by running well log "tools" (sensors) down a borehole. The well logs provide information about the rock and fluid properties, and are the single most important instrument used to determine how much hydrocarbon might exist in rocks. Because each borehole might have several different tools, interpretation of such multitool logs in rocks of a complex and changing lithology poses a challenge best solved by computers, along with equations that attempt to model rock properties. To date, most models have not been successful. Neural nets are a mathematical way of analyzing large datasets where there is no apparent model to explain the interrelationships among variables, or when the relationships among variables are highly non-linear. GAMLS (Geologic Analysis via Maximum Likelihood System) is a model-based neural system for analyzing wireline well logs and core data.

OBJECTIVE

To fully develop a commercial version of GAMLS as a well-log interpretive tool. The product will lend itself to a service industry, as well as a marketable software product, for the oil and gas industry, where many reservoirs cannot be modeled adequately for accurate reserves evaluation (a key economic consideration).

DESCRIPTION

A prototype version of GAMLS has been developed by the contractor in the last two years. GAMLS uses algorithms developed by Nichols Research Corporation for defense applications; this is the first application of these algorithms to geologic problems. The project will package the current Macintosh version for beta-testing or license to those clients interested in a Macintosh version. Also, the Macintosh version will be converted to Windows 95 and NT platforms. Finally, the contractor will perform comparison studies that compare GAMLS results with those of other analyses, including those where analyses have been done using other neural-net programs or traditional linear and non-linear procedures.

BENEFITS

The market for this software could lead to the development of a New York-based high-technology firm servicing the oil and gas industry. Also, due to New York's complex geology, indigenous producers require better modeling tools. Existing data could be run through this type of system, allowing these reservoirs to be characterized better.

SCHEDULE AND STATUS

TheWindows NT version is being beta tested. Product marketing continues.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$98,928	0	$98,928
Eric Geoscience	28,880	0	28,880
Phillips Petroleum	20,000	0	20,000
Other sources	159,040	0	159,040
TOTALS	$306,848	0	$306,848

Contractor: Eric Geoscience, Inc.
Site: Glenmont, Albany County
Contract Duration: 9/96-7/98
Key Words: product development, gas, exploration, production
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4482-ERTER-ER-97

-> Natural Gas Storage Assessment

Identify potential gas storage formations in New York State.

BACKGROUND

Underground natural gas storage is an important component of the natural gas supply distribution system. Storage allows utilities and transmission pipeline companies to meet peak gas demand and maintain system balance requirements. Siting gas storage facilities requires geological interpretation, technology application, environmental protection, and market access. The right conditions exist in New York State to expand natural gas storage to meet the State's future supply needs. Before the in-situ resource base can be turned into new gas storage, substantial resource identification and geological assessment work are necessary. This project will assess the regional geology of New York State to identify potential gas storage sites.

ACCOMPLISHMENTS

The study developed an information bases from which industry can develop new natural gas storage facilities in New York State.

FINDINGS AND CONCLUSIONS

The study concluded that there are a number of storage opportunities in New York State. The study identified a number of depleted gas-field storage prospects, bedded-salt storage areas, and a non-conventional storage area. The study also developed parameters for brine disposal in the Sauk sequence in the region identified for bedded-salt storage development.

REALIZED OR ANTICIPATED BENEFITS

This project may accelerate the development of natural gas storage fields, which would improve the stability of the State's natural gas market and help create a competitive storage industry.

TECHNOLOGY TRANSFER ACTIVITIES

The study will be available to industry.

FUNDING	TOTALS
NYSERDA	$187,930
New York Gas Group	207,880
TPC Corporation	20,000
TOTALS	$415,810

Contractor: New York Gas Group; subcontractor: Northeastern Science Foundation, Inc
Site: Troy, Rensselaer County
Contract Duration: 6/94-11/97
Key Words: assist business, gas, utilities, energy storage
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4027L-ERTER-ER-95

->Three-Dimensional Seismic Demonstration - The Northwoods Project

Demonstrate use of three-dimensional seismic technology to characterize new indigenous natural gas reservoir.

BACKGROUND

The advent of large, fast computers (particularly supercomputers and parallel processors) enables three-dimensional (3D) imaging of the subsurface. The computers permit collection of the vast data needed to form a complex 3D image. This technology will allow a more accurate characterization of the deep Cambro-Ordovician reservoirs in New York State. The Cambro-Ordovician section has been the target for exploratory drilling in Ohio for more than a decade, during which time it has gone from an insignificant reservoir to 49% of all permits issued in 1994. With this increase in exploratory drilling has come a significant increase in oil and gas production directly associated with Cambro-Ordovician reservoirs. Because the geology and stratigraphy of the Cambro-Ordovician section in New York are similar to that in Ohio, the potential clearly exists for hydrocarbons from this section in New York.

ACCOMPLISHMENTS

The project demonstrated the ability of 3D seismic technology to identify the size, shape, and structure of a Cambro-Ordovician gas reservoir, which is one of New York State's most promising prospects for new indigenous natural gas.

FINDINGS AND CONCLUSIONS

The 3D survey resulted in a complete revision of the initial interpretation and the preconception of stratigraphy and structure in the area studied. The initial assumption proposed a northeast-southwest strike in the fabric of the deep section, which would be consistent with the analysis of the shallower section and basin configuration in general. The 3D data, however, strongly indicates the features in the deep Cambro-Ordovician section are actually oblique to this.

REALIZED OR ANTICIPATED BENEFITS

The 3D survey identified a drillable prospect, the Stahl #1 well in the Town of Arcade, Wyoming County. The well has been drilled and is producing. This survey also proved the value of this technology in New York State.

TECHNOLOGY TRANSFER ACTIVITIES

The results were presented at the Independent Oil and Gas Association of New York/NYSERDA Technical Seminar in July 1996 and at the American Association of Petroleum Geologists Eastern Section Annual Meeting in Lexington, KY, in September 1997. The final case study is available from NYSERDA..

FUNDING	TOTALS
NYSERDA	$60,000
Los Alamos National Laboratory (CRADA)	70,000
Ardent Resources	70,000
TOTALS	$200,000

Contractor: Ardent Resources, Inc.
Site: Arcade, Wyoming County
Contract Duration: 8/95 - 11/97
Key Words: assist business, gas, exploration
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4207-ERTER-ER-96

-> Aeromagnetic Geologic Demonstration Survey for Natural Gas Drilling

Use advanced geologic techniques to improve opportunities for natural gas production in Western New York.

BACKGROUND

The Cambro-Ordovician section has been the target of exploration drilling in Ohio for more than a decade. The success rate for wells targeting this section has increased from 30% to more than 60% during that time due to better geological understanding and improved geophysics, aided by techniques such as aeromagnetic and three-dimensional (3D) seismic. Similarly, oil and gas production has increased substantially in the province of Ontario, Canada, as a direct result of new and prolific Cambro-Ordovician discoveries. Because the geology and stratigraphy of the Cambro-Ordovician section in New York are similar to Ohio and Ontario, similar potential clearly exists for oil and gas production in this section of New York State.

ACCOMPLISHMENTS

The aeromagnetic survey confirmed a successful drilling target, the Stahl #1, in the Town of Arcade, Wyoming County. Based on this survey, other targets were also identified and will be drilled. The project demonstrated the ability of advanced aeromagnetic technology to identify the possibility of a Cambro-Ordovician gas reservoir, which is one of New York State's most promising prospects for new natural gas.

FINDINGS AND CONCLUSIONS

The aeromagnetic survey confirmed the 3D seismic survey project's reinterpretation of stratigraphy and structure in the area studied. The initial assumption proposed a northeast-southwest strike in the fabric of the deep section, which would be consistent with the analysis of the shallower section and basin configuration in general. Aeromagnetics is an appropriate and cost-effective technology to delineate deep natural gas reservoirs in New York State.

REALIZED OR ANTICIPATED BENEFITS

This technology, along with 3D seismic, helped locate the Stahl #1 well, currently producing 250 million cubic feet of natural gas per day. At least three other surveys have been conducted in New York State since this demonstration was conducted. A number of new wells are expected to be drilled.

TECHNOLOGY TRANSFER ACTIVITIES

The contractor made presentations at the 1996 Independent Oil and Gas Association of New York/NYSERDA Technical Seminar and the 1997 American Association of Petroleum Geologists Eastern Section Annual Meeting. An article was published in the 2/16/98 *Oil and Gas Journal* and a case study has been completed.

FUNDING	TOTALS
NYSERDA	$40,000
Ardent Resources, Inc.	51,568
TOTALS	$91,568

Contractor: Ardent Resources, Inc.
Site: Wyoming and Erie counties
Contract Duration: 2/96 - 3/98
Key Words: assist business, gas, exploration
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4365-ERTER-ER-96

-> Application of Innovative Technologies to Shallow Fractured-Reservoir Development

Evaluate hydrocarbon prospects for fractured reservoirs over large portion of New York State.

BACKGROUND

Locating and characterizing fractured reservoirs using remote-sensing techniques and basin-level geologic analysis can be useful when trying to evaluate the potential for economic production from these reservoirs. This analysis will be used to identify and assess prospective areas in New York that have a high potential for containing commercial reserves of oil and gas in fractured shales, siltstones, and sandstones of New York's Ordovician through Devonian stratigraphy.

ACCOMPLISHMENTS

The project identified 22 prospective targets for fractured-reservoir production in New York State. In doing so, it significantly reinterpreted the potential for natural gas production from non-producing areas. The results are already forming a basis for further activities by exploration companies. A model was also developed to calculate estimated recoveries from fractured-shale reservoirs.

FINDINGS AND CONCLUSIONS

Using remote sensing and geologic analysis, the study found significant fracture systems in New York State that could provide significant ultimate recoveries of natural gas. Quality source and reservoir rocks were identified in many of these areas, with 22 identified as good targets. These targets are distributed throughout the State, from Chautauqua to Albany County.

REALIZED OR ANTICIPATED BENEFITS

This study has already led to a follow-on exploration project (4712-ERTER-ER-98). Further investigation of these target areas is expected to lead to exploration and drilling activity.

TECHNOLOGY TRANSFER ACTIVITIES

The 10 consortium partners received reports, maps, and digital datasets. The results will be presented to industry at a Technical Seminar sponsored by NYSERDA and the Independent Oil and Gas Association of New York.

FUNDING	TOTALS
NYSERDA	0
Gas Research Institute	20,000
Natural gas E&P companies	100,000
TOTALS	$120,000

(Remote sensing funded as project 4538-ERTER-ER-97.)

Contractor: The Cadmus Group, Inc.
Site: Upstate New York
Contract Duration: 10/96-3/98
Key Words: natural gas, exploration
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous
Contract No.: 4479-ERTER-ER-97

Perform remote-sensing and geologic evaluation of large portion of New York State.

BACKGROUND

Locating and characterizing fractured reservoirs using remote-sensing techniques can be useful when trying to evaluate the potential for economic production from those reservoirs. This analysis helped identify and assess prospective areas in New York that offer great potential for commercial reserves of oil and gas in fractured shales, siltstones, and sandstones for New York's Ordovician through Devonian stratigraphy.

ACCOMPLISHMENTS

The project provided practical and useful tools and information for basin-level exploration for fractured reservoirs. The results included interpretation of faults, folds, fractures, vegetation, and tonal anomalies that may mark hydrocarbon microseepage, and any other features useful in pursuing fractured-rock reservoirs.

FINDINGS AND CONCLUSIONS

The project analyzed Landsat TM images for nearly all of New York State east of the Hudson River. The contractor generated map overlays for lineaments, structure, fracture density, and tonal anomalies. In all, 22 potential fractured reservoir plays were identified.

REALIZED OR ANTICIPATED BENEFITS

The results of this study are already being used by 10 companies participating in a fractured-reservoir exploration consortium. Similar studies have lead to exploration programs in other regions, so this study is expected to be the basis for further exploration activity in New York State.

TECHNOLOGY TRANSFER ACTIVITIES

The results of this study are being used by a 10-company research consortium. Arrangements are being made to provide all results to the New York State Geological Survey to be included in an open-file report.

FUNDING	TOTALS
NYSERDA	$69,956
TOTALS	$69,956

Contractor: Earth Satellite Corporation
Site: Upstate New York
Contract Duration: 12/96-6/97
Key Words: natural gas, exploration
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: 4538-ERTER-ER-97

->Catskill Mountains Geologic Investigation

Investigate hydrocarbon potential of an area of eastern New York State

BACKGROUND
The eastern New York region is a prominent area containing rocks primarily of Devonian or Ordovician origin. The region represents the northeastern-most portion of the Catskill Delta formed during the Devonian Period. Many of these formations have produced economic levels of hydrocarbons in other regions, but little has been produced in New York State.

ACCOMPLISHMENTS
The study identified a potential prospect area north of the Catskill Park.

FINDINGS AND CONCLUSIONS
The study concluded that potential exists for economic production of hydrocarbons in the eastern portion of New York State.

REALIZED OR ANTICIPATED BENEFITS
Some industry interest in testing the identified prospect is anticipated.

TECHNOLOGY TRANSFER ACTIVITIES
The contractor presented the results of this project at the Summer 1997 NYSERDA/Independent Oil and Gas Association of New York Technical Seminar. A report will be available.

FUNDING	TOTALS
NYSERDA	$10,000
TOTALS	$10,000

Contractor: Wilbur Smith Associates
Site: Latham, Albany County; and Schoharie, Schenectady, Greene, Ulster, Delaware, and Sullivan counties
Contract Duration: 12/96-10/97
Key Words: natural gas, exploration
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous
Contract No.: 4551-ERTER-ER-97

->High-Potential Recovery by Gas-Repressurization Demonstration

Demonstrate use of flue-gas as repressurization method for oil fields.

BACKGROUND

Oil production began in western New York State in 1865, just five years after the Drake Well was drilled in Titusville. These New York fields are still in production today, with more than 3,000 stripper wells still active in Allegany and Cattaraugus counties. State oil production totaled nearly 300,000 barrels in 1994. Unlike natural gas, oil production usually relies on some mechanical lift technology to bring the oil to the surface. This can be a simple pumping mechanism (primary production) or more sophisticated (secondary or tertiary) external pressurization. Primary production, using only mechanical pumps, really only extracts a small percentage of the actual oil in the reservoir. Secondary recovery methods such as waterflooding are common in the U.S. and are used extensively in New York. Secondary methods considerably improve the percentage of oil recovered, but still leave more than half the oil behind. Tertiary recovery, such as gas pressurization, is far less common. Tertiary recovery tackles the remaining oil and improves production rates over secondary means. The U.S. Department of Energy is trying to economically increase stripper-well production by repressurizing the fields using hot flue-gas generated by burning natural gas.

ACCOMPLISHMENTS

The project demonstrated a gas-repressurization technique to enhance oil production in New York State's historic oil fields.

FINDINGS AND CONCLUSIONS

The results showed the difficulty of implementing new technology in an old oil field. Primary and secondary recovery techniques had already been attempted. This tertiary technique caused some physical plant problems. Ultimately, very small incremental production was realized. The research team determined that the age of the field and past practices inhibited the final results, both technically and economically. This project showed that very old fields that have undergone waterflooding (secondary recovery) need to be redrilled and upgraded. Reservoir modeling may also improve yield.

REALIZED OR ANTICIPATED BENEFITS

The contractor now has a clear understanding of this enhanced oil-recovery technique. The compressor unit will be moved to a newer field that has only seen primary production. It is expected that the recovery improvement in this field will be substantial.

TECHNOLOGY TRANSFER ACTIVITIES

The contractor will present the results of the project at a U.S. DOE-approved technical workshop.

FUNDING	TOTALS
NYSERDA	$10,000
U.S. Department of Energy	133,000
Hydrocarbon Generation, Inc.	123,000
TOTALS	$266,000

Contractor: Hydrocarbon Generation, Inc.
Site: Allegany, Cattaraugus County
Contract Duration: 7/96-12/97
Key Words: assist business, petroleum, production
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: R2058

-> Application of Paleogeomorphic Mapping Techniques to Exploration Problems in New York State

Demonstrate paleogeomorphic mapping of three distinct natural gas exploration targets.

BACKGROUND

Paleogeomorphic mapping is used to identify stratigraphic hydrocarbon reservoirs that can be missed by geophysical methods. Paleogeomorphic maps are created by identifying thicknesses of stratigraphic rock sequences indicative of depositional conditions. Thinning of the chosen map interval is directly related to the presence of hydrocarbon reservoirs and is related to those elements necessary for the formation of a hydrocarbon reservoir, including porosity, permeability, fluid content, and trapping mechanism. In the paleogeomorphic high proper, porosity and permeability, as well as hydrocarbons, are usually found. The key is that the paleogeomorphic high creates conditions that promote the formation of porosity, whether in clastic or carbonate rocks.

ACCOMPLISHMENTS

The project demonstrated the applicability of paleogeomorphic mapping to two types of natural gas reservoirs of New York State. This technique, used in conjunction with other remote-sensing and geophysical techniques, can reduce the overall cost of exploring for natural gas in New York State.

FINDINGS AND CONCLUSIONS

The project identified two Devonian exploration targets and one gas storage target.

REALIZED OR ANTICIPATED BENEFITS

This methodology offers a low-cost alternative to seismic methods. The identified prospects may create exploration interest.

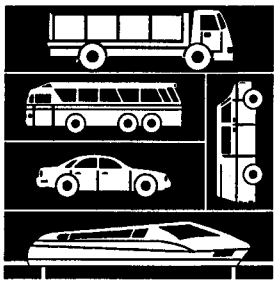
TECHNOLOGY TRANSFER ACTIVITIES

The contractor presented the results of this project in July 1997 at the Independent Oil and Gas Association of New York - NYSERDA Technical Seminar.

FUNDING	TOTALS
NYSERDA	$6,900
Pyron Consulting	18,500
TOTALS	$25,400

Contractor: Pyron Consulting
Site: Tioga County, and Pottstown, PA
Contract Duration: 10/96-7/97
Key Words: assist business, gas, petroleum, production
Project Manager: John Martin (518) 862-1090, ext. 3265
Program: Energy Resources
Subprogram: Indigenous Resources
Contract No.: R2069

TRANSPORTATION



Benefits and Rationale

The transportation sector accounts for 39% of the net energy used in New York, contributes 37% of the State's CO_2 emissions, and remains 99% petroleum dependent. Over the next 20 years, vehicle miles traveled are projected to increase by 40% and traffic congestion is forecasted to triple. If no actions are taken to reduce current trends, the cost to New Yorkers in terms of fuel expense, environmental quality, and lost mobility will be substantial.

In the early 1990s, three pieces of federal legislation contributed to the impetus for improved transportation technologies: the Clean Air Act Amendments of 1990, the Intermodal Surface Transportation Efficiency Act of 1991, and the Energy Policy Act of 1992. These actions, combined with a significant investment in clean vehicle research at the national level and by electric and natural gas utilities, provided a strong advancement in alternative fuels for vehicles. The national research program has focused on working with only the largest auto manufacturers to develop technologies that will produce production prototypes in the next century. As we enter the later 1990s, utility restructuring has motivated utilities to focus on near-term competition and profitability, curtailing a once-strong mid- and long-term utility- funded alternative fuel R&D program. These trends have discouraged the types of research and product development activities that are designed to accelerate the commercialization of emerging technologies.

NYSERDA's transportation R&D program is directed primarily at filling the gap between deployment of the best of yesterday's technologies and long-term research. The program will promote investment in emerging technologies that offer the potential to have a significant beneficial impact on the State's energy and environmental problems over the near-to-mid-term. The transportation R&D program will be developing energy storage, power generation, and electric vehicle technologies for demonstration within the SBC Program.

Improved transportation technologies and systems are required if we are to minimize the energy consumption associated with the predicted growth in vehicle miles traveled while meeting the State's air-quality goals, particularly in urban areas. The transportation R&D program develops and demonstrates new technologies to meet these needs and provides opportunities for New York State businesses in transportation industries.

With the development of new technologies, New York State has an opportunity both to increase compliance with environmental requirements and to establish new industries. Within this framework, NYSERDA's Transportation program includes a technology development and applications component, to develop new products to meet specific New York State needs; an advanced vehicle technology demonstration component, to evaluate emerging ultra-clean and efficient vehicle technologies in real world applications; and, a complementary effort to evaluate the costs and benefits of advanced public-sector transportation systems that will provide transportation alternatives for the coming decades.

The *Advanced Vehicle Technology Development* program supports New York firms in developing advanced vehicle technologies for national and international markets, emphasizing those technologies that have the greatest potential to meet the State's specific needs involving severe urban driving cycles and heavy-duty vehicles. The program addresses improved vehicle performance by developing advanced drive systems, such as fuel cells, and electric and hybrid electric drives; more efficient vehicle subsystems; and reductions in vehicle mass. Projects involve development efforts ranging from advanced materials and components to complete vehicles. Success in this program area is measured in terms of new products developed, energy and environmental advantages of new products over existing alternatives, and ultimately the volume of commercial sales.

The *Advanced Technology Vehicle (ATV) Demonstration Program* supports the early deployment of products developed in the Advanced Vehicle Technology Development program area. It is also an effort to evaluate the energy and environmental benefits associated with new and emerging ultra-clean, super-efficient vehicle technologies and to disseminate this information to the public and State policy-makers. The ATV Demonstration program focuses on moving ultra-clean, super-efficient vehicle technology, such as advanced alternative fuel vehicles (AFVs) and electric, hybrid-electric, and fuel-cell systems out of the laboratory and

into real-world demonstrations. Success in this program area is measured in terms of reduced fuel consumption, air emissions, and vehicle maintenance costs.

Traffic congestion wastes millions of dollars in terms of both time and fuel consumption, while increasing emissions of air pollutants in densely populated areas. To address these problems, NYSERDA sponsors research on *Advanced Transportation Systems & Infrastructure*. This initiative addresses improved public infrastructure transportation technologies, including high-speed rail, advanced traffic controls for traffic-demand management, and electrified commuter and transit systems. Technical evaluations and demonstrations of these types of options are necessary to assess costs and benefits, guide the State in improving transportation energy efficiency and mobility, and reducing transportation-related environmental impacts. Success in this program area is measured by reduced travel times, improved transit ridership, reduced congestion and reduced emissions and fuel consumption resulting from NYSERDA's projects and their subsequent replication elsewhere in the State.

Goals

- Expand opportunities for New York State businesses to develop and introduce new technologies in the transportation sector.
- Improve vehicle efficiency and reduce mobile source emissions.
- Promote fuel efficiency by developing super-energy-efficient propulsion systems and a range of economical alternative fuel options.
- Develop options for improved performance and energy efficiency within the State's transportation infrastructure.

Alternative-Fuel Vehicle Program Summary

Provide technical and financial support for NYSERDA's Alternative Fuels for Vehicles Fleet Demonstration Program and support research and development projects in the area of alternative fuels.

BACKGROUND

New York State has reduced industrial, residential, and commercial dependence on petroleum; however, transportation is still 99% petroleum-dependent. Transportation is also a major cause of urban air pollution. Alternative-fuel vehicles (AFVs) may reduce petroleum dependence while improving urban air quality through reduced vehicle emissions.

OBJECTIVE

NYSERDA's Alternative-Fuel Vehicle Program includes the Alternative Fuels for Vehicles Fleet Demonstration Program (AFV-FDP) and a complementary R&D project portion. The goals of the AFV-FDP have included fielding 257 AFVs in fleets operated by municipalities, county governments, and State agencies to provide data so the State can develop strategies to meet scheduled reductions in air pollution. The R&D component develops state-of-the-art technology.

RESEARCH EFFORT

NYSERDA has provided technical and financial support to acquire, operate, and maintain a variety of AFVs, ranging from cars and light trucks to transit buses. Fuels include methanol, natural gas, propane, ethanol, and electricity. Projects that develop components and/or systems technologies also are supported.

BENEFITS

New York State will benefit through reduced dependence on petroleum-based fuel, improved air quality, and mitigation of future fuel-price increases through diversification. Air-quality improvements made in the transportation sector may preclude the need to impose environmental constraints on other sectors of the economy.

SCHEDULE AND STATUS

The project is nearing completion.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$9,909,066	0	$9,909,066
Petroleum Overcharge Funds	2,201,897	0	2,201,897
Other co-funders[1]	30,385,652	0	30,385,652
TOTALS	$42,496,615	0	$42,496,615

[1] Includes vehicle acquisition and in-kind services.

Contractor: Various contractors
Site: Multiple sites throughout New York State
Contract Duration: 12/90 - 4/98
Key Words: transportation, alternative fuels, AFV
Project Managers: Karen Villeneuve, Joe Wagner
Program: Transportation
Subprogram: Advanced Transportation Systems, Alternative Fuels for Vehicles Demonstration, Petroleum Overcharge Funds, Technology Development and Applications
Contract Nos.: Multiple

Alternative Fuels for Vehicles Fleet Demonstration Project

Provide technical and financial support for selected fleet operators participating in NYSERDA's Alternative Fuels for Vehicles Fleet Demonstration Program.

BACKGROUND

New York State has reduced industrial, residential, and commercial dependence on petroleum; however, transportation is still 99% petroleum-dependent. Transportation is also a major cause of urban air pollution. Alternative-fuel vehicles (AFVs) may reduce petroleum dependence while improving urban air quality through reduced vehicle emissions.

OBJECTIVE

The Alternative Fuels for Vehicles Fleet Demonstration Program (AFV-FDP) has been a comprehensive technology assessment of alternative-fuel vehicles (AFVs) and fielded 257 AFVs in State and local government fleets to collect data on AFV performance, emissions, and cost. The data and hands-on experience help State and local decision-makers identify ways AFVs can assist in achieving energy, environmental and economic development goals, and in complying with federal air-quality and alternative-fuel mandates. Natural gas, methanol, ethanol, propane and electricity have been among the fuels evaluated in the AFV-FDP.

DESCRIPTION

NYSERDA has provided technical and financial support to selected State, county, and municipal fleets in New York to acquire, operate, and maintain a variety of AFVs, ranging from cars and light trucks to transit buses. Support included assistance with purchase or retrofit of vehicles, training of operating and maintenance personnel, safety inspection of maintenance facilities, emissions testing, data collection and analysis, and reporting of results.

BENEFITS

The AFV-FDP has provided data and field experience that assist decision-makers in defining appropriate roles for AFVs. New York State will benefit through reduced dependence on petroleum-based fuel, improved air quality, and mitigation of future fuel-price increases through diversification. Air-quality improvements made in the transportation sector may preclude both environmental constraints on other sectors of the economy and imposition of federal sanctions.

SCHEDULE AND STATUS

Field operations and data collection have been completed and a comprehensive final report was prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$2,937,406	0	$2,937,406
Petroleum Overcharge Funds	1,745,958	0	1,745,958
Other co-funders	12,943,925	0	12,943,925
TOTALS	$17,627,289	0	$17,627,289

Contractor: EA Engineering, Science, and Technology, Inc.
Site: Statewide
Contract Duration: 12/90 -4/98
Key Words: transportation, alternative fuels, emissions control, diesel, ethanol (E85), flexible fuel (FFV), methanol (M85), natural gas (CNG), propane (LPG)
Project Managers: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Alternative Fuels for Vehicles Demonstration, Petroleum Overcharge Funds
Contract No.: 1614-ERER-ER-91

-> Alternative Fuels for Vehicles Fleet Demonstration Program - Task Order #15

Disseminate results of Alternative Fuels for Vehicles Fleet Demonstration Program.

BACKGROUND
The alternative fuels for vehicles fleet demonstration program (AFV-FD)P was a comprehensive technology assessment of alternative-fuel vehicles (AFVs) and fielded 257 AFVs in State and local government fleets to collect data on AFV performance, emissions, and cost. The data and hands-on experience help State and local decision-makers identify ways AFVs can assist in achieving energy, environmental and economic development goals, and in complying with federal air-quality and alternative-fuel mandates. Alternative fuels assessed in the AFV-FDP include compressed natural gas (CNG), methanol, ethanol, LPG/propane and electricity.

OBJECTIVE
To inform the general public, fleet operators, and other decision makers about AFVs and the results of the AFV-FDP.

DESCRIPTION
The approach entails: displaying AFVs and presenting introductory-level AFV information to fleet operators and the public; preparing materials for dissemination to the news media by NYSERDA; and providing assistance to technical experts to enable them to participate in dissemination of AFV information at fleet operator conferences, meetings of technical societies, alternative fuel-related conferences and other events.

BENEFITS
This Task Order disseminates data and field experience that will assist decision-makers in defining appropriate roles for AFVs. New York State may benefit through reduced dependence on petroleum-based fuel, improved air quality, and mitigation of future fuel-price increases through diversification. Air-quality improvements made in the transportation sector may preclude both environmental constraints on other sectors of the economy and imposition of federal sanctions.

SCHEDULE AND STATUS
The contractor has assisted NYSERDA in providing AFVs for display at events and has made presentations of AFV-FDP findings at various conferences across the State, including Clean Cities workshops. Current activity focuses on completion of AFV-FDP documentation and final wrap-up of the program.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$140,789	0	$140,789
Petroleum Overcharge Funds	97,918	0	97,918
TOTALS	$238,707	0	$238,707

Contractor: EA Engineering, Science, and Technology, Inc.
Site: Multiple sites statewide
Contract Duration: 7/92 - 12/98
Key Words: transportation, alternative fuels, AFV, dissemination
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Alternative Fuels for Vehicles Demonstration, Petroleum Overcharge Funds
Contract No.: 1614-ERER-ER-91, TO #15

-> Electric Car Commuter Demonstration - Phase I

Place electric commuter car into service to test feasibility of zero-emission vehicles.

BACKGROUND

New York's adoption of California emission regulations requires the sale of zero-emission vehicles (ZEVs) beginning in 1998. The bulk of ZEVs most likely will be electric vehicles, at least in the early years. Some New York Stte utilities are testing van-sized and other electric vehicles to determine their feasibility for fleet applications. Fleet sales alone, however, are unlikely to meet the ZEV quantitative requirements (2% of total vehicle sales in 1998, rising to 10% in 2003). Another likely market for ZEVs may be small commuter cars with limited range requirements. In order to learn whether electric cars can serve commuter needs of this type, NYSERDA tested a single in-house vehicle.

ACCOMPLISHMENTS

The charging sites, including the Empire State Plaza garage, were monitored under NYSERDA's Alternative-Fuel Vehicle Fleet Demonstration Program to document the energy consumed by the vehicle. NYSERDA staff who drive the car provided data on usage and vehicle behavior.

FINDINGS AND CONCLUSIONS

The vehicle has been in service since December 1992. Batteries have been a source of difficulty, but the vehicle has been reliable in other respects. An experimental battery thermal-management system, intended to prevent low-temperature loss of battery power, was found to work well in cold weather but proved vulnerable to leakage of battery acid (from "leakproof" batteries). The vehicle was refurbished in the fall of 1996, including new batteries, and is operating up to specifications.

TECHNOLOGY TRANSFER ACTIVITIES

Results were shared with the New York State Department of Environmental Conservation. the Public Service Commission, and other interested organizations.

FUNDING	TOTALS
NYSERDA	$42,250
TOTALS	$42,250

Contractor: Solectria Corporation. (Wilmington, MA)
Site: Albany, Albany County
Contract Duration: 12/92-3/98
Key Words: transportation ,alternative fuels, electric car
Project Manager: Richrd Drake (518) 862-1090, ext. 3258
Program: Transportation
Subprogram: Alternative Fuels for Vehicles Demonstration
Contract No.: PO1405 ,PO2015, PO2033

-> Postal Electric Vehicle

Develop, test, and demonstrate electric vehicle to be used by Postal Service on local delivery routes.

BACKGROUND

The U.S. Postal Service (USPS) seeks to achieve environmental and energy benefits by replacing the gasoline-fueled Long-Life Vehicle (LLV) with an electric-drive LLV, or ELLV. The LLV is the primary vehicle used for making local mail deliveries and its usage pattern, featuring short trips, frequent stops, and low speeds, is very appropriate for substitution of electric-drive technology. General Motors Corporation (GM) has developed a chassis and electric powertrain suitable for integration with a modified LLV body, and GM wishes to promote sales of this powertrain to help comply with Zero-Emission Vehicle (ZEV) sales requirements in New York State and elsewhere. Baker Electromotive, Inc. builds special vehicles to meet specifications of commercial fleet operators, and has worked with GM and USPS on prior electric-vehicle projects. The New York State Technology Enterprise Corporation (NYSTEC) has established the Alternative Fuel Technology Center (AFTC) in Rome, New York, as an incubator for companies building advanced-technology vehicles.

OBJECTIVE

To design, develop, test, demonstrate, and commercialize an ELLV, with production facilities in New York State.

DESCRIPTION

In Phase 1, Baker, in collaboration with GM and USPS, will design, build, and test an ELLV Concept Vehicle, including a modified LLV body and GM's electric-drive powertrain. The concept vehicle will be evaluated by USPS and, based on this evaluation and feedback, Baker will develop updated specifications for building additional prototypes for use in Phase 2 test and demonstration projects with USPS. Baker will formalize relationships with GM and USPS and define additional phases aimed at achieving volume production of ELLVs at the NYSTEC-AFTC site in Rome.

BENEFITS

This project fosters production and use of ZEVs in New York State in support of air quality and energy diversification objectives.

SCHEDULE AND STATUS

The concept vehicle has been completed and testing is being performed. Phase 1 is scheduled for completion in late 1998. An 18-month Phase 2 is being defined.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$150,000	$300,000
Baker Electromotive, Inc.	0	1,757,500	1,757,500
U.S. Postal Service	0	300,000	300,000
NYSTEC-AFTC	0	238,000	238,000
ESEERCO	0	50,000	50,000
Empire State Development Corp.	0	150,000	300,000
TOTALS	0	$2,795,500	$2,945,500

Contractor: Baker Electromotive, Inc.
Site: Rome, Oneida County
Contract Duration: 10/97 - 10/98
Key Words: transportation, product development, electric vehicle
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4686-ERTER-TR-98

-> Electric Pedicab

Design, fabricate, and test five electric pedicabs.

BACKGROUND

Electric vehicles are proving their value in niche markets where limited range is not a factor. One such market is the pedicab market. Though the number of potential units to be sold is small compared to the automotive market, electric pedicabs are likely to gain a significant percentage of their market. These vehicles are sold to operators at resorts, boardwalks, downtown malls, and similar tourist attractions, and are cleaner and more efficient than gasoline-powered alternatives. They will complement the human-powered pedicab market by providing greater mobility than those carts currently achieve.

OBJECTIVE

The contractor will design and build five electric pedicabs and will place them in the hands of customers for field evaluation.

DESCRIPTION

The work consists initially of redesigning existing human-powered pedicabs to accommodate electric drive components, and fabricating five upgraded electrically-powered units. The contractor will also prepare a conceptual design of a "ground up" unit as part of a marketing and commercialization plan.

BENEFITS

If the program is successful, electric pedicabs will come to market in 1998. These vehicles will provide the public with clean and convenient transportation in selected areas. In addition, a New York State firm will be launched into a niche area of the electric vehicle business. Completion of the prototypes and early production is planned at the Alternative Fuel Technology Center at the Griffiss Industrial Park near Rome, New York.

SCHEDULE AND STATUS

The first cab has been built and is undergoing test. Conversion costs have been high, and structural rework is labor-intensive. A different approach may be required for additional conversions.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$39,285	$39,285
ZEV Technologies	0	26,220	26,220
G. Bliss	0	11,930	11,930
NYSTEC/AFTC	0	3,500	3,500
TOTALS	0	$80,935	$80,935

Contractor: ZEV Technologies
Site: Rome, Oneida County and New York City, New York County
Contract Duration: 9/97-9/98
Key Words: transportation, product development, electric vehicle
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4545-ERTER-TRN-98

-> Electric Scooter

Develop and commercialize two-seat electric scooter using advanced-composite material process.

BACKGROUND

The use of motorized scooters that have conventional two-stroke oil/gas engines is expanding rapidly, particularly in dense urban areas. These engines are 8-10 times more polluting than typical automobile engines. Personal Electronic Transportation's (PET) prototype two-seat electric scooter developed as part of the Costa Rica Clean Air Project, was well-received at the December 1997 UN global warming conference in Kyoto. PET will establish manufacturing operations at the former Griffiss AFB or an alternativee site. The contractor intends to fabricate the scooter body using a new composite-material process developed by the TICOM Corporation. This process would eliminate the need for a separate chassis and improve the cost, weight, range, and durability of the PET scooter and other similar vehicles.

OBJECTIVES

To develop and commercialize a two-seat electric scooter as a clean and efficient transportation alternative. Design goals include high efficiency, ruggedness, low retail cost compared to gasoline-powered competitors, and attractive styling. A central goal of the project is to develop a combined chassis/frame using the TICOM composite process.

DESCRIPTION

This will be a two-phase project that, if successful, will lead directly to large-scale manufacturing at the contractor's New York State facility. In Phase I, up to five different pre-production prototypes will be constructed to evaluate several modifications of the current design. Each prototype will be extensively field-tested in specific target markets. Scooters will be used in revenue service to obtain primary market feedback for the final production design. In Phase II, a final production-intent design will be selected using the results of Phase I testing and consumer feedback. The selected design will be used to build up to 45 more scooters for additional testing and marketing.

BENEFITS

Electric scooters will displace the imported petroleum used in conventional scooters while ameliorating local air-quality problems and greenhouse gas emissions. The New York manufacturing location would help build a critical mass of vehicle-fabrication capabilities in our State. The advanced composite materials developed in the project could potentially benefit other advanced transportation products.

SCHEDULE AND STATUS

The project has just begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$150,000	$300,000
Personal Electronic Transportation	0	458,779	750,000
TOTALS	0	$608,779	$1,050,000

Contractor: Personal Electronic Transportation
Site: Rome, Oneida County
Contract Duration: 3/98-10/99
Key Words: product development, transportation, electricity, alternative fuels, air quality, materials
Project Manager: Tucker Ruberti (518) 862-1090, ext. 3330
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4732-ERTER-98

-> Electric Outboard Motor

Develop electric outboard drive system and supporting commercialization plan.

BACKGROUND

Internal combustion engines (ICEs) are banned on many bodies of water in New York and around the United States. These bans reflect concerns about water, noise, and air pollution. One solution is to develop an electric marine drive system which would operate cleanly and quietly. The contractor has been independently pursuing this solution by developing two successful prototype electric outboard engines mounted on pontoon boats. These prototypes have been well-received in informal surveys, but the true market potential of electric marine drive systems has not yet been assessed. Additional research is required to determine the best initial commercial application of this new electric drive system.

OBJECTIVE

To: (1) develop a marine electric drive system and viable commercialization plan, and (2) secure a commercialization partner with marine and manufacturing expertise.

DESCRIPTION

Phase I will focus on quantifying the market potential of outboard electric drive systems in various applications and identifying commercialization paths and product designs that have the greatest likelihood of commercial success. Technical goals for the electric drive system include minimizing cost, weight, and volume while delivering high reliability and range. A target product and market will be selected at the end of the first phase. A critical goal in the first phase is securing a commercialization partner with marine and manufacturing expertise. In Phase 2, the contractor and commercializa-tion partner will perform the engineering design work required to build the selected marine drive system.

BENEFITS

A successful product would displace inefficient, loud, and polluting ICEs with clean, quiet, and efficient electric drives for marine applications. Operating costs would be reduced by 60-75% compared to ICEs. Gasoline and oil consumption will be displaced. Pollution prevention will be especially significant in applications where electric drives displace highly polluting two-stroke engines. A successful business would also expand the acceptance of electric drive products.

SCHEDULE AND STATUS

The project has just begun..

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$14,500	$45,200
ZEV Technologies	0	20,140	37,470
NYSTEC/AFTC	0	9,460	21,910
TOTALS	0	$44,100	$104,580

Contractor: ZEV Technologies
Site: Rome, Oneida County
Contract Duration: 3/98-12/98
Key Words: transportation, product development, marine, electric drive
Project Manager: Tucker Ruberti (518) 862-1090, ext. 3330
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4735-ERTER-TR-98

-> Hybrid-Electric Taxi

Design, construct, and test hybrid-electric taxi.

BACKGROUND

Urban vehicles equipped with hybrid-electric propulsion systems can achieve improved fuel efficiency, reduced emissions, and lower operating costs than conventional vehicles. NYSERDA has sponsored work in which Lockheed Martin Control Systems (Lockheed) developed hybrid-electric vehicle (HEV) powertrains for medium-duty trucks, large buses, and other vehicles of roughly 19,000-44,000-pound gross vehicle weight (GVW) rating.

NYSERDA also sponsored Phase I of the Hybrid Taxi project, in which Lockheed developed a proof-of-concept prototype powertrain for smaller HEVs and installed this prototype in a B-series chassis manufactured by GSM Design. This vehicle, configured as a taxi, features improved access for disabled persons and is fueled by compressed natural gas (CNG). Interested parties have expressed support for demonstration programs to display and document the capabilities of Lockheed's smaller powertrain in taxi, paratransit, and similar applications. Suggested demonstration vehicles include ones using the B-series chassis, the newer E-series, or other suitable chassis.

OBJECTIVE

To accelerate commercialization of HEV technology by demonstrating HEV capabilities in vehicles below the size range of Lockheed's current commercial product line.

DESCRIPTION

The current vehicle prototype is not yet suitable for demonstrations in which it would have to satisfy the requirements of a full-time commercial vehicle. The powertrain components and other vehicle systems require further integration and optimization, plus durability testing in a controlled environment, before being placed in demonstration service. In this Phase II effort, Lockheed will: (1) select, based on commercialization objectives, one or more chassis types for use in demonstrations; (2) develop a demonstration plan identifying the demonstration sites, duty cycles, powertrain specifications, and other particulars for demonstrating the HEV powertrain in the selected chassis; (3) develop, integrate, and evaluate improved components for the HEV powertrain; and (4) demonstrate the powertrain in a hybrid-electric taxi.

BENEFITS

If successful, this project will lead to production of fuel-efficient, clean, cost-effective taxis and other vehicles for urban applications.

SCHEDULE AND STATUS

Phase II has just begun. The project team plans to demonstrate the technology by the end of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$764,411	$200,000	$964,411
New York State Electric & Gas Corp.	25,000	0	25,000
GSM Design	36,010	0	36,010
Lockheed/Martin	1,079,500	200,000	1,279,500
EDO Corporation	15,170	0	15,170
TOTALS	$1,920,091	$400,000	$2,320,091

Contractor: Lockheed Martin Control Systems
Site: Johnson City, Broome County
Contract Duration: 3/98 - 3/99
Key Words: transportation, product development, alternative fuels, HEV, CNG, disabled persons
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4750-ERTER-TR-98

-> Hybrid-Electric School Bus

Develop and test hybrid-electric school bus powered by natural gas.

BACKGROUND

Matthews Buses, Inc. is a builder and remanufacturer of school buses based in Ballston Spa, New York. Among the company's current products is natural-gas-powered school bus with a conventional power train. Urban school buses are prime candidates for hybrid-electric drive because of their stop-and-go duty cycle. Hybrids offer improved fuel economy, reduced emissions, and lower maintenance costs in urban service.

OBJECTIVE

To assist a New York State school bus builder in developing an advanced hybrid-electric product that could be manufactured at a competitive price. The vehicle will incorporate major components also manufactured in New York State, including a powerful new electric-drive motor under development in a separate NYSERDA project.

DESCRIPTION

This project will design, build, and test a natural-gas-powered hybrid-electric school bus. Upon completion, the bus will be delivered to the Syracuse City School District for extended field-testing.

BENEFITS

Hybrid-electric propulsion offers improved fuel efficiency, reduced emissions, and lower maintenance costs in urban service. The maintenance savings accrue mainly from reduced brake wear through regenerative braking. If successful, this project will create new economic opportunity in New York State.

SCHEDULE AND STATUS

An appropriate duty cycle has been documented for use in design and testing. Work has been suspended due to financial reorganization by the contractor. It is expected that new technical arrangements will enable the contractor to resume the project in the summer of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$328,567	0	$328,567
Matthews Buses, Inc.	235,515	0	235,515
U.S. Dept. of Energy	65,000	0	65,000
Syracuse City School District	$55,000	0	55,000
TOTALS	$684,082	0	$684,082

Contractor: Matthews Buses, Inc.
Site: Ballston Spa, Saratoga County, and Syracuse, Onondaga County
Contract Duration: 2/96 - 3/99
Key Words: transportation, product development, electricity, alternative fuels, natural gas, hybrid
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4229-ERTER-TRN-96

-> Hybrid-Electric Aerial Tower Truck

Develop, test, and demonstrate a CNG-fueled, hybrid-electric truck for use by utility companies and highway crews.

BACKGROUND

Federal initiatives, including the Energy Policy Act of 1992 and the Clean Air Act Amendments of 1990, encourage or require utility companies to acquire vehicles that use alternative fuels, such as compressed natural gas (CNG). Hybrid-electric vehicle (HEV) technology greatly improves fuel efficiency and alleviates the problems vehicle designers have encountered in trying to find enough space for CNG fuel tanks, which are much bulkier than conventional fuel tanks. NYSERDA has been developing HEV technology for medium-duty trucks for several years and the technology is ready for demonstration. Aerial tower trucks (used to service overhead utility lines, traffic lights, etc.) are an ideal application because HEVs can generate large amounts of on-site power without requiring a separate generator, and can even support substantial auxiliary loads without the engine running. This approach can provide quiet operation in addition to significant reductions in fuel consumption and tailpipe emissions.

OBJECTIVE

To develop, test, and demonstrate a CNG-fueled, hybrid-electric aerial tower truck. The new truck will be manufactured at the New York State Technology Enterprise Corporation (NYSTEC) Alternative Fuel Vehicle Technology Center (AFVTC) in Rome, NY.

DESCRIPTION

Baker Electromotive, in collaboration with Lockheed Martin Control Systems (Johnson City, Broome County), will design, build, test, and demonstrate a prototype CNG-fueled, hybrid-electric aerial tower truck. The project includes participation by the NYSTEC AFVTC and several New York State utilities in the product development and evaluation stages.

BENEFITS

This project will pave way for production of vehicles that, compared to conventional vehicles, will: (1) reduce fuel consumption by an estimated 20%, (2) reduce tailpipe emissions by an estimated 50%, (3) create a significant number of manufacturing jobs in New York State, (4) generate credits to satisfy federal and state alternative-fuel vehicle (AFV) fleet requirements, and (5) provide improved performance and valuable new features to the utility industry and other users.

SCHEDULE AND STATUS

The project has just begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$150,000	$300,000
Baker Electromotive, Inc.	0	301,436	438,936
NYSTEC	0	100,000	100,000
Empire State Development Corp.	0	150,000	300,000
ESEERCO	0	50,000	50,000
Niagara Mohawk Power Corporation	0	50,000	50,000
Others	0	105,719	238,219
TOTALS	0	$907,155	$1,477,155

Contractor: Baker Electromotive, Inc.
Site: Rome, Oneida County, and Johnson City, Broome County
Contract Duration: 11/97 - 12/99
Key Words: transportation, product development, HEV, CNG
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4666-ERTER-TR-98

-> Heavy-Duty Vehicle Repowering Venture

Convert buses and trucks to operate on alternative fuels and hybrid-electric drive.

BACKGROUND

Diesel engines, the usual power source for medium- and heavy-duty trucks and buses (vehicles with gross vehicle weight ratings above 10,000 pounds), consume large quantities of imported petroleum and emit significant amounts of particulate matter, nitrogen oxides, and other pollutants. Engine manufacturers now build improved diesels that pollute less, and also have developed engine variants, based on diesel designs, that operate on cleaner-burning alternative (non-petroleum) fuels. Despite these developments, a large population of older diesels remains on the road, partly because of their inherent durability but also because it is often cost-effective to rebuild an engine rather than buy a new one. Moreover, owners are reluctant to switch to newer engine technologies because of the high capital cost and, in the case of alternative fuels, uncertainty about fuel availability. Many of these factors (air pollution, petroleum dependence, capital costs, alternative-fuel infrastructure limitations) are even more significant in overseas markets and create a demand for products that would enable vehicle owners to migrate away from traditional diesels in a cost-effective, low-risk manner.

OBJECTIVES

To identify and develop cost-effective technical options for converting conventional, in-service, heavy-duty vehicles to operate on alternative fuels, or to otherwise significantly reduce their consumption of petroleum products.

DESCRIPTION

The options to be studied are called repower kits, because they require significant modifications to the vehicle's engine or other powertrain components. Configurations of interest provide significant economic incentive, primarily through reductions in fuel costs, plus some measure of fuel flexibility, and include designs such as hybrid-electric drive and multifuel engines (e.g., diesels converted to run on alternative fuels, but still able to run on diesel fuel).

In Phase I, the contractor will: (1) identify technical options that can quickly be made ready for market introduction, (2) work with fleet operators to determine which types of repower kits have the best chance for market success, and (3) work with engine companies and other component suppliers to develop teaming arrangements that will lead to manufacturing and marketing of repower kits. The plan is for these kits to be assembled at the contractor's facility on Staten Island. Some kits would be installed in vehicles at this facility, but others would be shipped to distributors who would perform installations and provide service on behalf of the contractor.

BENEFITS

Benefits include potentially significant reductions in emissions and petroleum consumption, and development of significant export markets for manufactured products.

SCHEDULE AND STATUS

The project has just begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$19,978	$19,978
Clean Vehicle Systems	0	29,687	29,687
TOTALS	0	49,665	$49,665

Contractor: Clean Vehicle Systems, Inc.
Site: Staten Island, Richmond County
Contract Duration: 3/98 - 3/99
Key Words: transportation, product development, alternative fuels
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4736-ERTER-TR-98

-> Hybrid-Electric Vehicle Productization

Design and fabricate improved hybrid-electric vehicle components for Class 5-7 trucks.

BACKGROUND

Hybrid-electric vehicles (HEVs) recover energy when braking to a stop or moving downhill. This energy is stored and then made available to accelerate the vehicle. In previous projects, NYSERDA has demonstrated the advantages of hybrid-electric technology in urban-duty transit buses and, in a prior project with Lockheed Martin, NYSERDA assisted in designing, constructing, and testing a proof-of-concept HEV delivery truck in the Class 6 size range (19,501-26,000 pound gross vehicle weight [GVW]). The contractor is working with major truck and bus manufacturers to bring this technology to a market-competitive level.

OBJECTIVE

To design and build improved hybrid-electric components, producible at potentially competitive cost, and suitable for field service, and install them in Class 5-7 trucks (16,001-33,000 pound GVW) for field-testing by fleet operators.

DESCRIPTION

The work consists of: (1) redesigning the hybrid-electric components (generator, engine-control system, electric-drive motor and controller, and battery energy-management system); (2) fabricating and testing each component to determine reliability; and (3) installing the resulting components in trucks in cooperation with major vehicle manufacturers. This is part of a larger activity by the contractor in which a total of five vehicles (trucks designed for package delivery, recycling, garbage, and utility use, plus a school bus) will be built for fleet-testing by customers.

BENEFITS

If the program is successful, heavy-duty hybrid-electric vehicles will come to market starting in 1999. These vehicles will operate with improved fuel efficiency and reduced emissions and maintenance costs. In addition, a New York State firm will supply hybrid-electric drive trains to major vehicle manufacturers and may eventually earn more than $1 billion a year in new sales revenue.

SCHEDULE AND STATUS

Redesign and fabrication of components is expected to be completed by the fall of 1997. Customer evaluation of vehicles is scheduled to begin in 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$950,000	$300,000	$1,250,000
Lockheed Martin	2,376,883	0	2,376,883
Others (vehicle manufacturers)	600,000	0	600,000
TOTALS	$3,926,883	$300,000	$4,226,883

Contractor: Lockheed Martin
Site: Johnson City, Broome County
Contract Duration: 2/97 - 12/98
Key Words: transportation, product development, hybrid-electric
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4539L-ERTER-TRN-97

-> Rotary-Vane Compressor for Hybrid-Electric Vehicles

Integrate rotary vane compressor with inverter/motor drive for hybrid-electric vehicle heating and cooling.

BACKGROUND

Hybrid-electric vehicles require greater efficiency, reduced size and weight, and increased layout flexibility from all subsystems, including heating, ventilation and air-conditioning (HVAC) systems. These requirements have created increased interest in rotary-vane compression technology, which has been under development in Europe for the past 18 years. Mobile Climate Control (MCC) recently bought the rights and patents of Rotovane™ technology from Rotocold of the United Kingdom. MCC intends to implement advanced rotary-vane compressors as the cornerstone of the next generation of mobile HVAC systems. MCC has previously worked on conventional mobile HVAC systems for the Orion II and Orion VI buses.

OBJECTIVE

To develop an inverter/motor drive that can be integrated with MCC's semi-hermetic rotary-vane compressor. The electric motor drive would replace the standard system of pulleys and belts that has essentially remained unchanged for the past 20 years. The integrated unit would efficiently control compressor speeds independently of engine operation. Coordination with Orion and Lockheed Martin will result in a product that is designed specifically for hybrid-electric bus applications.

DESCRIPTION

MCC will analyze the mounting interfaces of its compressor and Lockheed Martin's inverter/motor drive. Power requirements will be characterized. The two devices will be mated mechanically and externally by modifying each unit as necessary using computer modeling and recasting. The completed unit will be bench-tested and then an installation location will be selected. Possible uses for excess cooling capacity will also be addressed.

BENEFITS

The completed unit will be smaller, quieter and more efficient than traditional HVAC systems. Compressor speeds will be independent of motor speeds. The design will also require less maintenance and have a longer life. Increased layout flexibility will aid in designing low-floor buses to comply with the Americans with Disabilities Act. This project will also help New York maintain its leadership position in the hybrid vehicle industry.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1998-99	Total Anticipated
NYSERDA	0	$150,000	$150,000
Mobile Climate Control Corp.	0	372,800	372,800
TOTALS	0	$522,800	$522,800

Contractor: Mobile Climate Control Corp.
Site: Utica, Oneida County
Contract Duration: 3/98-9/99
Key Words: transportation, product development, HVAC, hybrid-electric vehicles, compressor
Project Manager: Tucker Ruberti (518) 862-1090, ext. 3330
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4711-ERTER-TR-98

-> Hybrid-Electric Vehicle Motor Business

Establish hybrid-electric vehicle motor business in New York State.

BACKGROUND

Hybrid-electric vehicles (HEVs) recover energy when braking or moving downhill, storing this energy for use in accelerating the vehicle. In previous projects with NYSERDA, Lockheed Martin Control Systems has demonstrated the energy and environmental advantages of HEV technology in urban transit buses and medium-duty delivery trucks (16,001-44,000 lb. gross vehicle weight). Lockheed has now inaugurated commercial sales of the HybriDrive™ propulsion system for HEV buses and trucks and continues to develop improved hybrid-electric powertrain components. One such component is an improved electric motor that Lockheed plans to manufacture.

OBJECTIVE

To establish an HEV electric motor business in New York State.

DESCRIPTION

The work consists of: (1) evaluating and selecting motor component vendors, with emphasis on strengthening the local manufacturing infrastructure; (2) developing motor assembly and test procedures; (3) planning facilities; (4) qualifying vendors, including work to help suppliers establish quality assurance programs conforming to a baseline technical data package; (5) producing 3-5 motors to validate component selection, production processes, and test procedures; and (6) manufacturing 50 units on a standard production basis.

BENEFITS

If the program is successful, it will provide an improved motor for HEV powertrains and assist in launching HEVs into the commercial market, yielding energy and environmental benefits. By working directly to foster development of a local network of suppliers to build this motor, this project helps New York State maintain its leadership role in the emerging HEV industry and increases the probability that a significant new manufacturing industry will take root in NYS.

SCHEDULE AND STATUS

Work has begun and manufacture of the improved motor on a regular production basis is expected to begin in late 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$150,000	$300,000
Lockheed Martin	0	1,225,017	1,225,017
TOTALS	0	$1,375,017	$1,525,017

Contractor: Lockheed Martin Control Systems
Site: Johnson City, Broome County
Contract Duration: 9/97 - 12/98
Key Words: transportation, product development, hybrid-electric, HEV, electric motor
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4663-ERTER-TRN-98

-> Low-Cost Transportation Fuel Cell

Develop and demonstrate low-cost proton-exchange-membrane fuel cell that uses new materials and processes.

BACKGROUND

Fuel cells convert hydrogen to electricity in a safe, quiet, efficient, and environmentally acceptable manner. However, the high cost of fuel-cell materials has prevented their widespread use. The contractor has developed and patented new materials and processes that will offer a cost-effective option.

OBJECTIVE

To build prototype proton-exchange-membrane (PEM) fuel cells that incorporate new electrode and membrane materials to use hydrogen and ambient air as fuels.

DESCRIPTION

The contractor will optimize electrode and membrane materials, develop an assembly processes, and build a two-kilowatt prototype. Systems will be tested for performance and durability. Market analysis and development of manufacturing and marketing strategies will begin.

BENEFITS

Fuel cells that use hydrogen produce only water emissions. Using this technology for transportation; recreation, lawn, and garden equipment; and emergency home generators would reduce emissions and noise in urban environments, as well as our nation's dependence on imported oil. In addition, a small New York State firm would expand, become a manufacturer, and create new jobs.

SCHEDULE AND STATUS

30- and 100-watt cells have been built and are undergoing tests. The two-kilowatt prototype should be completed by July 1998. System testing will be completed by October 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$200,000	$169,962	$369,962
DAIS Corporation	68,161	4,987	73,148
Wright-Malta Corporation	164,000	206,668	370,668
TOTALS	$432,161	$381,617	$813,778

Contractor: DAIS Corporation
Site: Ballston Spa, Saratoga County, and Troy, Rensselaer County
Contract Duration: 10/95 - 12/98
Key Words: transportation, product development, hybrid-electric vehicles, fuel cells
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4210O-ERTER-TR-96

->Ford Proton-Exchange-Membrane Fuel Cell

Develop 50-kilowatt proton-exchange-membrane fuel cell for Ford vehicle.

BACKGROUND

Proton-exchange-membrane (PEM) fuel cells convert hydrogen to electricity. They are very efficient, clean, lightweight, and have been proposed as on-board generators for electric vehicles. Recent advances indicate that hydrogen can be generated on board a vehicle, using liquid fuels such as gasoline or methanol as input, which could resolve technical and cost issues associated with producing, distributing, and storing hydrogen. The federal Partnership for a New Generation of Vehicles (PNGV) regards PEM fuel cells as prime candidates to achieve the goal of an 80-mile-per-gallon automobile. The U.S. Department of Energy (U.S. DOE) contracted with Ford Motor Company to develop a prototype vehicle embodying this concept, and Ford in turn contracted with Mechanical Technology Incorporated (MTI) to develop a 50-kilowatt PEM fuel cell prototype for testing by Ford in a mid-sized automobile (e.g., Ford Taurus sedan). MTI is now pursuing this project as part of a new business venture, Plug Power, LLC, established to focus on fuel cell development and commercialization.

OBJECTIVE

To design and construct a 50-kilowatt PEM fuel cell system and deliver it to Ford for installation and testing in a vehicle.

DESCRIPTION

Key tasks include building and testing: (1) a short stack (the basic working element of a fuel cell) capable of rapid scale-up to the full-size power specification; (2) a compressor-expander (compander) to supply pressurized air to the stack; (3) controls and other auxiliaries; and (4) a complete, integrated, 50-kW fuel cell system suitable for installation in a Ford vehicle.

BENEFITS

If the program is successful, Ford and other companies could potentially design and manufacture vehicles powered by fuel cells and electric motors, in place of conventional vehicles that have internal combustion engines. The fuel-cell vehicles could provide greater energy efficiency and greatly reduced tailpipe emissions (aside from by-products of any hydrogen-production process, the primary exhaust product of a fuel cell is water vapor). These factors could reduce dependency on petroleum, improve air quality, and reduce greenhouse gas emissions. In addition, a significant new manufacturing industry could develop in New York State to produce fuel cells for transportation and other applications.

SCHEDULE AND STATUS

The 50kW PEM fuel cell is scheduled for completion and delivery to Ford in 1998, with additional tasks running through 2000.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$1,191,478	0	$1,448,056
Plug Power, LLC	1,062,727	0	1,573,227
Ford Motor Company	2,235,622	0	2,235,622
TOTALS	$4,489,827	0	$5,256,905

Contractor: Plug Power, LLC
Site: Latham, Albany County
Contract Duration: 12/97 - 12/00
Key Words: transportation, product development, alternative fuels, fuel cells, PEM, PNGV
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4633L-ERTER-TR-98

-> DC Voltage Converter

Design and commercialize DC voltage converter to improve efficiency of electrical subsystems on vehicles.

BACKGROUND

In conventional light-duty vehicles, electric-motor-driven systems heavily tax onboard electric supply systems. The traditional alternator and battery have difficulty providing enough current at the standard 12-volt level for vehicle subsystems, and designs for new vehicles are being restricted to an "electric-current budget." A DC voltage converter would allow use of higher-voltage motors, in turn leading to reductions in overall vehicle electrical losses, weight, and cost. The improved electrical efficiency and reduced vehicle weight would yield energy savings that would be very large on a fleetwide basis. BBS PowerMod specializes in designing and manufacturing packaged power-electronic circuits for incorporation in components sold by major suppliers to vehicle manufacturers.

OBJECTIVE

To design, develop, and commercialize an electronic DC voltage converter for vehicles. The device would be small enough and cheap enough to be packaged with an individual motor or with each of the multiple circuits on a vehicle. Specific goals of Phase 1 include developing a prototype capable of complying with the General Motors Qualification Procedure. BBS anticipates moving into volume manufacturing pending successful completion of demonstrations and qualification procedures.

DESCRIPTION

Phase 1 of this project includes design, fabrication, testing, and qualification of prototypes to be used in demonstrations with customers. Depending on Phase 1 results, a Phase 2 is planned to encompass production readiness tasks. In the presently funded Phase 1, BBS PowerMod will: (1) identify and survey potential customers to gather additional information about customers' technical requirements; (2) develop detailed specifications for the DC Voltage Converter, incorporating information from the customer surveys; (3) develop a circuit design and determine the necessary components and interconnections; (4) perform circuit simulation and analysis; (5) fabricate engineering prototypes of the circuit; (6) analyze and test the engineering prototypes to verify compliance with electrical requirements; (7) design a production-intent prototype module, including a protective outer shell and connectors compatible with automotive assembly techniques; (8) fabricate and test production-intent prototypes; and (9) perform demonstrations with potential customers to assist marketing efforts.

BENEFITS

Results of this project may allow significant design improvements in conventional vehicles and may be an "enabling technology" for electric and hybrid-electric vehicles. Energy savings, environmental benefits (less fuel use, less material), and economic benefits (reduced vehicle cost, fuel savings, and economic development) could be large. BBS plans to initiate manufacturing at a site in New York State and to sell components for incorporation into electrical subsystems built by major automotive hardware vendors.

SCHEDULE AND STATUS

The contractor has fabricated several prototypes and is performing tests to evaluate materials and overall performance.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$150,000	$150,000
BBS PowerMod	0	150,000	150,000
TOTALS	0	$300,000	$300,000

Contractor: BBS PowerMod, Inc.
Site: Victor, Ontario County
Contract Duration: 10/97 - 12/98
Key Words: transportation, product development
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4667-ERTER-TR-98

Develop natural gas engine for large trucks and buses.

BACKGROUND

Diesel engines in heavy-duty vehicles generate significant emissions, including about half the particulates, that cause significant air-quality problems in New York City and elsewhere. Substitution of compressed natural gas (CNG) for diesel fuel in these engines would greatly reduce output of particulates and other emissions, and also would reduce dependence on imported petroleum.

Cummins produces the L10 diesel engine for large trucks and buses, and also has developed the L10G, a version of the L10 capable of using natural gas and which has become popular in the transit-bus market. To broaden its natural gas engine product line, Cummins plans to develop improved versions of the L10G that will produce more power and be more economical to buy and operate. Cummins has formed a consortium to defray research and development costs, and to assist in demonstration projects. Consortium members have included: NYSERDA; New York Gas Group; Gas Research Institute; Columbia Gas of Ohio, Inc.; Southern California Gas Company; Consolidated Natural Gas Company; and, Gas Technology Canada.

OBJECTIVE

To develop and commercialize L10G natural gas engine variations that, compared to the current L10G, provide increased power, fuel efficiency, and durability, while reducing cost and emissions. Advanced versions of the L10G are to be "slipstreamed" into production, helping sustain production volumes of the L10 engine family at Cummins' Jamestown, New York, plant.

DESCRIPTION

The improved natural gas engines use many parts from the base diesel engine, so that the new engines require fewer unique (i.e., expensive) parts and so they can be manufactured on the same assembly line as the diesel engine. Also, the natural-gas components are designed for use across a family of engines that satisfy the needs of many vehicle types, further reducing the number of unique parts that must be designed and manufactured. Major technical developments include improved engine-control electronics and other hardware designed to meet both performance, emissions, and cost objectives. Specific tasks include: (1) Definition of functional requirements and design, (2) performance modeling, (3) engine builds, (4) durability evaluations, (5) field tests, and (6) emissions certification, presently defined by the ULEV (ultra low-emission vehicle) standards promulgated by the California Air Resources Board.

BENEFITS

The approach taken will allow natural gas engines to gain wider market acceptance by increasing their power range and reducing their cost. This in turn will produce environmental, fuel diversity, and economic development benefits.

SCHEDULE AND STATUS

Cummins has started work and plans to be able to accept commercial orders for the improved natural gas engines in 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$300,000	0	$300,000
Cummins Engine Company	4,982,481	0	4,982,481
Other Consortium Members	1,680,000	0	1,680,000
TOTALS	$6,962,481	0	$6,962,481

Contractor: Cummins Engine Company, Inc.
Site: Jamestown, Chautauqua County
Contract Duration: 3/96 - 3/99
Key Words: transportation, product development, alternative fuels, CNG
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4357-ERTER-TR-96

-> Advanced Rotary Compressor: Phase 2

Develop new type of compressor for CNG refueling stations.

BACKGROUND

Using compressed natural gas (CNG) as a vehicle fuel potentially can provide significant environmental, energy diversification, and economic development benefits. Unfortunately, the capital and operating costs of CNG refueling stations are high and represent significant barriers to increased penetration into the highway fuels market. The high costs are partly due to the size, complexity, and maintenance requirements of conventional reciprocating compressors. Aurora Technology Corporation, a packager of CNG stations, has suggested a more cost-effective alternative, the advanced rotary compressor (ARC), a device that uses rotary motion for all major moving parts, as compared to conventional compressors that use reciprocating pistons. The ARC allows a major reduction in the number of compressor parts and in overall compressor size, and in turn yields significant reductions in capital and maintenance costs.

OBJECTIVE

Phase 1 objectives were to design an ARC prototype and to build and run the prototype to demonstrate proof-of-concept. Test-stand operation of the prototype was aimed at generating data for use in defining ARC capabilities, identifying potential design enhancements, and designing compressor auxiliaries. Phase 2 goals include optimizing the ARC and its auxiliaries, building and operating field-test units, and starting commercialization efforts.

DESCRIPTION

Phase 2 requires development of design improvements leading to a Second Generation ARC suitable for field tests. The existing ARC test stand includes a rudimentary set of auxiliaries that were sufficient for Phase 1 testing. New auxiliaries suitable for field demonstration and later commercialization, plus an upgraded data acquisition system and other improvements, will be designed, fabricated and incorporated into a new test stand that will be used for performance and durability tests prior to ARC field tests.

BENEFITS

The approach taken may reduce the cost of CNG refueling stations, leading to greater adoption of CNG vehicles and resulting environmental, energy diversification, and economic development benefits. Commercialization plans call for the ARC to be manufactured by a New York State firm for sale to Aurora and other CNG station packagers.

SCHEDULE AND STATUS

The researchers have assembled the initial ARC prototype compressor and test stand, performed tests to verify performance, and were successful in receiving a patent for the basic mechanical design of the ARC. Field tests for the second generation ARC units are scheduled to begin in late 1998 and a final report will be completed in 1999.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$103,511	0	$278,013
Aurora Technology Corp.	340,721	0	421,516
TOTALS	$444,232	0	$699,529

Contractor: Aurora Technology Corporation
Site: East Aurora, Erie County
Contract Duration: 3/96 - 6/99
Key Words: transportation, product development, alternative fuels, CNG, compressor
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4349-ERTER-TR-96

Improve cost and performance of compressed natural gas (CNG) refueling stations with advanced auxiliaries.

BACKGROUND

The high capital and operating costs of conventional CNG refueling stations are obstacles to introduction of natural gas as a vehicular fuel. The compressor module is an expensive element of such stations and has been the subject of research efforts to improve economics. Another factor in the high cost of CNG stations is the current practice of using auxiliary systems developed for non-CNG applications, and which have not been optimized for CNG service. This lack of optimization increases cost and impairs performance. More cost-effective auxiliaries are needed.

OBJECTIVE

To design and develop auxiliary systems that will improve the cost and performance of CNG refueling stations, and increase the manufacturing base for CNG components in New York State. The project addresses the major components of a CNG station, including control system software, but not including the compressor module.

DESCRIPTION

This project examines conventional practices used in CNG station design. New approaches will be investigated, encompassing consideration of advanced electronics and improved control techniques. Some of the investigations involve fabrication of bench-scale prototypes and laboratory testing of prototype components and systems.

BENEFITS

This project will enable construction of CNG stations having lower capital and operating costs, thus increasing the potential for greater use of CNG as a highway fuel and providing air-quality and petroleum displacement benefits. New products developed in this project should provide additional revenue and jobs in the manufacture of CNG components in New York State.

SCHEDULE AND STATUS

The contractor has completed analysis of several refueling station subsystems and has developed new designs for auxiliaries that yield significant energy and cost savings when compared to standard industry components. Products developed in this project include a new type of station controller and an improved CNG dispenser. A separately funded field test in 1998 will evaluate prototypes from this project.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$200,000	0	$200,000
New York Gas Group	201,331	0	201,331
Niagara Mohawk Power Corp.	200,000	0	200,000
Aurora Technology Corp.	201,593	0	201,593
TOTALS	$802,924	0	$802,924

Contractor: Aurora Technology Corporation
Site: East Aurora, Erie County
Contract Duration: 12/93-9/98
Key Words: transportation, product development, alternative fuels, AFV, CNG, refueling station, natural gas
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 3022-ERTER-TRN-94

-> Compressed Natural Gas Component Manufacturing Venture

Design and commercialize improved compressed natural gas conversion kits.

BACKGROUND

To reduce petroleum consumption and air pollution, NYSERDA is assisting New York City in a program to convert a large number of the city's 12,000 medallion taxis to operate on compressed natural gas (CNG). Existing CNG bifuel conversion kits (systems that allow a vehicle to switch back and forth between CNG and gasoline) have trouble complying with U.S. Environmental Protection Agency (EPA) revised and strengthened requirements for emissions certification. San Marino Engineering (SME) has developed a technical approach that satisfies certification requirements for bifuel conversion kits, and also potentially reduces the cost of installing these kits.

In Phase I (Agreement 4544), SME developed and certified with EPA the Single-Point Negative Pressure (SPN) system, the only conversion kit to comply with the most stringent EPA procedures. SME has started installing this system in taxis and is now developing plans to mass-produce the SPN kit.

OBJECTIVES

To: (1) further improve the performance and cost-effectiveness of alternative-fuel vehicle systems and (2) make this improved technology available to a wider range of market segments.

DESCRIPTION

In Phase II, SME will develop additional conversion kit enhancements, including a new configuration optimized for dedicated CNG vehicles (which use CNG only) called the Multiport Positive Pressure (MPP) system. The MPP system will be suitable for sale to original equipment manufacturers,(i.e., vehicle manufacturers who would install the equipment as part of the vehicle assembly process). The MPP system includes an electronic control module, software, a novel single-stage pressure regulator, and multiple fuel injectors, one per engine cylinder. Specific tasks in Phase II include: developing the MPP system; performing field tests; obtaining certification from EPA; establishing a production facility; and performing technology transfer tasks to increase awareness among potential users of the benefits of both the SPN and MPP systems.

BENEFITS

This project will assist in increasing market penetration of alternative-fuel vehicles, leading to reductions in petroleum consumption and tailpipe emissions. SME plans to initiate manufacturing at a site in New York State and sell equipment to major domestic and international markets.

SCHEDULE AND STATUS

SME has completed Phase I and has just started Phase II.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$100,000	$ 100,000
San Marino Engineering	0	200,000	200,000
TOTALS	0	$ 300,000	$300,000

Contractor: San Marino Engineering
Site: SUNY Farmingdale, Nassau County; and New York, New York County
Contract Duration: 3/98 - 3/99
Key Words: transportation, product development, alternative fuels, CNG
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4751-ERTER-TR-98

-> Compressed Natural Gas Component Manufacturing Venture

Design and commercialize improved compressed natural gas conversion kit for taxis.

BACKGROUND

The 12,000 taxis in New York City emit a significant portion of the City's mobile-source pollutants and consume large amounts of gasoline. To reduce emissions, New York City has secured $3.2 million in federal funding to assist in converting taxis to compressed natural gas (CNG). However, before this money can be used, functional, economic, and emissions shortcomings of typical bifuel CNG conversion kits need to be overcome.

San Marino Engineering (SME) has defined a technical approach that potentially overcomes problems with existing CNG conversion hardware, specifically in complying with U.S. Environmental Protection Agency (U.S. EPA) revised and strengthened requirements for emissions certification.

OBJECTIVE

To design and commercialize a CNG conversion kit optimized for taxis and suitable for other vehicles equipped with spark-ignition engines. First sales are planned in conjunction with the federally funded CNG taxi program, and will require obtaining certification from various standards and regulatory bodies, including U.S. EPA.

DESCRIPTION

Project work will focus on design, fabrication, testing, and certification of a kit installed on a Ford Crown Victoria. The primary kit components that require additional development and certification are the pressure reducer, fuel-metering valve, fuel-control electronics, and software. The fuel-storage system, including fuel tanks, will be obtained from a third party. SME will: (1) develop an integrated kit design, (2) fabricate components (3) acquire a vehicle for prototyping, (4) acquire a CNG tank package, (5) install all equipment on the prototype vehicle, (6) perform extensive emissions tests and other tests to support design optimization and certification efforts, (7) obtain certifications from U.S. EPA and other organizations, and (8) demonstrate the prototype in on-road field-tests.

BENEFITS

This project will displace petroleum and reduce emissions in a high-visibility application in an emissions-sensitive location. The resulting CNG conversion kits will provide technical options facilitating implementation of the federally funded CNG conversion program for NYC taxis. SME plans to initiate manufacturing at a site in New York State and to sell equipment to major domestic and international markets.

SCHEDULE AND STATUS

SME has succeeded in becoming the first company to obtain EPA certification for a CNG conversion kit and is now focused on commercialization activities, including establishment of a production facility.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$75,000	0	$75,000
San Marino Engineering	129,800	0	129,800
Brooklyn Union and Others	39,000	0	39,000
TOTALS	$243,800	0	$243,800

Contractor: San Marino Engineering
Site: Staten Island, Richmond County
Contract Duration: 3/97 - 8/98
Key Words: transportation, product development, alternative fuels, CNG
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4544-ERTER-TRN-97

-> Hybrid Compressed Natural Gas Station

Fabricate and field-test improved compressed natural gas refueling station.

BACKGROUND

Compressed natural gas (CNG) is an alternative to fuels such as gasoline and diesel fuel for vehicles. In addition to reducing demand for imported petroleum, CNG has the potential to reduce production of greenhouse gases and ground-level air pollutants. Unfortunately, compressors and other equipment for dispensing CNG are very expensive. Under two ongoing projects, Aurora Technology Corporation has developed an improved CNG compressor and improved station auxiliaries that can reduce costs and enhance station operation. The Hybrid CNG Station combines these advances into an integrated skid-mounted package. Several CNG station operators have expressed interest in field-testing Aurora's concept.

OBJECTIVES

To build and demonstrate a prototype CNG station that embodies advanced components developed under two separate research efforts. The demonstration is intended to accelerate commercialization of new CNG station components made in New York State and facilitate adoption of CNG vehicles.

DESCRIPTION

The Hybrid CNG Station incorporates a new type of compressor, station controller, and fuel dispenser. In this project, the contractor will: (1) develop an overall station design that combines the advanced components into an integrated package; (2) fabricate and install a field-test unit at a site in New York State; and (3) perform field tests to refine the package, demonstrate system capabilities, and acquire data to assess the benefits of the Hybrid CNG Station compared to a conventional unit.

BENEFITS

CNG vehicles help reduce petroleum consumption and air pollution. This project will assist market penetration of CNG vehicles by demonstrating a CNG-refueling station with improved economic and technical performance compared to conventional CNG-refueling equipment. Moreover, this project will help a small New York State manufacturer launch a product line with national and international sales potential.

SCHEDULE AND STATUS

The contractor has built production versions of the various components and has started fabricating an integrated, skid-mounted, fully enclosed module suitable for installation at the test site.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$315,213	0	$315,213
Aurora Technology Corporation	74,134	0	74,134
Amoco	243,000	0	243,000
Others	91,364	0	91,364
TOTALS	$723,711	0	$723,711

Contractor: Aurora Technology Corporation
Site: East Aurora, Erie County
Contract Duration: 9/95 - 6/99
Key Words: transportation, product development, alternative fuels, air quality, natural gas, CNG
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4246-ERTER-TRN-96

-> Advanced Pavement Quality Indicator

Develop and demonstrate method for real-time evaluation of pavement quality.

BACKGROUND

Nationwide, there is a need to improve the quality of road paving, which would extend the life of the pavement and reduce the need for rehabilitative maintenance. Real-time pavement-density measurements are available through nuclear measurement techniques, which require costly equipment and specially licensed personnel. The contractor has identified two other promising approaches to measuring the percentage of air voids, and therefore the quality, of asphalt: Capacitance Energy Dissipation (CED) and Micro-Power Impulse Radar (MIR). The contractor has designed, built, and tested a breadboard CED device with promising results. The MIR approach was developed at Lawrence Livermore National Laboratory.

OBJECTIVE

To evaluate two technologies, CED and MIR, for measuring the density of asphalt pavement. The program is expected to demonstrate that relative compaction (density) of an asphalt mat can be measured in real time and the information used to feed back in-process corrections in paving and rolling operations.

DESCRIPTION

The contractor will: (1) construct initial prototype systems, (2) evaluate their performance under varying environmental conditions, (3) demonstrate their performance in the field, and (4) make any required upgrades. The contractor also will perform marketing and cost/benefit analyses of the products.

BENEFITS

These new technologies will make real-time feedback more widely available at a reduced cost and with increased safety. The result will be reduced construction, less rework of paving operations, and improved pavement durability. An estimated energy savings of 23 trillion Btu per year is expected at peak deployment through reducing the use and trucking of asphalt paving mix, paving fuel consumption, and traffic congestion. In addition, eliminating the use of radioactive material in the process will provide significant environmental and health benefits, and eliminate energy costs for storage, use, and transport of that material. Manufacturing will take place in New York State.

SCHEDULE AND STATUS

The contractor has performed field evaluations on the product with excellent results. Additional packaging and electronics work is under way. The device will be provided to paving contractors and others for beta site testing starting in May 1998. Product manufacturing is expected to start in the summer of 1998. Other co-funders include the Army Corps of Engineers Waterways Experimental Station, and the Transportation Research Board..

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$199,208	$125,000	$324,208
TransTech Systems, Inc	54,773	136,025	190,798
Others	56,323	116,677	173,000
TOTALS	$310,304	$377,702	$688,006

Contractor: TransTech Systems, Inc
Site: Latham, Albany County
Contract Duration: 11/95 - 10/98
Key Words: transportation, product development, infrastructure, construction
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4354-ERTER-TR-96

-> Composite Materials for Transportation - TEMPEST Aircraft

Use innovative composite/aluminum material to build low-cost, fuel-efficient airplane.

BACKGROUND

The recently stagnant general aviation industry, suffering from declining aircraft numbers, an aging fleet, and expensive maintenance, is poised for rapid growth due to economic and administrative changes. The contractor has taken advantage of improved aerodynamics, materials, and construction techniques to design a lighter, more fuel-efficient, quieter, and lower-cost airplane. The unique approach uses an aluminum skeleton that carries all significant structural loads, and composite panels integrally joined to the aluminum parts to complete the aerodynamic envelope. This approach not only overcomes objections to prior aircraft design that incorporated composites, but also is directly transferable to construction of advanced ground vehicles.

OBJECTIVES

To: (1) design, fabricate, and test a prototype low-cost, four-seat airplane made of aluminum and composite materials; (2) submit test plans, reports, and specifications to the Federal Aviation Administration (FAA) for aircraft certification; and (3) identify and explore other potential applications of the composite materials in the transportation industry.

DESCRIPTION

Project scope includes: (1) preliminary design, (2) detailed design and construction of tooling, (3) component construction and testing, (4) documentation development and control, and (5) airplane fabrication.

In addition, the contractor will meet with representatives of other transportation industry sectors to present its composite material and manufacturing process.

BENEFITS

The plane will reduce fuel consumption by 20%. Annual fuel savings based on a 20% market share will be 1.5 million gallons of fuel. Over time, with 20% fleet penetration, this represents an annual savings of approximately 50 million gallons of gasoline annually, with related emissions benefits. Additionally, this low-energy, high-strength, low-weight composite-manufacturing process is directly transferable to ground-based advanced vehicles and could be expected to provide significant energy benefits in the future. NYS would benefit through the addition of up to 500 manufacturing jobs and the expertise acquired in fabricating composite structures needed in the transportation industry.

SCHEDULE AND STATUS

Parts fabrication for a prototype airplane is under way at the Saratoga facility. FAA certification is ongoing. The contractor plans on the first flight in 1998. Other applications for the material are under way

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$150,000	$100,000	$250,000
Jaran Aerospace Corp.	810,654	4,134	814,788
TOTALS	$960,654	$104,134	$1,064,788

Contractor: Jaran Aerospace Corporation
Site: Ballston Spa, Saratoga County
Contract Duration: 3/97 - 12/98
Key Words: transportation, product development, composite materials, aircraft
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4543N-ERTER-TR-97

Construct and test hybrid-electric vehicle brass-board models using hydrogen-powered fuel cell and free-piston Stirling engine.

BACKGROUND

Hybrid-electric vehicles (HEVs) have the potential to reduce emissions and fuel consumption and provide range and performance competitive with conventional vehicles in urban service while using non-petroleum fuels.

ACCOMPLISHMENTS

This project demonstrated and characterized a hydrogen-powered fuel cell and a free-piston Stirling engine (FPSE) alternator integrated with HEV components and necessary controls and supervisory functions. Tests simulated HEV operation under various duty cycles. The characterization tests compared advantages and disadvantages of each system.

FINDINGS AND CONCLUSIONS

HEVs have the potential to significantly conserve petroleum-based fuels, reduce emissions per mile, and overcome the range limitations of today's battery-electric vehicles. Advanced power sources such as fuel cells and FPSEs enable HEVs to perform even more efficiently and cleanly.

REALIZED OR ANTICIPATED BENEFITS

A prototype control system was designed, built, and tested for the 2kW FPSE. The system performed as required.

A 10kW PEM fuel cell was built by Mechanical Technology, Inc. (MTI) and delivered to Ford Motor Company under the U.S. Department of Energy's Partnership for a Next Generation of Vehicles (PNGV) program, with assistance from NYSERDA. A similar 10kW unit will be built by MTI, at its own cost, for use in evaluating the brass-board hybrid-electric propulsion system and possible subsequent applications

TECHNOLOGY TRANSFER ACTIVITIES

This project has been superseded by NYSERDA project 4633-ERTER-TRN-98, which continues the development and demonstration of PEM fuel cell technology for transportation applications.

FUNDING	TOTALS
NYSERDA	$559,475
MTI	277,227
TOTALS	$836,702

Contractor: Mechanical Technology , Inc.
Site: Latham, Albany county
Contract Duration: 11/92 - 12/97
Key Words: product development, transportation, fuel cells
Project Manager: Richard Drake (518) 862-1090 ext. 3258
Program: Transportation
Subprogram: Technology Development and applications
Contract No.: 1791-ERTER-TRN-92

-> Development of Vehicle-Fleet Fuel/Maintenance Management System

Develop and test software that will integrate all areas of vehicle-fleet management to achieve fuel savings.

BACKGROUND

The contractor has developed and markets a vehicle-maintenance software system used by approximately 50 vehicle-fleet operators nationwide. Research has shown that vehicle-fuel savings of up to 10% can be achieved through driver feedback and fleet-management activities. This project will develop and add features to the existing software to achieve these savings.

ACCOMPLISHMENTS

This project developed a Windows-compatible product to permit on-line analysis of fleet operations based on fuel consumption. To assure that a real market need was met, the product-development process included design consultation and testing with sample vehicle-fleet operators. Product-development testing increased the ease of use and effectiveness of the product. Field-testing activities provided quantitative data on the fuel-saving effectiveness of maintenance activities and increased driver training. Product-marketing efforts included a brochure describing the results of field-testing, a demo disk, and a telephone marketing campaign targeting vehicle-fleet operators.

FINDINGS AND CONCLUSIONS

Fleet fuel savings of 6-10% can be achieved with an integrated fleet-maintenance program that addresses fuel efficiency.

REALIZED OR ANTICIPATED BENEFITS

Transportation accounts for more than 40 percent of New York State's energy use. Previous studies have indicated that fleet-fuel savings approaching 10% are possible with proper vehicle-maintenance programs and driver education. This product integrated all areas of vehicle-fleet management, including driver training and maintenance, so that energy savings could be achieved by on-site managers. Additional benefits may accrue due to the decreased emissions per gallon that accompany increased fuel efficiency and a properly maintained fleet.

TECHNOLOGY TRANSFER ACTIVITIES

Technology transfer is occurring through product sales .

FUNDING	TOTALS
NYSERDA	$56,361
Roger Creighton Associates, Inc.	61,136
TOTALS	$117,497

Contractor: Roger Creighton Associates, Inc.
Site: Delmar, Albany County
Contract Duration: 4/92 - 3/98
Key Words: transportation, product development, software
Project Manager: Richard Drake (518) 862-1090 ext. 3258
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 1822-EEED-IEA-92

-> Combustion of Alcohol Fuels

Investigate combustion behavior of methanol, ethanol, and blends of these alcohols with other hydrocarbons.

BACKGROUND

When used as vehicle fuel, alcohols such as methanol and ethanol have the potential to reduce emissions and petroleum imports. Disadvantages presently include high per-gallon cost and poor cold-starting, problems made worse by the present practice of using alcohol fuels in vehicles originally designed to run on gasoline. This project was designed to analyze basic combustion characteristics of alcohol fuels and develop computer models that may enable researchers to design improved alcohol-fueled engines. The new engines would have improved performance and higher efficiency, thereby increasing the functionality and reducing the cost of alcohol fuels.

ACCOMPLISHMENTS

As a result of this project, engine designers now have more information about the autoignition characteristics (i.e., the conditions under which a fuel-air mix will spontaneously ignite) and other combustion attributes of alcohol fuels. By using technical committees of the Society of Automotive Engineers (SAE) to review and disseminate project results, the researchers helped assure that the project information will be available to people who can put it to good use.

FINDINGS AND CONCLUSIONS

The researchers developed ignition diagrams, showing autoignition temperature (AIT) and factoring in combustion-chamber surface effects and other variables, and developed ignition-delay correlations. Fuels studied included methanol, ethanol, and numerous alcohol-gasoline blends. Of particular interest was a linear correlation between the gasoline content and AIT of methanol-gasoline blends; at a pressure of one atmosphere, the AIT increased from 728° Kelvin to 745° Kelvin as the volume-percent of unleaded gasoline in the mix decreased from 35 to zero.

REALIZED OR ANTICIPATED BENEFITS

The results of this project may assist in the design and use of alcohol-fueled vehicles, potentially reducing petroleum imports and vehicular emissions.

TECHNOLOGY TRANSFER ACTIVITIES

Under the auspices of SAE, the researchers wrote technical papers and made presentations at national conferences. The researchers also wrote a comprehensive final report and plan to use the report as the basis for articles published in technical journals.

FUNDING	TOTALS
NYSERDA	$ 55,179
Petroleum Overcharge Funds	74,076
TOTALS	$129,255

Contractor: Union College
Site: Schenectady, Schenectady County
Contract Duration: 4/93 - 12/97
Key Words: transportation, university, alternative fuels, AFV, alcohol, ethanol, methanol (M85)
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications, Petroleum Overcharge
Contract No.: 3010-ERER-POP-94

-> Engine-Driven CNG Station

Design and build compressed natural gas vehicle-refueling station, that uses engine-driven compressors.

BACKGROUND

Compressed natural gas (CNG) is an alternative fuel that potentially can reduce vehicle exhaust emissions and dependence on petroleum. Because air-quality improvements are most needed in cities and the range restrictions of CNG vehicles are less problematic in urban areas, it is logical to concentrate on cities when beginning to establish a CNG-fueling infrastructure. Unfortunately, siting new facilities in urban areas is difficult because of space restrictions. Also, costs can be high because CNG stations typically use large electric motors to drive the natural gas compressors; the cost to run high-voltage wires to the CNG equipment can be high and electric operating costs, including factors such as demand charges, represent a major expense. The objective of this project was to develop a more cost-effective, self-contained CNG station that could be easily installed at existing service stations in urban areas.

ACCOMPLISHMENTS

The project team developed a prototype module containing all the CNG station equipment. The CNG compressor in the module is driven by a natural-gas-fueled engine, eliminating the need for a large electric motor and expensive electric service lines. Based on natural gas vs. electricity costs, the system should also be less expensive to operate. In addition, the design reduces the "footprint" of the station, compared to other designs, and incorporates other features to further reduce installation problems and costs.

FINDINGS AND CONCLUSIONS

Although the initial prototype was better than other designs, it did not achieve all of the planned technical and cost objectives. A second, improved prototype was to be developed, but has been postponed indefinitely untiul there is more demand for CNG equipment.

REALIZED OR ANTICIPATED BENEFITS

A standardized engine-driven CNG refueling module with a minimal footprint would potentially improve the economics and reduce the problems associated with adding CNG-refueling capability to existing gasoline stations. This would overcome some of the hurdles limiting expansion of the CNG infrastructure, especially in urban areas. In turn, this would make it easier to tap the potential air-quality and petroleum-displacement benefits of CNG vehicles.

TECHNOLOGY TRANSFER ACTIVITIES

The prototype design has been documented and the developers will factor the lessons learned into future CNG station designs.

FUNDING	TOTALS
NYSERDA	$100,000
Brooklyn Union	700,000
TOTALS	$800,000

Contractor: Brooklyn Union
Site: Brooklyn, Kings County
Contract Duration: 11/93 - 6/97
Key Words: product development, transportation, alternative fuels, AFV, CNG, fueling station, natural gas
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 3023-ERER-ER-94

-> Cost-Effective Free-Piston Stirling Engine System for Hybrid-Electric Vehicles

Develop cost-effective, low-emission power-generation unit for hybrid-electric vehicles.

BACKGROUND

Clever Fellows Innovation Consortium, Inc. developed a low-cost free-piston Stirling engine (FPSE) for solar collectors. The engine technology also applies to vehicles and free-standing generators when coupled with an alternative energy source. This system will provide an efficient, quiet, low-maintenance, and low-emission power-generation unit that can use a variety of fuels.

ACCOMPLISHMENTS

A burner for natural gas was developed and tested in a test cell. Additional fuels were not explored, and the burner was not mounted on a free-piston Stirling engine for evaluation, due to a lack of adequate market interest.

FINDINGS AND CONCLUSIONS

The burner performed well, and was modified for use on another engine type. If market interest grows, this project should be re-evaluated for applicability and potential further development.

REALIZED OR ANTICIPATED BENEFITS

Benefits of this system compared to an internal combustion engine include: improved emissions; improved reliability and ease of maintenance due to fewer moving parts, a more fully sealed system, and the lack of lubricated/wear components; more fuel diversity at less cost; and quieter operation. The technology will transfer directly to the free-standing generator market.

TECHNOLOGY TRANSFER ACTIVITIES

A modified version of this burner is being used on the thermoacoustic engines under development by the contractor.

FUNDING	TOTALS
NYSERDA	$275,450
Clever Fellows Innovation Consortium	120,000
TOTALS	$395.450

Contractor: Clever Fellows Innovation Consortium, Inc.
Site: Troy, Rensselaer County
Contract Duration: 5/95 -3/98
Key Words: transportation, product development, alternative fuels, Stirling engine
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4082L-ERTER-TR-95

->CNG Taxi Pilot Fleet

Design, build, and field-test improved compressed natural gas conversion kits optimized for taxis.

BACKGROUND

The 12,000 medallion taxis in New York City consume significant amounts of fuel and emit pollution in a densely populated area. In view of a taxi's limited area of operation and intensive use, this high-profile application warrants rapid development for alternative-fuels use, with emphasis on air-quality enhancement. New York City has secured $3.2 million in federal funding to assist in converting taxis to compressed natural gas (CNG).

The objective of this project was to develop and demonstrate CNG conversion kits optimized for vehicles approved for use as NYC taxis, and to validate these kits by operating them in revenue service in a pilot fleet that would serve as the starting point for the federally funded conversion program.

ACCOMPLISHMENTS

The contractor converted 17 taxis to CNG, using components integrated into configurations optimized for taxi application. A unique aspect was onboard storage of relatively large amounts of CNG (approximately 16 gasoline-equivalent gallons), while adding only about 150 pounds to vehicle weight and preserving adequate trunk space. This enabled the taxis to store enough fuel in one fueling stop to meet functional requirements and to generate fuel-cost savings large enough to be financially attractive. The results of this project were used to shape and initiate the federally funded CNG taxi program, the goal of which is placing more than 300 CNG taxis in service.

FINDINGS AND CONCLUSIONS

After being placed in service, the converted vehicles demonstrated that CNG was a practical fuel for taxis. By working closely with the Taxi and Limousine Commission, other New York City agencies, local gas utilities, taxi owners, drivers, and other interested parties, the contractor was able to successfully resolve many technical and institutional issues.

REALIZED OR ANTICIPATED BENEFITS

This project helped initiate use of a technology that displaces petroleum and reduces pollution in an emissions-sensitive location. By increasing the demand for CNG, this project has helped stimulate growth of CNG infrastructure such as fueling stations, conversion centers, and mechanic training programs.

TECHNOLOGY TRANSFER ACTIVITIES

Technology transfer is taking place in the form of the federally funded CNG taxi program and also other CNG vehicle programs that benefit from this ground-breaking initiative. Project results have been used to assist taxi owners in selecting equipment conversions.

FUNDING	TOTALS
NYSERDA	$192,011
EDO Corporation	55,000
NYC Dept. of Env. Protection	135,000
U.S. DOT/EPA	1,065,000
TOTALS	$1,447,011

Contractor: EDO Corporation
Site: College Point, Queens County
Contract Duration: 3/95 - 6/97
Key Words: transportation, product development, alternative fuels, air quality, natural gas, CNG, AFV
Project Manager: Joe Wagner (518) 862-1090, ext. 3228
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4097-ERTER-ER-95

-> Development of an Ultracapacitor for Hybrid-Electric Vehicles

Design, build, and test ultracapacitor stacks for hybrid-electric vehicle applications.

BACKGROUND

General Electric Corporate Research and Development (GE-CRD) was awarded a contract by Ford Motor Company to participate in the U.S. Department of Energy (U.S. DOE)-sponsored hybrid-electric vehicle development project. GE-CRD is developing an ultracapacitor as part of the power-handling system of the vehicle. Other firms are developing competing technologies under the U.S. DOE/Ford program.

ACCOMPLISHMENTS

Prototype ultracapacitor cells were designed, built, and tested. Performance met or exceeded expectations; however, packaging issues were not fully resolved. Cost goals were approached, but not met.

FINDINGS AND CONCLUSIONS

Additional research and development is required to address packaging issues and continue to reduce cost. The system may be cost-effective for some markets, including heavy-duty hybrid-electric vehicles, that are small at this time.

REALIZED OR ANTICIPATED BENEFITS

Successful development of this technology would dramatically improve performance of hybrid and electric vehicles. An ultracapacitor system can be used in conjunction with batteries or other power sources to provide bursts of power and a reservoir to accept energy from regenerative braking at a high rate. The results are more energy-efficient vehicle drive systems, reduced emissions, and better performance. If cost-effective, applications could extend to light-duty vehicles.

TECHNOLOGY TRANSFER ACTIVITIES

The contractor will continue to seek additional funding to continue development work for interested markets.

FUNDING	TOTALS
NYSERDA	$583,556
General Electric CRD	472,427
U.S. Department of Energy/Ford	1,406,302
TOTALS	$2,462,285

Contractor: General Electric Corporate Research and Development
Site: Schenectady, Schenectady County
Contract Duration: 3/94-8/97
Key Words: transportation, product development, ultracapacitor, electric vehicles, hybrid-electric vehicles
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4114-ERTER-TR-95

-> Low-Cost Hybrid-Electric Drive

Developed and demonstrated low-cost hybrid-electric drive train for Class 6 school buses and trucks.

BACKGROUND

Hybrid-electric drives let vehicles recover energy when they are braking to a stop or moving downhill. This energy is stored and then made available for acceleration. In previous projects, NYSERDA demonstrated the advantages of hybrid-electric technology in urban-duty transit buses.

ACCOMPLISHMENTS

The research effort focused on development of a low-cost, integrated system controller, battery charger, generator/motor controller. The contractor worked closely with Navistar to assure that performance of the hybrid drive met or exceeded that of the conventional drive. The drive was tested in a heavy-duty bus/truck chassis and outperformed conventional drive technology in all respects.

FINDINGS AND CONCLUSIONS

This project demonstrated that medium- and heavy-duty vehicles are ideal candidates for hybrid electric-drive. Hybrids provide superior driveability, acceleration, and hill-holding while reducing fuel consumption and emissions.

REALIZED OR ANTICIPATED BENEFITS

Previous hybrid-electric drive implementations demonstrated 50% reductions in vehicle emissions and 30% improvements in fuel efficiency. The goal of this development effort was to meet or exceed these improvements at a cost of less than 30% more than a conventional engine-transmission drive.

TECHNOLOGY TRANSFER ACTIVITIES

The developmental truck was debuted by Navistar in late 1997. Navistar announced it will offer the hybrid drive in its Class 5, 6, and 7 vehicles following performance and durability testing.

FUNDING	TOTALS
NYSERDA	$650,000
Lockheed Martin	729,883
Navistar	600,000
TOTALS	$1,979,883

Contractor: Lockheed Martin
Site: Johnson City, Broome County
Contract Duration: 12/95- 9/97
Key Words: transportation, product, hybrid-electric
Project Manager: Richard Drake (518) 862-1090, ext. 3258
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4345-ERTER-TRN-96

-> Ultracapacitor Controller

Develop controller as interface between ultracapacitor and drive systems of hybrid-electric vehicle.

BACKGROUND
Ultracapacitors are seen as a critical element in the success of electric and hybrid vehicles. However, although ultracapacitors offer very high specific power, they decline rapidly in voltage as energy is extracted, and require a special controller as an interface.

ACCOMPLISHMENTS
The contractor designed, built, and tested two 25kW controllers. One was delivered to U.S. DOE for further testing, and the other was kept by the contractor for its own use. The interface can be used with any energy-storage, power -handling devices, including ultracapacitors, batteries, and flywheels.

FINDINGS AND CONCLUSIONS
The interface effectively manages the loads, providing protection against current spikes and overcharging.

REALIZED OR ANTICIPATED BENEFITS
Hybrid-electric propulsion offers improved fuel efficiency and reduced emissions in urban service. The controller developed in this project will allow ultracapacitors to be used effectively in hybrid-electric vehicles such as transit buses, delivery trucks, and taxis. Ultracapacitors perform the load-leveling function needed in hybrid-electric vehicles, but with significantly lower weight and longer life than batteries.

TECHNOLOGY TRANSFER ACTIVITIES
The contractor intends to commercialize the interface for several applications, including industrial power supplies. The product is expected to be developed for commercialization by the end of calender year 1999.

FUNDING	TOTALS
NYSERDA	$216,684
U.S. Department of Energy	267,610
TOTALS	$484,294

Contractor: General Electric Corporate Research and Development
Site: Niskayuna, Schenectady County
Contract Duration: 5/96 - 6/98
Key Words: transportation, product development, electricity, alternative fuels, natural gas, hybrid, ultracapacitor, controller
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4352-ERTER-TRN-97

-> Ford Proton-Exchange Membrane Fuel-Cell

Develop 50-kilowatt proton-exchange-membrane fuel cell for Ford vehicle.

BACKGROUND

Proton-exchange-membrane (PEM) fuel cells convert hydrogen to electricity. They are very efficient, clean, lightweight, and have been proposed as on-board generators for electric vehicles. The federal Partnership for a New Generation of Vehicles (PNGV) program has identified PEM fuel cells as prime candidates to achieve the goal of an 80-mile-per-gallon automobile. The U.S. Department of Energy (U.S. DOE) contracted with Ford Motor Company to develop this vehicle, and Ford contracted with Mechanical Technology, Inc. (MTI) to develop a 50-kilowatt prototype unit for testing in a Taurus-sized vehicle.

ACCOMPLISHMENTS

Key developments included fabrication of internal components and design of a compressor-expander (compander) to supply pressurized air. The completed fuel cell will be installed in a Ford aluminum-intensive vehicle (AIV), a Mercury Sable (similar to Taurus), for testing.

FINDINGS AND CONCLUSIONS

Vehicles powered by hydrogen would achieve very high fuel efficiency and emit only water vapor when operating.

REALIZED OR ANTICIPATED BENEFITS

As PEM fuel cells become a reality in automotive applications, a New York State firm is well-positioned to become a supplier to Ford, and may eventually earn more than $1 billion a year in new sales revenue.

TECHNOLOGY TRANSFER ACTIVITIES

The contractor transferred this technology to the stationary applications market through a joint venture with Detroit Edison that has resulted in a new NYS business, Plug Power, Inc. Plug Power is aggressively marketing this technology, and continuing to further develop the technology for vehicle applications.

FUNDING	TOTALS
NYSERDA	$888,581
Mechanical Technology, Inc.	1,296,000
Ford Motor Company/USDOE	2,235,622
TOTALS	$4,420,203

Contractor: Mechanical Technology, Inc.
Site: Latham, Albany County
Contract Duration: 3/97 -11/97
Key Words: transportation, product development, alternative fuels, electricity, fuel cells, PEM, PNGV
Project Manager: Richard Drake (518) 862-1090, ext. 3258
Program: Transportation
Subprogram: Technology Development and Applications
Contract No.: 4540-ERTER-TR-97

-> New York State Interregional Transit Information System

Develop and deploy web site with transportation information for intercity travel.

BACKGROUND

Passenger travel between and within New York State metropolitan areas, much of it in single-occupancy vehicles (SOVs), consumes significant amounts of fossil fuels and contributes to high levels of regulated vehicle emissions. One way to reduce SOV travel is to encourage the use of mass transit, particularly for business travelers. Information systems providing pre-trip planning and guaranteed ride information are expected to help make mass transit a realistic option for travelers.

OBJECTIVES

To design, build, evaluate, and deploy an information system providing intercity and intracity transit information, including public and private transportation options, for New York State's major urban centers. The system will be targeted to business class consumers, accessible via the Internet, and supported with advertising revenue.

DESCRIPTION

The contractor will: (1) survey existing transportation data to identify what can be used in its existing electronic form; (2) create additional data files as needed to produce a comprehensive set of transportation information for intercity travelers, with initial focus on New York State's major urban centers; (2) design the user interface for a web site, evaluate the system on-line, and deploy the system via the Internet; (4) promote use of the site and sell advertising to pay for its continued maintenance; and (5) evaluate consumer use of the site to determine, to the extent possible, its effect on intercity transit.

BENEFITS

Accessible, accurate data is expected to increase the use of mass transit and reduce SOV travel, providing related energy and environmental benefits. Successful deployment will establish this small Internet information systems provider as a leader, enhancing business growth opportunities.

SCHEDULE AND STATUS

The web site design is underway. Contacts have been made with appropriate transportation authorities around the State. Testing of the system is expected to begin in the fall of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$36,890	$36,890
MetroCommute	0	36,890	36,890
TOTALS	0	$73,780	$73,780

Contractor: MetroCommute Options Group
Site: New York, New York County
Contract Duration: 4/97 - 4/98
Key Words: transportation, transit, traveler information systems
Project Manager: Karen Villeneuve (518) 862-1090 ext. 3275
Program: Transportation
Subprogram: Advanced Transportation Systems and Infrastructure
Contract No.: 4615-ERTER-TR-98

-> New York Wide-Area Information Network System (NY-WINS)

Design system to collect and disperse real-time traffic data.

BACKGROUND

Traffic congestion in urban areas results in wasted fuel, increased vehicle emissions, and travel time, traffic incidents, and driver frustration. The New York Wide-Area Information Network System (NY-WINS) will provide information to motorists through in-vehicle messages (IVM), highway advisory radio (HAR), and variable-message signs (VMS.) The system builds on electronic toll-collection technology and the TRANSMIT data-collection system already deployed in the New York City area. NY-WINS will take the technology one step further, using two-way communication to identify vehicle location and feed information back to the vehicle regarding traffic conditions. In addition, the HAR and VMS systems will be tied into the TRANSMIT system, providing accurate real-time information to all motorists.

OBJECTIVES

To: (1) provide real-time traffic information to motorists, (2) reduce traffic congestion, and (3) develop a data and communications system that could be used as a platform for a Statewide traffic-management system. Maintain compatibility with national intelligent transportation systems (ITS) standards and architecture, as well as other systems.

DESCRIPTION

The project consists of three phases: (1) design, (2) implementation, and (3) enhancement. Phase 1 includes extensive requirements analysis based on the needs of transportation agencies and commercial/private vehicle operators, as well as system design. Phase 2 consists of integration of HAR and VMS with the TRANSMIT system. Phase 3 consists of deployment of read/write hardware in selected demonstration vehicles, information transmission, and systems enhancement as needed to improve performance. The NY-WINS program will be implemented within the existing TRANSMIT system coverage area (18 miles along the New York State Thruway and Garden State Parkway). Later phases of the project may expand the operating area, as TRANSMIT and other data-collection systems expand.

BENEFITS

Accurate, real-time information on road and traffic conditions will allow travellers to make informed choices. Fuel consumption will be reduced by 1,500 gallons per day, and travel time by 53,000 person-hours per day. Vehicle hydrocarbon emissions will be reduced by 8 percent, and carbon monoxide by 15 percent. After successfully implementing the program in this corridor, funding will be sought to expand the system locally, to other metropolitan areas in the Northeast, and to other locations already using or planning to use electronic toll collection.

SCHEDULE AND STATUS

A draft design document has been completed. The next phase of development is currently being definitized. A proposal for additional development work is expected in July 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$129,975	0	$129,975
PBQD	24,995	0	24,995
Mark IV IVHS, Inc.	20,512	0	20,512
NYS Thruway Authority	20,137	0	20,137
TOTALS	$195,619	0	$195,619

Contractor: Parsons, Brinckerhoff, Quade & Douglas (PBQD)
Site: Rockland County; Westchester County; and Bergen, NJ
Contract Duration: 3/96 -12/97
Key Words: transportation, ITS, traffic management, IVHS
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Advanced Transportation Systems
Contract No.: 4371-ERTER-TR-96

-> Track Star II

Develop next-generation automatic vehicle location (AVL) and information system.

BACKGROUND
Commercial vehicle operators have been using AVL systems successfully in fleet management, resulting in significant fuel savings, better emergency response, and better control over operations. Additional benefits and efficiencies can be realized by improving AVL service, automating some other aspects of commercial operations on the vehicle, and making data available to operators in real time.

OBJECTIVE
To design a second-generation AVL system that will provide transportation operators with numerous pieces of vehicle data, including automated driver log books, vehicle operations logs, fuel tax reporting, cargo manifesting, and vehicle location without incurring cellular airtime charge, as well as continuous vehicle location information in the absence of geographic positioning system (GPS) satellite contact.

DESCRIPTION
The project is a three-year effort from preliminary design to full-scale manufacturing. Only the first year is funded at this time, and will encompass the design of the hardware and software. Phase I will result in the production of a prototype unit to be used in initial testing.

BENEFITS
Energy savings will result from more efficient operation of commercial vehicle fleets. Fleets have achieved nearly 4% fuel savings using AVL technology; even more savings are expected from the improvements planned for this project. In addition, the low cost of this system will make AVL and information technologies available to smaller trucking firms that cannot currently afford them. Economic benefits will be realized through increased jobs for a New York State defense conversion manufacturer.

SCHEDULE AND STATUS
Analysis and design began in October 1997. Prototype testing is expected to begin in August 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$123,178	$123,178
Phoenix Systems & Technologies	0	337,035	337,035
TOTALS	0	$460,213	$460,213

Contractor: Phoenix Systems & Technologies
Site: New Hartford, Oneida County
Contract Duration: 4/97 - 3/98
Key Words: transportation, product development, AVL, commercial vehicle operations (CVO)
Project Manager: Tucker Ruberti (518) 862-1090, ext. 3330
Program: Transportation
Subprogram: Advanced Transportation Systems and Infrastructure
Contract No.: 4616-ERTER-TR-98

-> Transit Route Selection Service

Improve transit customer information with geographic information system.

BACKGROUND

Due to federal funding cuts, transit authorities need to boost revenue by increasing ridership without raising operator costs. This can best be accomplished during off-peak hours, when there is excess capacity to fill with non-commuters. There is also a need to provide lower-cost transit service to disabled and Medicaid customers.

OBJECTIVE

To improve the quality, quantity, and availability of transit customer information by developing a route selection system within a geographic information system (GIS) framework.

DESCRIPTION

The system will analyze routing options based on specific departure and destination points and other constraints, and select optimal routes for presentation to the user. Directions will be from point-of-departure, and include directions to bus stops, transfer waiting times, and directions to exact destination. It will also provide information on lifts and other features on buses that accommodate handicapped customers. The system will be evaluated by Capital District Transportation Authority (CDTA) telephone operators, Rensselaer Polytechnic Institute (RPI) students, and a social services office. Follow-on phases would expand system availability through the Internet, kiosks, fax-back systems, and other means as appropriate; and provide information about direct links from CDTA's regular transit service to specialty transit services and other modes of transportation.

BENEFITS

Better transit information is expected to increase transit use by handicapped, Medicaid, and other social services clients while decreasing door-to-door service currently provided at social service program expense; and result in related energy/environmental benefits. It is also expected to increase non-commuting (off-peak hours), and low-income ridership while decreasing single-occupancy vehicle trips. More effective transportation systems promote economic growth by increasing labor mobility and housing options.

SCHEDULE AND STATUS

Transit information has been converted to the GIS system. Algorithm development is underway. Testing of the system will begin in the fall of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$46,511	$46,511
Capital District Transportation Authority	0	14,560	14,560
Rensselaer Polytechnic Institute	0	24,986	24,986
TOTALS	0	$86,057	$86,057

Contractors: Capital District Transportation Authority and Rensselaer Polytechnic Institute
Site: Albany, Albany County and Troy, Rensselaer County
Contract Duration: 10/97 - 11/98
Key Words: transportation, transit, ITS, traveler information systems
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Advanced Transportation Systems and Infrastructure
Contract No.: 4614-ERTER-TR-98

-> Rail-Based Wheel Gauge

Design and develop wheel-measurement system mounted on rails.

BACKGROUND

One of the most time-consuming, expensive, and error-prone components of rail-car maintenance is wheel inspection. Process automation in the field will reduce unscheduled down-time of rail cars, improve safety, reduce inspection cost and time, and improve the competitiveness of rail for freight operations. In addition, automatic inspection that yields safety improvements and meets ride-quality requirements will be an enabling technology for passenger high-speed rail.

OBJECTIVE

To: (1) develop a field prototype rail-based wheel gauge that can accurately measure wheels at speeds of 10 mph or greater, and (2) install the system at a local rail yard for field evaluation.

DESCRIPTION

The contractor will: (1) perform market research to identify system performance, form, fit, and function requirements; (2) develop a system specification; (3) design and build prototypes for field evaluation; and (4) make necessary changes to the system design to prepare for commercialization.

BENEFITS

By enhancing the competitiveness of rail through lower costs and increased safety, more freight can be moved off highways, reducing the energy cost to move that freight by 2/3. Commuters switching from vehicles to rail save an average of 200 gallons of fuel annually per person. Improved wheel maintenance results in fewer train incidents and more efficient wheel re-manufacturing, lowering the energy cost of operating rail systems.

SCHEDULE AND STATUS

Laboratory evaluations are complete. The system is being installed at the Rensselaer Amtrak station. Field-testing should be complete by December 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$100,000	$150,000	$300,000
IEM	62,846	102,683	165,529
Simmons Machine Tools	40,285	0	40,285
Transportation Research Board	28,228	45,251	73,479
Amtrak	0	50,000	50,000
TOTALS	$231,359	$347,934	$579,293

Contractor: International Electronic Machines, Inc. (IEM)
Site: Albany, Albany County
Contract Duration: 2/97 -12/98
Key Words: transportation, product development, rail, inspection, infrastructure
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Advanced Transportation Systems
Contract No.: 4464M-ERTER-TR-97

Investigate feasibility of using cyclic-shear and other mechanical processes to increase pavement density.

BACKGROUND
Paving is a multistep process that involves laying down asphalt in a semi-compacted mode, followed by two or three compaction passes with large rollers to achieve adequate density. The paving industry would like to increase the compaction of the asphalt as it is first laid down, and reduce the number of rolling cycles required. The concrete industry has long used vibration as a technique to remove air voids and increase concrete density. The contractor has done some initial feasibility tests, and has determined that there is potential to apply the same principle to paving.

OBJECTIVE
To (1) investigate the feasibility of using cyclic-shear vibration and other mechanical means to increase the density of asphalt pavement as it is being laid, and (2) construct and demonstrate prototype units.

DESCRIPTION
The contractor will: (1) further evaluate, define requirements for, and design a system to increase the density of asphalt mats by using vibration as they are laid; (2) build a prototype system and test it both in the lab and in field demonstrations; (3) modify the design as needed to meet performance specifications; and (4) build and field-test prototype systems based on commercial specifications.

BENEFITS
The product will reduce time spent on paving operations, thereby reducing construction-related traffic congestion and incidents. Overall energy use in paving operations is projected to decline by eliminating one rolling pass, even when considering the energy used for vibration.

SCHEDULE AND STATUS
Design and testing of several prototype devices is under way. Laboratory testing is also under way. Testing of these options is expected to be complete by July 1998, when a design will be chosen for further development..

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$75,000	$75,000
TransTech Systems, Inc	0	106,187	106,187
TOTALS	0	$181,187	$181,187

Contractor: TransTech Systems, Inc.
Site: Latham, Albany County
Contract Duration: 8/97 - 8/98
Key Words: transportation, product development, paving, infrastructure, density
Project Manager: Karen Villeneuve (518) 862-1090 ext. 3275
Program: Transportation
Subprogram: Advanced Transportation Systems & Infrastructure
Contract No.: 4541-ERTER-TR-98

-> Soil-Compaction Meter

Develop system to measure density/compaction of soils and backfill.

BACKGROUND

TransTech has successfully developed a Pavement Quality Indicator (Agreement 4354-ERTER-TR-96) that is now entering commercialization. TransTech now plans to explore the application of this same technology to soils. The condition of material below pavement also has a significant impact on pavement life. Although road-base preparation is fairly extensive in new construction, repaving and patching operations generally do not receive adequate base preparation. The result is untimely or continuing failure of the pavement surface. In particular, after municipalities or utilities work on systems below the pavement surface, the backfill may not be adequately compacted prior to repaving. Currently, nuclear devices, core samples, and soil penetrometers (impact-based penetration) are used to determine density or compaction. As with paving, these techniques have practical limitations.

OBJECTIVE

To determine the feasibility of using capacitance-based technology for the measurement of soil density.

DESCRIPTION

Determine performance and other system requirements through literature searches and coordination with industry. Design a prototype soil-density measurement device based on the pavement quality indicator technology. Through laboratory testing, determine the applicability of this technology to soil compaction measurement. Revise the design based on the test program outcome.

BENEFITS

Benefits of this project may include: (1) improving the efficiency of the road-paving process and reducing energy consumption during paving (more accurate soil-compaction work, (2) lessening road maintenance through improved quality; (3) reducing maintenance energy consumption maintenance (materials mixing, and transport, resurfacing, etc.); (4) alleviating traffic congestion associated with paving and maintenance; (5) reducing wear-and-tear on vehicles thanks to better overall condition of roads; and creating jobs in Latham, NY.

SCHEDULE AND STATUS

Testing will take place in September 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$60,000	$60,000
TransTech Systems, Inc.	0	9,969	9,969
Brooklyn Union	0	50,000	50,000
TOTALS	0	$119,969	$119,969

Contractor: TransTech Systems, Inc.
Site: Latham, Albany County
Contract Duration: 3/98 - 12/98
Key Words: transportation, product development, paving, construction
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Advanced Transportation Systems and Infrastructure
Contract No.: 4731-ERTER-TR-98

-> Automated Highway Oversize/Overweight Permitting System (AHOOPS)

Develop, demonstrate, and deploy automated highway-permitting and route-selection system.

BACKGROUND

Oversize/overweight vehicles require permits that authorize specific routes for travel. Permitting systems are unique for each state, and even for individual transportation departments or authorities within a state. In New York, the process is manually intensive and time-consuming, and has a high (approximately 15%) application error rate. Trucking firms waste large amounts of fuel and time each year due to both inefficient or incorrect trip routing and working within a complicated system. Some trucking firms fail to obtain permits at all due to the complexity of the process, and use unauthorized routes, sometimes causing damage to roads and bridges.

ACCOMPLISHMENTS

An automated system was developed and installed. Additional systems-integration work is required to make the system fully operational and obtain its maximum level of performance.

FINDINGS AND CONCLUSIONS

Although the system has growth potential, it will not yet meet all of the projected performance goals. For example, sufficient data does not exist to support time-of-day routing based on traffic patterns.

REALIZED OR ANTICIPATED BENEFITS

Automated, accurate, and efficient routing based on road/bridge limitations, load size and type, and status of construction and maintenance will significantly reduce commercial-vehicle fuel consumption. Reducing unpermitted or improperly permitted vehicles will reduce the number of traffic incidents and road/bridge damage and provide significant energy savings from reduced congestion and maintenance and repair activities. Automating the permitting process will reduce both workload and paper use. In addition, the New York State Department of Transportation's (NYSDOT) and the New York State Thruway Authority's (TA) permitting operational costs will be reduced, and New York will benefit from an improved business climate.

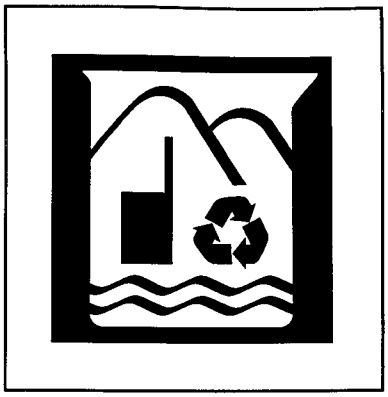
TECHNOLOGY TRANSFER ACTIVITIES

The contractor is displaying the system and advertising its availability at conferences and trade shows.

FUNDING	TOTALS
NYSERDA	$173,800
Lockheed Martin Federal Systems	135,914
DOT, TA, and others	140,751
TOTALS	$450,465

Contractor: Lockheed Martin Federal Systems, Inc
Site: Owego, Tioga County, and Albany, Albany County
Contract Duration: 1/96 - 8/97
Key Words: transportation, transportation management, transportation services
Project Manager: Karen Villeneuve (518) 862-1090, ext. 3275
Program: Transportation
Subprogram: Advanced Transportation Systems
Contract No.: 4372-ERTER-TR-96

ENVIRONMENT



Benefits and Rationale

The Environment program develops and demonstrates technologies associated with waste management and pollution control. The program responds to the needs of municipalities, industries, and utilities that are end-users of technologies. The program also facilitates business opportunities associated with manufacturing environmental products, controlling pollution, and managing wastes to meet customer needs. Principal areas of emphasis include drinking water and wastewater treatment, solid waste, hazardous sludge and process residuals management, and air-pollution control.

Benefits accruing to communities and businesses in the State from the use of efficient waste-management and pollution-control technologies include energy savings, increased plant capacity, lower costs, improved air and water quality, increased fuel diversity, re-use of brownfield sites, and creation of economic development opportunities. Also, helping the State's environmental products industry to develop and commercialize innovative products will create direct economic benefits and new jobs.

Increasingly stringent federal and State standards have created the need to better manage solid wastes, dredge materials, and sludges, treat drinking water and wastewater, and control air pollutants. While new regulations can mean higher costs to municipalities, industries, utilities, and residents, they also can mean new business opportunities for companies that recycle and compost wastes, control pollution through performance contracting, or develop and commercialize pollution-control technologies. Reliable and affordable treatment of drinking water and wastewater is essential to economic development in communities throughout the State, and many industries require water as an input to a wide variety of processes, as well as for boiler and cooling water needs.

More than 400 companies in New York manufacture equipment, chemicals, and software to manage waste or control pollution. Estimated technology needs for a variety of municipal and industrial end-users nationally will exceed several hundred billion dollars, with a global market estimated at $500 billion by the year 2010. Helping New York manufacturers improve energy efficiency and reduce the cost of their environmental products will help improve sales and create more jobs.

Many technologies employed to control air and water pollution use energy, and unit requirements tend to increase as emission standards become more stringent. Because recycling, composting, and disposal of solid wastes and sludges require energy, energy efficiency is an important consideration when developing cost-effective technologies to manage wastes and control pollution.

Retrofitting with energy-efficient technologies often results in the ability to treat more water or air, manage more waste, or manufacture more recycled product without additional capital improvements. The 1996 Environmental Bond Act will result in the investment of several hundred million dollars in drinking water and wastewater treatment. Innovative, energy-efficient technology will enable more communities to use these funds to pay back loans quicker because of reduced energy costs.

New York continues to face *solid waste management* challenges as it progresses from primary reliance on traditional landfills to a materials-management strategy based on source-separation and integrated systems. About one quarter of the 25 million tons of waste produced annually in New York is recycled or composted, -- one-half of the State's waste policy goal. More than 22,000 people in nearly 600 companies are employed in the State's waste-collection and recycling industries. Nearly one-half of the collected recyclable waste is shipped out of State for remanufacturing, with attendant loss of jobs and added value. About 15% of all waste generated is shipped out of State for landfilling, representing about $260 million per year that leaves the State. To maintain or increase this commercial base, retain more dollars in-State, and create more jobs, the State's municipalities and industries must increase material-collection efficiencies, lower processing costs, and produce higher-valued recycled and composted products. This will be especially important when the New York City Fresh Kills landfill closes in 2001.

Wastes from dredging New York Harbor can no longer be dumped into the ocean. This waste, amounting to

over five million cubic yards (about five million tons) per year will need to be landfilled at a cost of $50-60/ton. Similar types of waste from dredging the State's canals and rivers, and from trapped sediments in highway and street catch-basins, amount to an additional 2-3 million tons of sediment annually. Energy is required to dewater, treat, and haul these materials to landfills for disposal, as well as to treat the large volumes of water that are taken in along with the dredged solids. Finding cost-effective methods of treating dredge water and recycling the solids will avoid the cost and energy of landfilling which is expected to increase as more landfills in New York reach capacity. Some types of dredge materials contain toxic compounds, such as PCBs, and finding ways of treating these compounds is essential to keeping disposal costs down and facilitating their removal from the State's waterbodies.

Reclamation of polluted industrial and municipal sites or brownfields involves removal of soil for subsequent treatment and disposal or reuse, or on-site treatment of contaminated soils or groundwater. Energy requirements vary greatly depending on the type of treatment pursued, which ranges from off-site high temperature incineration to passive on-site phyto-remediation techniques. Currently, there are over 100 municipal and 200 privately-owned brownfield sites that have been identified by the New York State Department of Environmental Conservation, and the number is expected to increase dramatically. The sites identified thus far collectively cover over 4,000 acres of land that could be available for re-development. Current estimates to study these sites and recommend clean-up technology are about $15 million, with actual cleanup costs in excess of $900 million. While legal impediments and regulatory concerns about the degree of cleanup necessary for delisting a site are primary constraints to the success of the reclamation efforts, technology will play a crucial role in meeting environmentally acceptable endpoints.

Innovative *municipal wastewater treatment* can improve energy efficiency, increase treatment capacity, and reduce costs. Some 575 facilities rely on aerobic biological processes, using approximately three billion kWh per year of electricity to treat the wastes. An additional 750 million kWh per year are consumed to manage the resulting sludge. This energy use is expected to increase due to the need to meet more stringent effluent limits, control toxics, remove nutrients, treat storm water, and control air pollution (VOCs and odors). New York municipalities are expected to spend approximately $6 billion to improve operations and reduce pollutant discharges, with accompanying substantial energy-use increases. A wide variety of industries discharge wastewater to municipal systems, and pre-treatment at these sources can be cost-effective and result in a less contaminated municipal sludge. Sludge produced from wastewater treatment also presents energy and economic challenges. Processed sludge from New York City, for example, is shipped out-of-State at a cost exceeding $100 million annually, due to a limited market for sludge products in-State. Finally, many communities have inadequate or non-existent capacity to treat sewage, which limits their ability to grow and attract new economic development.

Drinking water quality is essential for public health, industrial process use, heating and cooling, and economic development. New York municipalities and industries use about four billion gallons of water daily. Pumping and treating this water requires about 2.5 billion kWh of electricity per year. New drinking water standards have been proposed that will require more communities to filter water, clean or replace piping, remove or prevent toxics, minimize the use of chlorine while improving disinfection for microorganisms, such as giardia and cryptosporidium, and manage reservoirs to prevent algae formation and associated tastes and odors, at a capital cost that may exceed $1.2 billion per year for the next 10 years. To accomplish this, chemicals for treating water will be replaced with electrotechnologies, such as ozone and ultraviolet light, with an increase in electricity use at treatment facilities.

All waste-management and combustion sources produce *air pollution.* Improving combustion efficiency can reduce many pollutants, such as carbon monoxide and particulates, as well as save fuel. More efficient, low-cost control technologies are needed to reduce acid gas, ozone precursors (nitrogen oxides and volatile organic compounds), and particulates to meet the requirements of the 1990 Clean Air Act Amendments and possibly the small particulate matter (PM-2.5) standards. Control technologies can consume up to 9% of generated electric power. Also, coordinated national and State research efforts are required to address environmental impacts and equitable control-cost distribution among the states due to acid rain, mercury and other trace airborne toxics, ozone, global warming, and other cross-cutting aspects of energy production and use.

Even with advanced air pollution control, emissions from power plants within and upwind of New York constitute one of the largest sources of pollutants that affect critical ecosystems and the natural water and forest resources of the State. The best example is the "acid rain" problem affecting the Adirondack Park forest and lakes. Continued monitoring of the critical ecosystems is necessary in order to determine progress in slowing or reversing these impacts. New instrumentation can be used to provide better data and clearer interpretations.

Holistic strategies which include land, forest, and wildlife management practices, as well as controlled burning, runoff control and treatment, rapid growth tree buffer zones, and constructed wetlands, may be needed.

Environment program results will be of value to all utilities and consumers in a restructured, competitive environment. Municipalities and businesses can use energy-efficient environmental technology to lower taxes and operating costs, or manufacture new products, thus creating an opportunity for growth and new economic development. In addition, because environmental technology generally uses electricity, utilities will have an incentive to help transfer the results of projects to their customers. This has begun to occur already and should increase in the future. Finally, the quality of New York's environment will improve, and this will help promote a better quality of life for all residents of the State.

Success in the Environment program will be measured in several ways. Saving energy, reducing costs, increasing the capacity of facilities through energy efficiency, and replication are the primary measures for end-users of environmental technology. Manufacturers of environmental products will increase both sales and jobs. Pollutant avoidance or reduction and waste reduction or disposal will be measured in tons not emitted. Environmental policy and impact projects will be qualitatively judged by the role they play in helping actual policy and law to be created. Environmental monitoring will provide data to determine whether ecosystem impacts are improving and whether mitigation strategies are working.

Through a part of the SBC-funded R&D program, the Environmental Research component proposes to complement the pollution control and waste management effort by evaluating the impacts of electric power generation on the natural resources and critical ecosystems of the State, and demonstrating methods of mitigating these impacts. Non-point source assessment and impact mitigation activities are also a part of this program, since these sources contribute nitrogen, sulfur, mercury and phosphorous pollutants that have impacts similar to those from power plants.

Goals

- Promote economical use of waste and energy-efficient pollution control.
- Reduce environmental compliance costs for municipalities, industries, and utilities.
- Assist the State's environmental-products manufacturing base in developing and commercializing new energy-efficient products.
- Assist the State's waste management and pollution control businesses in developing new processes and markets for recycled products, and in privatizing services based on process replacement with energy efficient technology.

-> Weight- and Volume-Based Billing for Commercial Solid-Waste Collection

Demonstrate waste-reduction impacts of billing commercial waste generators based on weight and volume.

BACKGROUND

Commercial waste-collection services in most cities currently bill based on scheduled pick-ups of the collection container. Commercial-waste customers usually are charged a fixed amount for each container, with the rate depending on container volume. These customers have an incentive to reduce their waste volume, as the lowest cost is charged for servicing the smallest number of the smallest containers. According to some pilot residential collection systems, the amount of waste discarded can be reduced when residents are billed based on the weight of discarded waste. Reducing the quantity of waste should reduce energy and other costs required to manufacture, collect, transfer, and dispose of the waste products.

OBJECTIVES

To: (1) demonstrate a system for commercial waste-collection and billing that relates the charges billed to the weight and volume of waste generated;
(2) quantify the total amount of waste-reduction that results from providing information to test customers about future changes based on weight and volume and opportunities for waste-reduction; and
(3) document the waste-reduction measures used and evaluate the program's effectiveness in reducing waste-generation, energy-use, and waste-management costs.

DESCRIPTION

Rochester installed truck-mounted equipment to weigh waste in individual containers of known volume. About 45 commercial customers were informed about the weight and volume of their discards, the potential impact on their bills, and waste-reduction techniques. Waste-reduction impacts will be evaluated based on data collected from these customers for a year. Results will be disseminated through a technical paper and final report.

BENEFITS

If the weight- and volume-based billing method encourages commercial businesses to institute practices that produce less waste, then significant energy benefits are possible. Demand for wasteful products will decrease, with the energy and materials used to manufacture them conserved for more marketable products. More direct benefits could be realized by reducing the energy and costs of waste-collection, transfer, and disposal. Both commercial businesses and local government would benefit from lower waste-management costs.

SCHEDULE AND STATUS

The scales have been installed and commercial routes revised for the project. Collection of waste-generation data has been completed. The final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$49,720	0	$49,720
City of Rochester	51,520	0	51,520
Eastern On-Board Scales	1,500	0	1,500
TOTALS	$102,740	0	$102,740

Contractor: City of Rochester
Site: Rochester, Monroe County
Contract Duration: 3/95 - 8/98
Key Words: environmental, assist business, transportation, solid waste, municipal, commercial
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Municipal Solid Wastes
Contract No.: 4135-ERTER-ER-95

-> Evaluating Processing Equipment and Markets for Mixed-Color Broken Glass from the Westchester County Material Recovery Facility

Test equipment for pulverizing glass residue and develop markets for resulting product.

BACKGROUND

The high costs associated with trying to increase recycling of municipal solid wastes such as glass can deter local governments that want to expand their recycling programs. When recyclable glass is collected and handled at material-recovery facilities, significant quantities of mixed-color glass are broken into unsortable pieces that remain as a process residue. Municipal recycling costs increase when revenue from broken glass is lost and municipalities have to pay for its disposal. Costs can be reduced if municipalities work with potential customers to develop uses for beneficiated mixed-color glass.

OBJECTIVES

To find better markets for pulverized glass produced from mixed-color broken glass residue, particularly to test and evaluate equipment for processing the waste glass to make these products.

DESCRIPTION

Initially Westchester County (1) solicited expressions of interest from processing-equipment suppliers and glass markets, including aggregate users and manufacturers of fiberglass, building products, filter media, abrasives, and surface coatings; (2) evaluated feasibility; and (3) developed test plans for equipment testing. In the next parts of the project, the County (1) tested the selected technologies; (2) evaluated process energy use and economic feasibility; (3) provided product samples to potential markets; and (4) performed technology transfer activities.

BENEFITS

Finding a market for mixed-color glass residue can reduce the quantity of waste requiring disposal, in turn lessening the fuel required to transport waste to a distant landfill and the cost of waste management for local governments.

SCHEDULE AND STATUS

Markets have been researched and processing has begun with optical sorting equipment and a glass crushing machine. A workshop was held to transfer information on the capabilities of the optical sorting system. Presentations were made at two solid waste management conferences. The glass crusher tested did not meet expectations. The optical sorting equipment performed well and Westchester County has decided to install this system on a permanent basis.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$300,000	0	$300,000
Westchester County	172,015	0	172,015
TOTALS	$472,015	0	$472,015

Contractor: Westchester County
Site: Yonkers, Westchester County
Contract Duration: 6/95 - 8/98
Key Words: environmental, solid waste, product development, municipal, recycling
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 4134-ERTER-ER-96

->Using Recycled Glass Sand Filter Media in an Intermittent Sand Filter (Data Collection and Reporting)

Document capabilities of recycled glass filtration media in wastewater treatment application.

BACKGROUND

NYSERDA has an ongoing project to accelerate both the use of recycled glass sand in energy-efficient, slow-sand filters for water treatment and the development of wastewater applications for glass filter media. Initial results of pilot-scale tests have been promising. A small recirculating intermittent sand filter has been installed by the Town of Oswego to treat the effluent from two community septic tanks serving Sleepy Hollow, a small development of about 50 homes. Intermittent sand filters use less energy to achieve the same level of treatment as other small community wastewater treatment methods such as package aeration systems that involve continuous use of electric motors for air blowers and pumping. The Sleepy Hollow intermittent sand filter is projected to require only one-third the energy of the alternative aeration system. Using scrap glass from material recovery facility (MRF) operations instead of purchased sand can reduce the costs of intermittent sand filter systems. Documentation is needed of the capabilities of recycled glass filter media.

OBJECTIVES

To: (1) collect data on the Sleepy Hollow wastewater treatment facility, (2) examine the solubility of mined sand filter media under acid conditions, and (3) report on the findings to accelerate technology transfer.

DESCRIPTION

The work performed will cover five activities: (1) compiling the operating characteristics in terms of flow rates and effluent recycling rates; (2) documenting treatment facility performance by testing influent and effluent for regulatory parameters; (3) comparing the glass sand with locally available, mined sands in terms of costs, physical characteristics, and durability under acid influent conditions; (4) documenting construction and operating costs and savings from the use of glass sand; and (5) preparing a report suitable for publication and distribution to other wastewater engineers and plant owners.

BENEFITS

Slow-sand filtration saves energy. MRFs can save money by reducing the disposal costs for the mixed broken glass and receiving revenues for the glass sand. Wastewater treatment for small communities could be more economical. Treatment plants already using sand filtration need to periodically add new sand. Expanding the use of locally available recycled glass for filtration applications also offers an opportunity for sand-mining businesses to expand their product line, conserve their current sand and aggregate resources, and reduce the frequency of facing local opposition to approval for new sand mines.

SCHEDULE AND STATUS

The project has just begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$9,200	$9,200
TOTALS	0	$9,200	$9,200

Contractor: Richard W. Elliot, P.E.
Site: Town of Oswego, Oswego County
Contract Duration: 3/98 - 9/98
Key Words: product development, environmental, wastewater treatment
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Municipal Solid Wastes
Contract No.: R2095

-> Demonstration of a Small-Scale Repulping and De-inking System

Demonstrate 25-ton-per-day scrap paper pulping and de-inking system.

BACKGROUND

Scrap-paper processors face large fluctuations in the value of recyclable paper. If New York State's paper processors could convert recovered paper into a higher-valued product than paper bales, their economic health could be improved and they would be able to offer greater incentives to increase the quantities of paper recovered for recycling. An innovative small-scale pulping technology developed by Regenex, LLC shows economic promise for use by scrap-paper processors.

OBJECTIVE

To determine the economic feasibility of the Regenex system. Subsequent phases would involve constructing and installing the system, operating it successfully, collecting operating data for one year, and describing the system's ability to meet projections.

DESCRIPTION

The first phase will include pulping scrap-paper samples in a Regenex test facility, securing sources of scrap-paper, and ascertaining markets for the pulp product. A financial and business plan was produced. If this plan shows sufficient economic potential, the system will be constructed and monitored for its first year of operation to document its economic, energy, and environmental benefits.

BENEFITS

The primary benefit would be to increase the product value of New York State scrap-paper processors, thereby improving their economic health. The net costs of municipal paper-collection programs could be decreased if paper processors were able to pay more for paper collected. The system itself promises reduced use of energy, water, and chemicals, generation of sludge, and overall cost per ton compared to other pulping methods. This also can improve the economic health of New York paper mills that buy market pulp.

SCHEDULE AND STATUS

Paper pulping test runs have been undertaken at the Regenex factory test site. The economic feasibility analysis has been drafted. Preliminary results are not favorable enough for the contractor to make the large investment needed. The final report is being completed to document the analyses performed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
Empire Recycling	4,891,099	0	4,891,099
Regenex, LLC	30,000	0	30,000
TOTALS	$5,171,099	$0	$5,171,099

Contractor: Empire Recycling Corporation
Site: Utica area, Oneida County
Contract Duration: 8/96 - 8/98
Key Words: assist business, solid waste
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Municipal Wastes
Contract No.: 4449-ERTER-ER-97

-> Interim Storage of Recyclable Materials

Determine how different storage options affect recyclability of waste materials.

BACKGROUND

New York State's Solid Waste Management Act of 1988 mandates that every municipality adopt a law requiring recycling of materials for which recycling markets exist. However, the supply of recyclables increases more quickly than market demand, reducing the value of the recyclables, and raising the cost of recycling to a point where it becomes infeasible. Finding inexpensive but effective ways to store recyclables until they are needed would help ensure that the cost of recycling does not exceed the cost of disposal.

OBJECTIVE

To store covered and uncovered bales of recyclables and determine maximum allowable storage periods and determine how extended storage affects the quality of recycled materials.

DESCRIPTION

A plan for a storage facility was developed using literature searches and experts knowledgeable in the end-uses of recyclable materials. Materials such as rubber, plastics, and paper for recycling and other uses are being stored for varying durations using different techniques to determine optimum storage conditions. The contractor will: (1) monitor emissions from the various storage-facility types to measure the odors or leachates generated; (2) monitor product quality; (3) test the product quality over time to determine any adverse effects of different storage techniques; (4) conduct tours and give presentations to various industry associations; (5) produce a video to distribute to other New York State municipalities; and (6) investigate various energy benefits and costs of selected storage techniques, and how these techniques generally affect the energy balance of the recycling process. The investigation will focus on paper and plastics, materials for which strong markets currently do not exist, as well as materials that are currently recycled but are subject to normal business cycles and price fluctuations.

BENEFITS

Balancing the supply and demand of the recycling market will help municipal planners accurately estimate costs/revenues. Municipalities will be able to market recyclables when revenues exceed landfilling costs.

SCHEDULE AND STATUS

The final report is being prepared and is due in May 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$304,496	0	$304,496
Oswego County	101,499	0	101,499
TOTALS	$405,995	0	$405,995

Contractor: Oswego County Department of Public Works, DSW
Site: Bristol Hill Landfill, Town of Volney, Oswego County
Contract Duration: 4/92 - 9/98
Key Words: environmental, solid waste, municipal, recycling, landfill
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Municipal Solid Wastes
Contract No.: 1926-ERER-MW-93

-> Develop and Commercialize a Waste-Fuel Burner Unit

Design and build feed mechanism and burner system to dispose of waste-oil residuals in rotary kiln.

BACKGROUND

The waste-oil residual from oil-storage-tank cleaning and waste-oil storage is a solid material and is difficult to manage due to its ignitability and its sandy, gritty nature. Therefore, most waste-oil residual is landfilled at a very high cost to industry. Finding a way to feed this material effectively as fuel in a rotary kiln, paper mill, or cement plant would reduce costs to these operations and save fossil fuels. Using this material as fuel in lieu of disposing of it also would save landfill space.

OBJECTIVE

To construct a solid-fuel feed system and modify the burner system in a rotary kiln to facilitate using waste-oil residual as an auxiliary fuel source.

DESCRIPTION

The contractor will: (1) design, install, and demonstrate an innovative feed system and waste-fuel burner system in a rotary kiln; (2) process and condition the waste-oil residual to enhance handling characteristics and then mix it with fuel oil; (3) feed the mixture into a kiln using a screw-feeder system with a motive fluid eductor; and test the system to determine cost-effectiveness and energy savings; (4) determine the amount of waste-oil residual burned the fossil-fuel saved; (5) monitor system performance and compare it to other alternatives; (6) evaluate and note operational difficulties over time; (7) conduct a market study to determine the volume of waste-oil residual available for fuel use and its regional availability; (8) determine the number of rotary kilns or fluidized-bed units currently in use that could take advantage of the technology; and (9) determine which New York State parts suppliers could build the systems.

BENEFITS

The project will lower costs for businesses in New York that either produce waste fuel or use low-grade fuel in production. This system could replace up to 10 percent of the fuel used in rotary kilns. Any non-combustible inerts or heavy metals in the residual will be bound up and incorporated into the final product, protecting the environment from possible impacts that would be associated with disposal of the residual. The feed system is expected to be able to handle various types of solid fuel, thereby increasing the potential for replacing virgin fuel with other types of solid-waste fuel. This project could reduce operating costs at the Norlite Company and make this currently marginal business more cost-competitive, thus saving 80-100 jobs.

SCHEDULE AND STATUS

The feed system has been installed and will be tested in late 1997. The final report is due in December 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$57,284	0	$57,284
Consulting Engineering Associates	57,284	0	57,284
TOTALS	$114,568	0	$114,568

Contractor: Consulting Engineering Associates
Site: Norlite Company, Cohoes, Albany County
Contract Duration: 7/96-12/98
Key Words: product development, environmental, industrial waste
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 4447-ERTER-ER-97

-> Controlling Odors and Stabilizing Waste in Composting Systems through Process Design, Analysis, and Monitoring

Develop better engineering-design models and monitoring and process-control strategies to reduce odor and accelerate compost stabilization.

BACKGROUND

Converting the organic fraction of municipal solid waste (MSW) to a usable product in an economical and environmentally acceptable manner is preferable to disposal. About 63% of the paper, paper-board, yard , and food waste in New York State not burned in waste-to-energy facilities, or 11.5 million tons per year, is compostable. Sewage sludge, septage, food processing, and brewery and winery waste solids and sludges increase the compostable amount to about 14 million tons per year. Barriers to increased use of composting include large energy and space requirements, odors, and a minimum 50-day compost/curing period.

OBJECTIVES

To develop better engineering-design models, and operational and process-control strategies for composting that reduce odor, increase process throughput, and increase compost-product stability.

DESCRIPTION

The contractor will: (1) conduct bench- and pilot-scale experiments to determine the kinetics of waste composting using sewage sludge and a solid-waste mixture of known nutrient content; (2) during kinetics experiments monitor the evolution of odorous gases, and postulated antecedent-odor gases including: carbon dioxide, carbon monoxide, hydrogen, methane, oxygen, nitric oxide, and low-molecular-weight odorous compounds; (3) develop a compost-process model based on biological kinetics, and heat- and mass-transfer considerations appropriate for aerated static-pile and agitated beds; (4) conduct experiments to determine effects of moisture content, temperature, and nutrients on compost stability; (5) conduct compost-drying experiments and determine energy requirements; (6) evaluate the costs and benefits of moisture addition, heating and drying compost from a system perspective; and (7) hold periodic meetings with a Technical Advisory Committee (TAC) comprising technology providers, end-users, and appropriate members of the scientific community.

BENEFITS

Better engineering knowledge of process design, monitoring, and factors affecting compost stability will improve compost economics, reduce energy needs, and mitigate environmental impacts.

SCHEDULE AND STATUS

The experimental work is complete and work on a cost/benefit analysis and draft final report are under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$350,000	0	$350,000
Cornell-WMI	100,000	0	100,000
Niagara Mohawk Gas	109,000	0	109,000
New York State Electric & Gas Corp.	109,000	0	109,000
Rochester Gas and Electric Corp.	50,000	0	50,000
Cornell University	123,584	0	123,584
Empire State Development	99,459	0	99,459
TOTALS	$941,043	0	$941,043

Contractor: Cornell University
Site: Ithaca, Tompkins County
Contract Duration: 6/93 - 9/98
Key Words: environmental, municipal solid waste, composting, drying, modeling, kinetics
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Municipal Wastewater Treatment
Contract No.: 3027M-ERER-MW-94

-> Commercialization of In-Vessel Organic Waste Composting

Demonstrate use of in-vessel organic-waste-composting facility.

BACKGROUND

Two thousand tons of solid waste are produced in the six-county Capital Region each day. Local disposal facilities are limited to the Albany and Colonie Landfills and the Adirondack Resource Recovery Facility, all of which are at capacity. Waste not going to these facilities must be shipped out of the area, along with $50-$65/ton of Capital Region revenue. The potential for a new landfill or waste-to-energy facility in the area is low; therefore, a local solid-waste-composting facility, in lieu of a disposal facility, may be an acceptable solution for some of the waste generated. Past attempts at operating a composting facility have failed due to high costs and odor problems. The proposed system would be in-vessel and use an energy-saving bio-filter system to control odors. This system is expected to be the lowest-cost system built to date.

OBJECTIVE

To construct and demonstrate an in-vessel source-separated organic-waste-composting system to be produced by New York State suppliers and manufacturers that will process a large portion of the waste stream into a salable, high-quality compost, (2) develop and sustain a feed source of organic waste and develop markets for the final compost, and (3) analyze the system and determine its energy, economic, and environmental benefits.

DESCRIPTION

The contractor will: (1) build a 50-ton-per-day (tpd) modular in-vessel composting facility to process organic waste from Capital Region supermarkets, restaurants, and institutions, using New York State suppliers and manufacturers to construct the system; (2) process the residual compost further into a soil amendment and fertilizer to be sold locally; (3) determine the costs and benefits of full-scale operation; and (4) determine the amounts of materials removed from the waste stream and beneficial compost produced, and the energy saved. A system to collect source-separated organic waste and education of haulers and waste producers is included in the project. This technology minimizes energy requirements for air-emission control, which can account for as much as 60 percent of the total energy costs for enclosed compost facilities. The initial system will have the potential to grow with an increased waste flow and residuals market and, if successful, will help commercialize the technology, increasing sales for Tougher Industries, Inc. of Menands.

BENEFITS

Energy for transporting waste out of the area will be saved. Less truck traffic will reduce emissions and impacts on highways. Innovative odor-control facilities will reduce energy use by as much as 35%. Disposal dollars that would have gone to out-of-State facilities will remain in the area. Six jobs will be created to run the facility and eight jobs will be created at Tougher Industries. Because the systems are modular, additional capacity can be added easily as waste flows increase. Measures of the project's success will include the number of New York State businesses that contribute to the project, reduction in waste to be disposed of out of State, energy saved, and the production of a marketable product.

SCHEDULE AND STATUS

The system will be constructed in the spring of 1998. Evaluation will continue until Fall of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
Capital Compost	$2,750,000	0	2,750,000
TOTALS	$3,000,000	0	$3,000,000

Contractor: Capital Compost and Waste Reduction Services
Site: Menands, Albany County
Contract Duration: 7/96-9/98
Key Words: product development, environmental, solid waste
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 4451-ERTER-ER-97

-> Secondary Materials Development Program at SUNY/Stony Brook -- Demonstration and Technology Transfer of Marine Use of Plastic Lumber

Demonstrate use of recycled plastic in marine pier construction.

BACKGROUND

The Secondary Materials Development Program at SUNY/Stony Brook concluded that plastic lumber made from recycled plastic has potential for marine and highway applications. A program report noted that "New products such as plastic lumber... will not reduce the waste stream unless the public accepts them. Demonstration programs for testing and displaying the utility of secondary materials are needed."

OBJECTIVES

To demonstrate and evaluate marine applications of plastic lumber and to disseminate information about its effectiveness.

DESCRIPTION

The contractor contacted data sources for information about plastic lumber and other structural materials used for marine construction. A small pier was built with lumber made from recycled plastic. A monitoring, testing, and an evaluation program was developed. Engineering properties were measured over time. A plastic lumber bulkhead also was installed in a freshwater pond, allowing for demonstration of its use in two water environments. Potential markets will be assessed. The project will examine the potential for conserving energy compared to other alternatives for disposal or recycling of the plastic waste. Project results will be disseminated through tours of the pier, a conference presentation, a journal paper, and the final technical report.

BENEFITS

Successful demonstration of this structural marine use for recycled plastic lumber can help develop a sustained New York State market.

SCHEDULE AND STATUS

The plastic lumber has been manufactured and used to construct the dock and bulkhead. Testing of the lumber has been completed. The final report is being completed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA			
Petroleum Overcharge Funds	$99,973	0	$99,973
SUNY/Stony Brook	52,902	0	52,902
TriMax of Long Island, Inc.	40,000	0	40,000
TOTALS	$192,875	0	$192,875

Contractor: State University of New York/Stony Brook,
Site: West Meadow Creek, Mill Pond, and Marine Sciences Research Center, Town of Brookhaven, Suffolk County
Contract Duration: 7/95 - 6/98
Key Words: environmental, solid waste, materials
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Municipal Solid Wastes
Contract No.: 4240-ERTER-POP-96

-> Using Dredged Materials in Flowable Fill

Produce building materials with soil dredged from harbors.

BACKGROUND

New York State industries pay the highest cost in the U.S. to dispose of non-hazardous waste. High disposal costs have been instrumental in virtually eliminating foundries from the State, and continue to impede future growth in many industrial categories.

The New York State Department of Environmental Conservation (DEC) has been considering designation of dredged soil material as a solid or hazardous waste. Including this material in the solid waste management system may replicate some of the negative economic impacts seen when other waste materials were regulated in the 1970s and 1980s.

This project will test the use of dredged and other selected waste materials to manufacture construction products, provide DEC with the information they need to determine how to best manage these wastes, demonstrate use of these materials in a significant product, and develop markets for that product.

OBJECTIVES

To: (1) test the engineering and environmental properties of dredged materials, and (2) develop one or more markets for them, thereby reducing residuals-management costs.

DESCRIPTION

Pohlman Materials Recovery will sample dredged materials from several New York State harbors. Non-hazardous dredged materials will be incorporated in various concrete and flowable-fill-based mixes. The mixes will be tested for environmental and engineering properties at the contractor's facility in Hamburg, NY. The materials will be placed in a bermed area to avoid run-off, with wells placed to monitor impacts on groundwater. An economic and environmental analysis will be done to determine project benefits. Riefler Concrete, a subsidiary of Pohlman Materials Recovery, Inc., will aggressively market the product.

BENEFITS

Several New York State harbors need periodic dredging to ensure access by large freight and passenger ships. Harbors are infrequently and inadequately dredged due to the high cost of dredged material disposal. Most dredged materials are transported long distances and disposed of in landfills, increasing pressure on these facilities and taking up space that can be used to dispose of other materials. Finding beneficial construction uses for dredged materials, such as substitutes for sand and aggregate in concrete and flowable fill, will save landfill space, energy and transportation costs, and natural resources, and will generate income for a New York State industry. Energy savings of 3.3 trillion Btu are expected each year.

SCHEDULE AND STATUS

The fill mixes have been designed and the permit from the DEC is being sought..

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$200,000	$200,000
Pohlman Materials Recovery, Inc	0	881,857	881,857
TOTALS	0	$1,081,857	$1,081,857

Contractor: Pohlman Materials Recovery, Inc.
Site: Hamburg, Erie County
Contract Duration: 3/98-11/99
Key Words: assist business, environmental, industrial waste
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 4743-ERTER-98

-> Recycled Plastic/Fiberglass Tendon Development

Develop and test prototype composite recycled plastic/fiberglass tendon for reinforcing concrete.

BACKGROUND

Deterioration of prestressed concrete structures caused by corrosion of steel reinforcing strands is of increasing concern because of a number of documented failures in corrosive environments such as parking garages and bridge decks. Nonmetallic, composite reinforcing materials are available for this application, but are currently not cost-competitive. Recycled high-density polyethylene (HDPE) plastics from rigid containers and scrap fiberglass are readily available to provide low-cost material streams for manufacturing a competitive, non-corroding reinforcing strand. If technically feasible, a commercially valuable product could be manufactured from waste materials that would ordinarily be landfilled.

OBJECTIVES

To: (1) develop a composite concrete-reinforcing tendon from recycled HDPE and scrap fiberglass, and (2) subject the prototype strand to laboratory testing to assess mechanical and corrosion-resistant properties.

RESEARCH EFFORT

The project will include: (1) designing a composite reinforcing strand to meet current construction specifications, (2) modifying an existing plastics extruder to produce a prototype HDPE/scrap fiberglass strand, (3) laboratory testing of the prototype, and (4) reporting project results.

BENEFITS

HDPE/scrap fiberglass reinforcing strands will be lighter, stronger, and less expensive than steel strands, and should have a longer useful life. Energy and environmental costs associated with repair/replacement of failed concrete structures will be reduced. Melting and extruding recycled HDPE/scrap fiberglass strands requires less energy than manufacturing steel reinforcing strands. Composite reinforcing strands manufactured from recycled HDPE/scrap fiberglass will reuse waste materials that would otherwise be landfilled. Commercial manufacture of a value-added product will dampen the price swings experienced in the plastics recycling business, and lead to sustainable, permanent job growth.

SCHEDULE AND STATUS

The contractor is looking for a new consultant to establish the design criteria for the composite tendon after the original consultant resigned from the project.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$39,650	$39,650
DuraCore Corporation	0	71,660	71,660
TOTALS	0	$111,310	$111,310

Contractor: DuraCore Corporation
Site: Amsterdam, Montgomery County and Troy, Rensselaer County
Contract Duration: 7/97 - 7/99
Key Words: environmental, product development, recycling
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 4532-ERTER-ER-98

-> Demonstrating Uses for Processed Waste Gypsum

Research and demonstrate energy-saving uses for waste gypsum recovered from used drywall.

BACKGROUND

New York State produces about 3.4 million tons of construction and demolition debris each year. Almost three percent, or 92,000 tons, is waste drywall from new construction and renovations; building a 2000-square-foot house produces 1.5 tons of waste drywall. Also, the drywall-manufacturing business must dispose of up to two million tons of off-specification drywall annually. Transporting this material to a landfill for disposal requires more than 75 billion Btu of energy. Decaying drywall in landfills produces hydrogen-sulfide gas, a nuisance and health hazard to those living nearby.

Gypsum from waste drywall may have several energy-saving and environmental applications that would preclude having to transport it to a landfill for disposal. Potential uses include reducing the energy needed for wastewater and paper-mill sludge-drying, sludge-dewatering, fertilizer additive, sewage- and water-treatment plant clarifiers, compost enhancer, and odor control for sludge and liquid waste.

OBJECTIVE

To develop several new uses for recycled gypsum that would otherwise be landfilled, and manufacture salable products from the gypsum.

DESCRIPTION

This project will: (1) assemble a panel of researchers to determine which uses of processed gypsum are most likely to result in a salable product; (2) formulate a research plan that will test the most appropriate applications for processed gypsum; (3) test the selected end-uses in the various research experiments; (4) determine which experiments are successful; and (5) manufacture and market the new products when they are developed.

BENEFITS

Finding uses for waste drywall will reduce the need to landfill it and avoid associated transportation and disposal costs and environmental impacts. Successfully developing new products for sludge-drying, composting, and odor control could save some of the energy these processes use. New products made from a waste material will displace raw materials currently used in manufacturing and add manufacturing capability to the New York State economy. Due to the large amount of waste gypsum available, the contractor should be able to commercialize several useful end-products.

SCHEDULE AND STATUS

The research plan has been approved and is being implemented. Field work will continue through the summer of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$95,050	0	$95,050
Gyp-Pack Container, Inc. (in-kind)	95,050	0	95,050
TOTALS	$190,100	0	$190,100

Contractor: Gyp-Pack Container, Inc.
Site: Tonawanda, Erie County
Contract Duration: 5/95 - 10/98
Key Words: environmental, product development, solid waste
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Municipal Wastes
Contract No.: 4127-ERTER-MW-95

-> Brooklyn Union Gas Pavement-Recycling Truck

Test pavement-recycling truck for restoring utility-line-repair openings.

BACKGROUND

While repairing utility gas lines, Brooklyn Union excavates and backfills 30,000 pavement openings each year. Broken pavement and soil from around the gas line must be removed from the site for disposal. New materials are brought to the site to backfill the opening. After the soil has settled, the repair crew returns to the site, removes the top layer of soil, and places the required pavement-base and top-wearing courses to restore the pavement to its pre-excavation level. This process may require three trips to the site, disrupting traffic flow; using excess fuel, soil, and pavement materials; and inconveniencing motorists.

OBJECTIVE

To determine the effectiveness of a pavement-recycling truck that processes excavated soil and pavement into new backfill and pavement to repair openings in one process.

DESCRIPTION

Brooklyn Union will evaluate the use of excavated soil and pavement to make flowable slurry, cement-treated soil, portland-cement concrete, rammer-compacted concrete, and recycled soil for use as backfill. The contractor will: (1) apply these materials to 1,050 restoration openings using a recycling truck that will process the different mixes on board and apply them to the repair immediately; (2) evaluate the restoration techniques both separately and in various combinations to establish the best restoration techniques; (3) compare the results to conventional site-restoration techniques; and (4) analyze the energy, environmental, and economic impacts of using the newly developed techniques.

BENEFITS

Recycling excavated materials at the source has definite environmental and economic benefits. In large urban areas across the United States, as landfill availability decreases, there is an urgent need to extend landfill lives by reducing the amount of waste disposed of in them. Further, the need to conserve scarce natural resources puts a premium on recycling. For soil- and source-reduction, reusing excavated materials offers a significant environmental contribution. Implementing this project will preclude the need to dispose of more than 650,000 cubic yards per year of material in Brooklyn Union's service area alone. An equal volume of new backfill materials will be saved, as will the fuel needed to transport these materials to and from the restoration site. Delays and traffic jams that occur during restoration, which add to vehicle-idling time, will be reduced by 10 to 15 percent, cutting vehicle-fuel use and emissions.

SCHEDULE AND STATUS

This project began in October 1994 with a planning effort that outlined the boundaries of the study area. Pavement-restoration activities were conducted for a six-month period, after which it was determined that redesign was needed to facilitate using such a vehicle in the urban environment. The vehicle will be modified per Brooklyn Union specifications and re-tested on various types of pavement restorations. Monitoring the quality and performance of the restorations will continue through November 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$338,000	0	$338,000
Brooklyn Union	338,000	0	338,000
TOTALS	$676,000	0	$676,000

Contractor: Brooklyn Union
Site: Brooklyn, Kings County (multiple sites)
Contract Duration: 10/94 - 11/98
Key Words: environmental, utilities, industrial, recycling, product development
Project Managers: Jim Reis and Adele Ferranti (518) 862-1090, exts. 3251 and 3206
Programs: Environment; Industry
Subprograms: Municipal Wastes; Industrial Waste Minimization
Contract No.: 4092L-ERTER-ER-96

-> Waste Reduction/Food-Waste Composting at Rikers Island.

Design, construct, and demonstrate an institutional-scale food-waste-composting system using products on site and marketing surplus product off site.

BACKGROUND

Waste diversion to an on-site compost system using on-site compost cuts down on the energy that otherwise would be used to transport waste to landfills or other waste treatment/disposal facilities. Composting converts organic waste to a usable product, removing material that otherwise would enter the municipal solid waste (MSW) stream. The process is recognized in Part 360 of the New York State Department of Environmental Conservation's (DEC) solid waste regulations as a waste-management practice with a product having beneficial-use characteristics. To the extent the compost can be used on site, it is analogous to other on-site waste-reduction measures such as backyard composting and mulching mowers. Currently, the New York City Department of Sanitation (DOS) disposes of wastes generated at Rikers Island Correctional Facility at the Fresh Kills landfill.

OBJECTIVES

To demonstrate food-waste composting and compost use on an institutional scale at a minimum of 10 tons per day.

DESCRIPTION

The contractor will (1) assess food-waste-composting technology; (2) assist DOS in developing plans and specifications for a minimum 10-ton-per-day food-waste-composting facility for Rikers Island; (3) construct, operate, and test the facility; (4) determine the effect of composting food waste and site-generated bulking agents on reducing wastes needing disposal; (5) develop material-handling plans to maximize the material to be composted and ensure satisfactory operation; (6) develop a facility-monitoring plan; (7) ascertain the amount of energy used; and (8) assist DOS in marketing the compost products on and off site.

BENEFITS

The project will provide DOS and others with demonstration and operating data for a small-scale enclosed composting system. These data will be used to determine the energy, economic, and environmental benefits of on-site, institutional-scale composting as a solid waste management method. Wastes sent to Fresh Kills will be reduced by 10 to 20 tons per day. This demonstration will provide a basis for making future decisions about composting as a partial means of dealing with NYC solid wastes if Fresh Kills landfill is closed.

SCHEDULE AND STATUS

The composting facility began in November 1996 after significant delays in the design phase. During the first year of operation biofilter media was replaced, and measures to improve operations were undertaken. Many compost process problems have been alleviated by abandoning the use cardboard as a bulking agent. Excess water in food waste continues to limit capacity.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$181,404	0	$181,404
NYC Dept. of Sanitation*	5,364,700	0	5,364,700
NYC Dept. of Corrections**	30,000	0	30,000
TOTALS	$ 5,576,104	0	$5,576,104

* includes $5,000,000 toward construction

** in-kind services

Contractor: Tellus Institute
Site: Rikers Island, Bronx County
Contract Duration: 12/92 - 12/98
Key Words: environmental, municipal, solid waste, composting, waste reduction, land application
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 2004-ERER-MSW-93

-> Plasma Pyrolysis for Regulated Medical-Waste Disposal

Use plasma pyrolysis to dispose of medical waste.

BACKGROUND

The medical industry in New York State produces more than 61 million pounds of regulated waste each year. The accepted method for disposal is to "red bag" the material and transport it in refrigerated vehicles to an approved autoclave site where it is sterilized and landfilled. This form of disposal is not only costly, but also hazardous during transit, subject to disruption due to weather conditions and labor strife, and environmentally taxing because of the demand on landfill space. Pyrolysis Systems, Inc. has been developing an alternative to this process that uses plasma pyrolysis, is environmentally sound, and has significant economic-development potential for New York State.

OBJECTIVE

To demonstrate the energy, economic, and environmental advantages of using plasma pyrolysis to dispose of medical waste.

DESCRIPTION

The project will be carried out in two phases. The first phase includes: (1) design and installation of a new waste-injection system; (2) installation of a new plasma torch designed by the proposers; (3) design and construction of a new scrubber system that will both clean and recycle the off-gas stream; and (4) evaluation of the effectiveness and energy efficiency of the system using simulated medical waste. The second phase will entail: (1) testing on real medical waste as a full-scale demonstration unit; (2) expanding the system to process other types of wastes, such as chemical, low-level radioactive or contaminated soils, to address a still larger market; (3) measuring the system's effectiveness by sampling and analyzing the off-gas and solid residue from operating the system using uncontaminated material similar to medical waste and waste spiked with various substances to determine the fate of such substances; and (4) determining the energy efficiency of power consumption as a function of the weight of material processed. A full-scale system will be implemented using venture-capital funding for both the system and the process.

BENEFITS

This system will be operated with argon gas in the absence of oxygen, which will substantially reduce the formation of many types of gaseous pollutants. The argon gas will be partially recycled, further reducing costs and opportunities for pollutant discharge. In-State processing of medical waste will be a substitute for shipping the materials to other states, which results in the export of large sums of money. Out-of-state transport is also environmentally unsound on a national basis, uses large amounts of fuel, and is unreliable in the event of labor disputes in the interstate trucking industry. Developing a process for local destruction of such waste would represent a significant decrease in medical costs to New York State residents and environmental improvements, and will create new manufacturing opportunities and opportunities for larger hospitals to create regional medical-waste-processing facilities to serve smaller, local generators.

SCHEDULE AND STATUS

The systems are constructed and have endured 18 trial test runs. Final modifications are being implemented and unit will be completed in April 1998 and tested and demonstrated for three months. Investors needed to begin manufacturing are being sought.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
Plasma Pyrolysis, Inc.	407,878	0	407,878
TOTALS	$657,878	0	$657,878

Contractor: Pyrolysis Systems, Inc.
Site: Chittenden Falls Hydropower Plant, Stuyvesant Falls, Columbia County
Contract Duration: 9/95-12/98
Key Words: product development, environmental, solid waste
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 4296-ERTER-ER-96

-> New York City Cooperative Agreement for Municipal Solid Waste Research, Development, and Demonstrations

Implement innovative, energy-efficient methods to improve solid waste management, with initial emphasis on waste prevention.

BACKGROUND

New York City and other cities in New York State are faced with high costs to manage municipal solid waste. The New York City Department of Sanitation and NYSERDA are cooperating to improve waste management. Initial work will focus on waste-prevention methods. Preliminary estimates show significant potential for cost and energy savings from waste prevention; however, actual costs and benefits need to be documented.

OBJECTIVES

To develop, demonstrate, and evaluate improved methods of source-reduction and reuse to decrease quantities of waste being generated, with an emphasis on measurable benefits and costs.

DESCRIPTION

The contractor will evaluate waste-prevention assessments for several business sectors in New York City. The costs and benefits of the programs will be measured and quantified to provide municipal officials with guidance about effective waste-prevention initiatives.

BENEFITS

New York City's Solid Waste Management Plan, approved by the New York State Department of Environmental Conservation and the New York City Council, establishes a target of nine-percent source-reduction of the City's municipal waste stream by 2000. This reduction should result in significant cost savings to the City and may yield an energy savings of some two million barrels of oil per year. The information developed about waste-prevention methods will assist New York City and other municipalities in determining the potential benefits and costs of municipal waste-prevention initiatives and in determining how best to encourage waste prevention.

SCHEDULE AND STATUS

Work has begun to improve measurements of waste-reduction impacts. Work also has started to conduct waste-reduction assessments for businesses.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$471,900	0	$900,000
NYC Dept. of Sanitation	1,571,895	0	1,999,991
U.S. Environmental Protection Agency	100,000	0	100,000
Other cosponsor(s)	0	0	54,942
TOTALS	$2,143,795	0	$3,054,933

Contractor: New York City Department of Sanitation
Site: New York City, New York County
Contract Duration: 3/94 - 6/99
Key Words: environmental, solid waste, municipal, reduction, recycling
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Municipal Solid Wastes
Contract No.: 3008-ERTER-MW-94

-> Using Construction and Demolition Debris as Constituents in Asphalt Pavement

Use plastic, window glass, and concrete from construction and demolition debris in asphalt pavement.

BACKGROUND

Construction and demolition (C&D) debris often must be transported to distant landfills. High disposal costs and fuel use make C&D activities more expensive. The City College of the City University of New York and the New York City Department of Transportation are evaluating the potential for using crushed concrete, glass, and plastic from C&D debris.

OBJECTIVE

To evaluate the technical and economic potential for using crushed plastic, window glass, and concrete from C&D debris in asphalt pavement.

DESCRIPTION

The contractor will collect C&D debris from different sources. Plastic debris will be combined in varying proportions with asphalt to determine the potential for using scrap plastic as a binder constituent in asphalt pavements. Crushed concrete and glass from C&D debris will be mixed with different proportions of the plastic/asphalt and standard asphalt. Energy requirements of using these mixes and standard mixes also will be compared. Laboratory samples of the asphalt mixes will be prepared and subjected to physical and chemical tests. The environmental, economic, and energy impacts of using C&D/asphalt products will be compared to standard asphaltic binders and aggregate.

BENEFITS

Using C&D plastic, glass, and concrete can save energy now used to transport them to landfills, and can save the energy to extract and transport the aggregate and binder replaced by the C&D material. Reducing the costs of C&D disposal also can reduce the costs of housing construction and urban renewal projects.

SCHEDULE AND STATUS

Different mixtures of plastic and asphalt have been tested. Mixtures of processed C&D concrete aggregate have been tested. An interim report has been completed. Tests are being completed for the final report.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$249,949	0	$249,949
CUNY (in-kind)	91,882	0	91,882
NYC DOT (in-kind)	50,000	0	50,000
TOTALS	$391,831	0	$391,831

Contractor: City University of New York
Site: New York County
Contract Duration: 1/93 - 8/98
Key Words: environmental, university, solid waste, municipal, recycling, construction & demolition debris
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Municipal Solid Wastes
Contract No.: 1986-ERER-MW-93

-> Cold Mix Asphalt made from Petroleum-Contaminated Soil

Use non-hazardous petroleum-contaminated soil to manufacture cold-mix asphalt.

BACKGROUND

Petroleum-contaminated soil is produced during remediation of leaking underground fuel storage tanks. Currently, most petroleum-contaminated soils are treated thermally. This incineration process is energy-intensive and produces harmful emissions that must be treated using expensive air-pollution control devices. After incineration, the soil is landfilled, which uses valuable landfill space and is also expensive. Using this material in road construction could be an alternative to incineration. TT Materials has developed an emulsification process to turn contaminated soil into a cold-mix product. The process does not produce the emissions that incineration does and uses substantially less energy. Using dense-graded cold-mix asphalt made from contaminated soil instead of approved virgin soil and stone for paving New York State roads would provide a vast market for this material. To do this, TT Materials must demonstrate to state and municipal highway departments that the cold-mix would meet current paving specifications.

OBJECTIVE

To conduct a Quality Assurance/Quality Control (QA/QC) analysis on the entire cold-mix production process and test the product used in various installations to produce a custom specification that can be marketed to public and private sectors for use in asphalt applications. The QA/QC program must guarantee a gradation within the specified range for a particular product. The custom specification needs to be created, which includes gradation parameters and consistent test results for plasticity, soundness, compaction, and density.

DESCRIPTION

TT Materials will: (1) sample the contaminated soil, (2) mix test batches with stone and manufactured soil at different moisture contents, (3) cure the materials, and (4) construct test pads made of different thicknesses of cold mix. Differing spreading and compaction techniques will be used to determine optimum construction specifications. The materials will then be marketed to municipal and state highway departments.

BENEFITS

Up to 5.7 million tons of contaminated soil is available within a 75-mile radius of downstate NY. Not incinerating this material will save energy, reduce emissions, lower the cost of remediating fuel-spill sites, and reduce the cost of road construction and maintenance. It will also produce an inexpensive pavement product that could be used for parking lots, bike paths, and driveways. The product can be sold at 41% of the cost of conventional pavement materials.

SCHEDULE AND STATUS

Laboratory design of the mix has been completed and several areas of highway and parking lots have been paved. Monitoring of the pavement and marketing of the project will continue through September of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$117,500	$117,500
TT Materials Corporation	0	117,800	117,800
TOTALS	0	$235,300	$235,300

Contractor: TT Materials Corporation
Site: Wingdale, Dutchess County
Contract Duration: 6/97-9/98
Key Words: environmental, product development, solid waste, air quality
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 4568-ERTER-MW-98

-> Leachate Recirculation to Enhance Methane Production at the Monroe County Landfill

Enhance methane production at operating landfill via leachate recirculation.

BACKGROUND

Over time, the anaerobic-decomposition process in landfills releases methane, a greenhouse gas that can be collected to reduce its environmental impact and combusted to produce energy. Leachate, produced as rainwater and snowmelt percolate through the refuse, must be collected and hauled to a wastewater treatment plant (WWTP) for disposal. Recirculating the leachate back through the landfill reduces its strength and reseeds the waste with moisture and nutrients to accelerate methane production.

OBJECTIVE

To design, build, and evaluate two leachate-recirculation systems in a landfill.

DESCRIPTION

This project, which will be subject to a technical peer review for each phase, involves: (1) a literature search on landfill-related issues, (2) designing and constructing two types of recirculation systems in separate landfill cells, (3) monitoring the pollutant parameters contained in the recirculated leachate over time, (4) monitoring landfill-gas quality and quantity, and (5) comparing the leachate quality and quantity, and gas quality and quantity produced from the cells with the leachate and gas from a control cell. Two separate cells will be designed with a different leachate-recirculation system to determine which is more effective at both improving the quality of the leachate that must be disposed of and increasing the volume of methane. The contractor will demonstrate that biogas-production rates can be accelerated by leachate recirculation, that recirculating leachate avoids trucking it to a WWTP, and that the stabilized landfill either can be reclaimed or can accept additional refuse due to the volume reduction achieved by the stabilization.

BENEFITS

Accelerating biogas-production rates at landfills will make it more economical to produce electricity and may enable smaller landfills to use biogas recovery. The energy to truck leachate to a WWTP and treat it aerobically will be avoided. Methane, a more potent greenhouse gas than CO_2, will reduce landfill impacts on global warming if it is used on site to produce energy.

SCHEDULE AND STATUS

The operational phase and monitoring will run through December 1999.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$754,200	0	$754,200
Monroe County	704,027	0	704,027
U.S. Environmental Protection Agency	58,469	0	58,469
Browning Ferris Industries	250 ,000	$50,000	420,000
TOTALS	$1,766,696	$50,000	$1,936,696

Contractor: Monroe County
Site: Mill Seat Landfill, Town of Riga, Monroe County
Contract Duration: 11/91 - 12/99
Key Words: environmental, solid waste, municipal, landfill
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Municipal Solid Wastes
Contract No.: 1831M-ERER-MW-92

Using landfill gas to evaporate landfill leachate.

BACKGROUND

6 NYCRR Part 360, which regulates solid waste management, requires that landfill operators minimize the impacts their landfills have on the environment. The leachate produced must be collected, treated, and disposed of. The landfill gases must be vented or collected and treated to avoid accumulation at or near the site. The Smithtown landfill currently transports its leachate to a wastewater treatment facility for disposal. Their transportation and the treatment process itself are expensive and energy-intensive. On-site treatment would eliminate the cost and energy to transport and treat the leachate and would reduce the load on the sewage treatment plant. Methane gas is produced by landfills as a by-product of waste decomposition and, when it is economical to do so, used to produce electricity. At most landfills, excess methane is flared as a means of odor control and disposal, essentially wasting the methane and potentially polluting or warming the environment. Using the methane to run a self-contained leachate-evaporation system would reduce energy requirements and decrease the detrimental environmental impact..

OBJECTIVE

To test a pilot-scale landfill-gas-fueled leachate-evaporation unit and evaluate it for future commercialization.

DESCRIPTION

The contractor has installed a leachate-evaporation system (LES) at the landfill. The LES will use the methane produced by the landfill as its heat source. The unit has separate combustion and gas/liquid contact chambers that will reduce the effects of corrosion on internal parts. Gas-control devices will allow the unit to operate efficiently on the different types of gas found in most landfills. The project includes: (1) permitting, (2) preparing feasibility test and health and safety plans, (3) feasibility test runs and sampling, (4) periodic inspection of the internal parts to determine the extent of corrosion, (5) analysis, and (6) impact assessment. Leachate will be partially evaporated, with the remaining concentrate reinjected into the landfill for disposal. The test plan will determine the optimal concentration of the remaining leachate to provide maximum energy and environmental benefits. If successful, commercialization will follow.

BENEFITS

New York State landfills produce three billion gallons of leachate per year that must be transported to WWTPs for treatment and disposal, requiring the energy equivalent of 293,000 barrels of oil. These same landfills produce usable methane equivalent to 475,000 barrels of oil, most of which is vented to the atmosphere or flared, adding greenhouse gases to the atmosphere. Using this methane to treat the leachate on site will save the energy required to transport, treat, and dispose of the leachate, and reduce the amount of methane emitted to the atmosphere.

SCHEDULE AND STATUS

The project has just begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$49,500	$49,500
ZAPCO	0	50,520	50,520
TOTALS	0	$100,020	$100,020

Contractor: ZAPCO Energy Tactics Corporation
Site: Smithtown Landfill, Suffolk County
Contract Duration: 3/98-12/99
Key Words: product development, environmental, solid waste, emissions control
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environmental Research
Subprogram: Solid Waste Management
Contract No.: 4737-ERTER-ER-98

-> Wetland Treatment of Leachate at the Olean Landfill

Monitoring performance of wetland system to treat landfill leachate.

BACKGROUND

Leachate, which is formed when rain and snowmelt seep into landfills, must be collected and treated to avoid contamination of surface and groundwater. Treatment usually involves transportation off site to a sewage-treatment plant at a high energy and economic cost. While most leachate seeps to the bottom of the landfill and is collected in a leachate-collection system, some moves laterally and seeps out the sides of the landfill, causing surface-water contamination. In addition, lateral movement of leachate increases when groundwater enters the landfill, or when leachate is recirculated back into the waste mass to enhance methane-gas production. An energy-efficient method of collecting and treating leachate from sideslope outbreaks will be researched and tested.

OBJECTIVE

To evaluate the use of constructed wetlands to treat landfill leachate.

DESCRIPTION

A collection and treatment system consisting of diversion berms and three series-connected surface-treatment cells will be built near the landfill. Cell 1 will be designed as a deep-water settling basin and will be provided with an impermeable lining system. Cell 2 will be designed as a lined surface-flow wetland and Cell 3 will be designed as a lined subsurface-flow wetland. Vegetation in the treatment cells will include water hyacinth, duckweed, cattail, bulrush, and giant reed (phragmites). The effluent of Cell 3 will be discharged to an unnamed tributary of the Ischua Creek that currently receives untreated leachate seepage from the landfill. After construction, the contractor will: (1) monitor the wetland system for two years to determine its effectiveness in collecting and treating leachate seepage, (2) compare the cost of constructing and operating the system and its overall treatment efficiency to transportation off site and conventional leachate treatment, and (3) compare the monitoring results to past wetlands-treatment projects to both verify results and determine the fate of some nutrients within the system.

BENEFITS

The long-term use of wetlands to treat leachate can lower energy consumption with a combination of natural aeration and solar/biological processes to remove organics, nutrients, and metals in an on-site wetland environment rather than trucking the leachate to a mechanically operated wastewater-treatment plant. Wetlands treatment also saves energy by avoiding the production of extra sludge at a wastewater treatment plant. Environmental benefits include decreasing the potential for spills off site by eliminating transportation and adding new wetlands to the ecosystem. Economic benefits are provided through reduced construction and operation costs. System optimization will minimize energy use and maximize cost savings for leachate treatment in Olean and other New York State municipalities.

SCHEDULE AND STATUS

The wetland system is currently in the design phase.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$101,312	0	$101,312
City of Olean	396,911	0	396,911
TOTALS	$498,223	0	$498,223

Contractor: City of Olean
Site: Ischua, Cattaraugus County
Contract Duration: 9/95 - 1/99
Key Words: environmental, solid waste, municipal
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 4278-ERTER-MW-96

-> Constructed Wetlands Leachate Treatment in Monroe County

Treat landfill leachate biologically in a constructed wetland.

BACKGROUND

NYSERDA developed and tested a constructed wetland that has been operational since July 1990 to treat about 1000 gallons per day (gpd) of landfill leachate in Tompkins County. The pilot project's success persuaded Monroe County to construct full-scale wetlands at the Van Lare Sewage Treatment Facility to treat all the leachate (about 10,000 gpd) from a remote landfill.

OBJECTIVE

To build and test a full-scale constructed wetland to treat landfill leachate.

DESCRIPTION

The contractor will: (1) build a modified wetland treatment system that will incorporate both an overland-flow area to pretreat leachate through aeration, oxidation, and then precipitation of iron, manganese, and other heavy metals, and a constructed wetland, downslope of the overland-flow area and planted with the reed Phragmites australis, that will be the principal treatment area where biological and geochemical processes, in conjunction with plant uptake, will remove contaminants; (2) recycle treated leachate through the process in drought periods to continue treatment and evaporation; (3) demonstrate that the discharge from a constructed wetland will meet State and national pollution discharge-elimination standards (SPDES and NPDES); and (4) identify the nature of water-renovating processes within the system.

BENEFITS

The long-term use of wetlands to treat leachate can lower energy consumption with a combination of natural aeration and solar/biological processes to remove organics, nutrients, and metals in an on-site wetland environment, rather than trucking leachate to a mechanically operated wastewater-treatment plant (WWTP). Wetlands treatment also contributes to energy savings by avoiding the production of extra sludge at the WWTP. Environmental benefits include decreasing the potential for spills off site by eliminating transportation. Economic benefits are provided through reduced construction and operation costs. System optimization will minimize energy use and maximize cost savings for leachate treatment in Monroe County and New York State.

SCHEDULE AND STATUS

The monitoring period is complete and the final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$167,250	0	$167,250
Monroe County Health Department	55,750	0	55,750
U.S. Geological Survey	223,000	0	223,000
TOTALS	$446,000	0	$446,000

Contractor: Monroe County Health Department
Site: Frank E. Van Lare Sewage Treatment Facility, Rochester, Monroe County
Contract Duration: 11/92 - 12/98
Key Words: environmental, leachate, landfill, municipal, constructed wetland, solid waste
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Municipal Solid Wastes
Contract No.: 1924-ERER-MW-93

-> Anaerobic Dechlorination of Polychlorinated Biphenyls (PCBs)

Demonstrate biological treatment of PCB-contaminated soil at hazardous waste landfill.

BACKGROUND

PCBs were used for 50 years in a wide variety of industrial applications and later became regulated as a toxic substance under the federal Toxic Substance Control Act (TSCA) in 1978. About 1.5 billion pounds were produced worldwide and many sites are contaminated. Currently, TSCA prescribes that PCB-contaminated remediation wastes (e.g., soils), with PCB concentrations greater than 500 parts per million (ppm) be incinerated, and, if greater than 50 ppm, treated and disposed of in a hazardous waste landfill. The U.S. Environmental Protection Agency (EPA) proposed revisions to TSCA, if adopted, would allow PCB-contaminated wastes to be "treated down" below 50 ppm and then disposed of at subtitle D municipal waste landfills.

OBJECTIVE

To demonstrate that anaerobic biological treatment of PCBs in contaminated-soils can reduce concentrations to less than 50 ppm by providing sufficient technical information to prove technical feasibility, regulatory compliance, and full-scale economic feasibility.

DESCRIPTION

At its permitted hazardous waste treatment facility in Model City, New York, the contractor will: (1) obtain all necessary permits, monitor the site environment, decontaminate equipment, and properly dispose of all liquid and solid residuals; (2) design, construct, and install three pilot-scale anaerobic treatment reactors sufficient to treat 20-30 tons of contaminated soil, and develop a detailed research and testing plan for the demonstration and parallel bench-scale experiments; (4) collect and analyze samples from pilot- and bench-scale experiments; and (4) evaluate the technical and economic potential of anaerobic dechlorination treatment.

BENEFITS

Anaerobic biological treatment is far less energy-intensive than incineration and thermal desorption, and is more acceptable than either method from the public's perspective. The availability of such treatment will enable more contaminated sites to be reclaimed because of lower costs.

SCHEDULE AND STATUS

Treatment began in September 1997. As of March 1998 there is little evidence of anaerobic dehalogenation.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$ 147,600	0	$147,600
Waste Management, Inc.	179,600	0	179,600
TOTALS	$327,200	0	$327,200

Contractor: Waste Management of Ohio, Inc.
Site: Model City, Niagara County
Contract Duration: 3/97 - 9/98
Key Words: environment, assist business, industrial, solid waste, anaerobic bioremediation
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 4450-ERTER-MW-97

-> Developing Systems for Using Incinerator Ash

Evaluate potential for using incinerator-ash material in road-paving aggregate and other applications.

BACKGROUND

Municipalities facing high costs for managing ash produced by energy-from-waste incinerators need information about using ash, rather than disposing of it in landfills.

OBJECTIVES

To: (1) evaluate ash-management options and test ash from five facilities to measure physical and chemical properties, and (2) evaluate the potential for using ash as a partial aggregate substitute to produce asphalt pavement.

DESCRIPTION

In the first phase, the contractor will characterize incinerator ash from selected energy-from-waste facilities and evaluate several options for ash use. The second phase is designed to include the demonstration and evaluation of several components of an ash-aggregate paving demonstration. In the second phase, the contractor will monitor key activities for process emissions, such as potential fugitive dust and runoff from an ash stockpile and air emissions from the asphalt plant using the ash. The demonstration roadway also would be monitored for leaching for at least two years.

BENEFITS

Energy-from-waste facilities can provide New York State with more than 400 MW of electric-generating capacity, but the problems associated with disposing of incinerator ash residues have been significant barriers to implementation. This project will investigate ash-management options, focusing on ash use in road-paving aggregate. Successful ash use could significantly reduce the quantities of ash that need to go to ashfill sites. In addition, ash use may achieve significant savings in ash-management costs and reduce the overall cost to operate energy-from-waste systems.

SCHEDULE AND STATUS

First-phase testing and evaluation are complete and the report has been distributed. Data from the stockpile demonstration have been collected, analyzed and described in the stockpile report. The paving demonstration is under way and data collection and assessment have begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$1,280,586	0	$1,280,586
LIRPB*	361,679	0	361,679
Nassau County	65,000	0	65,000
Suffolk County*	96,400	0	96,400
13 LI towns & 2 cities	224,504	0	224,504
Port Authority of NY & NJ	1,146,391	0	1,500,000
New York City*	34,843	0	34,843
NJDOT*	927,000	0	927,000
NJDEP	518,525	0	518,525
TOTALS	$4,654,928	0	$5,008,537

*Portions in-kind

Contractor: Long Island Regional Planning Board (LIRPB)
Site: SUNY/Stony Brook and Commack, Suffolk County; New Jersey
Contract Duration: 1/87 - 6/99
Key Words: environmental, municipal, solid waste, ash, aggregate, asphalt, incinerator
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environmental Research
Subprogram: Municipal Solid Wastes
Contract No.: 976B-ERER-ER-87

->Designing, Constructing, and Testing Model Mercury-Recycling Facility

Recycle mercury from wastes in an energy-efficient and environmentally sound manner.

BACKGROUND

Current retorting processes to recycle mercury from batteries, switches, valves, and other consumer and industrial products and wastes produce emissions that can cause pollution problems near the recycling plant.

ACCOMPLISHMENTS

The original objectives of developing a model mercury-recycling facility, improving the energy efficiency of materials processing, and meeting or exceeding all environmental standards were met. Facility emissions are low and may become the national standard after review of data submitted to the U.S. Environmental Protection Agency (U.S. EPA).

FINDINGS AND CONCLUSIONS

Natural gas consumption in retorts was reduced by 43%, even with a 450% increase in waste throughput. Electricity use increased by 800% on average due to the new pollution control system, the use of electric chillers to increase the capture efficiency of mercury vapor, increased throughput, and plant automation of the processing system. However, because of energy efficiency improvements, the amount of electricity used per cubic foot of waste processed increased only by 100%. Emissions of mercury decreased by about 2,000% from 40 lbs of mercury emitted per ton of mercury recovered to less than two lbs emitted per ton of mercury recovered. All air-quality data taken during the project met all NYS standards. Worker safety at the plant improved 10-fold due to process automation and the use of continuous monitors.

REALIZED OR ANTICIPATED BENEFITS

Employment increased at the facility from 10 to 30. Natural gas is being saved and the overall cost of energy per cubic foot of waste processed decreased due to efficiency improvements. The facility test data indicate that mercury from a wide variety of wastes can be safely recycled. This enables other metals from switches, valves, etc. to be recycled because the mercury has been removed.

TECHNOLOGY TRANSFER ACTIVITIES

U.S. EPA and the New York State Department of Environmental Conservation have received the plant emissions data, which may set a new standard that all mercury-recycling plants will have to meet.

FUNDING	TOTALS
NYSERDA	$500,000
Mercury Refining, Inc.	1,430,000
TOTALS	$1,930,000

Contractor: Mercury Refining, Inc.
Site: Colonie, Albany County
Contract Duration: 11/91 - 8/97
Key Words: environmental, assist business, mercury, recycling
Project Manager: Joe Visalli and Adele Ferranti (518) 862-1090 exts. 3205, and 3206, respectively
Program: Environmental Research; Industrial Applications
Subprogram: Solid Waste and Industrial Applications
Contract No.: 1760-ERER-MW-92; 1760-EEED-AEP-92

-> Waste Reduction at the Oneida-Herkimer Materials Recovery Facility

Demonstrate and evaluate technologies for waste reduction at a materials-recovery facility.

BACKGROUND

Waste reduction has first priority in the hierarchy of integrated systems called for in New York State's Solid Waste Management Plan. Better information is needed about how waste-reduction methods can reduce the energy, environmental, and economic costs of solid waste management. Due to the glass breakage during recycling, operators of materials recovery facilities (MRFs) are faced with the problem of disposing of mixed-color, broken glass that cannot be color-sorted for higher-valued markets. Improvements in MRF operations that could transform this broken glass into a marketable product and reduce the quantities of broken glass requiring disposal would improve the economic health of glass recycling.

ACCOMPLISHMENTS

A glass pulverizer was installed at the Oneida-Herkimer MRF. It produced more than 1,000 tons of pulverized, mixed-color glass.

FINDINGS AND CONCLUSIONS

The pulverized glass produced met specifications for use in the base course of a road repaving project near Rome, New York.

REALIZED OR ANTICIPATED BENEFITS

In addition to reducing the MRF residue by more than 1,000 tons, Oneida-Herkimer's purchase of this pulverizer helped stabilize the financial situation of the pulverizer's small New York manufacturer. This company has now prospered and sold some 50 pulverizers worldwide.

TECHNOLOGY TRANSFER ACTIVITIES

Technology transfer has been successfully carried out through the commercialization efforts of the pulverizer manufacturer, Andela Tool & Machine of Richfield Springs, (Otsego County) New York..

FUNDING	TOTALS
NYSERDA	$21,768
Oneida-Herkimer	14,332
TOTALS	$36,100

Contractor: Oneida-Herkimer Solid Waste Authority
Site: Utica, Oneida County
Contract Duration: 12/92 - 3/98
Key Words: environmental, municipal, solid waste, waste reduction, recycling
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Municipal Solid Wastes
Contract No.: 1950-ERER-MSW-93

Demonstrate oil-filter crushing and marketing.

BACKGROUND

Used oil filters disposed of in New York State each year contain about 175,000 gallons of recyclable used oil and 5,800 tons of recyclable metals. Redirecting a greater percentage of these used oil filters to recycling markets can reduce the potential for environmental damages caused by less desirable disposal options.

ACCOMPLISHMENTS

The demonstration recycling system was set up to collect used oil filters generated by commercial oil changers in Erie County. Over the seven-month demonstration, more than 89,000 filters were collected and processed through the crushing equipment.

FINDINGS AND CONCLUSIONS

The crushing equipment worked well in producing marketable cubes of scrap metal and in squeezing out burnable used oil. In setting up the demonstration, it was determined that the value of the recyclable components and the avoided disposal costs were not sufficient to cover the costs of making separate collection runs solely to collect used oil filters. Therefore, a more energy-efficient and economical collection method was tried in which collection was provided as an additional service by an existing company that was already visiting most of the oil changers as a supplier and recycler of automotive fluids. Analysis of the demonstration costs showed that, even with this more efficient collection method, the recycling program costs much more than the value of scrap metal and used oil recovered from the recovered filters. Due to the costs for the crusher, building space, processing labor, incremental collection time, and ancillary costs, the company would have to charge oil changers the equivalent of $340 per ton for collection of filters in order to make filter recycling a viable business. This charge is much higher than the other legal alternative of disposing of the filters along with other service station waste at a cost of about $50 per ton. The higher price for recycling could be covered if the oil changer charged an additional $0.25 for each oil filter changed. However, it is unlikely that very many oil changers will be willing to become less competitive by adding this charge to their price.

REALIZED OR ANTICIPATED BENEFITS

Over the seven-month demonstration, more than 89,000 filters were recycled, 2,600 gallons of oil were recovered for fuel use, and 45 tons of compacted filters were recovered for melting into rebar.

TECHNOLOGY TRANSFER ACTIVITIES

The fluids supply and recycling company is continuing to offer the oil filter recycling service to its customers. The County continues to encourage oil changers to take advantage of this recycling service based on the project findings that the crushing operation produces marketable metal and oil suitable for burning for energy purposes.

FUNDING	TOTALS
NYSERDA	$113,321
Petroleum Overcharge Funds	60,000
Erie County	57,774
TOTALS	$231,095

Contractor: Erie County
Site: Erie County
Contract Duration: 10/92 - 4/98
Key Words: environmental, solid waste, oil, municipal, recycling, oil filters, collection
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Municipal Sold Wastes
Contract No.: 1976-ERER-MW-92

-> Backyard Composting Waste-Reduction Demonstration and Evaluation

Demonstrate waste reduction through residential on-site composting.

BACKGROUND

A volunteer group of 143 participants individually separated their garbage, recorded weights or volumes, and then composted food or yard wastes for a year. Participants recorded information daily and mailed these data to SCS Engineers every two weeks. Participants were supplied with either a wooden or wire cloth compost bin, tools (pitchfork and a scale, if weight was to be recorded), buckets or plastic bags, a composting guide, data sheets, and stamped and addressed envelopes. Each participant was visited at least once by a member of the project team. A hotline was established to answer composting questions, and a quarterly newsletter was prepared to keep participants apprised of common problems and study progress.

ACCOMPLISHMENTS

Of the 143 original families, 137 remained in the program for the full year. Waste-generation data were collected. The study documented that the study participants composted about 32 tons of yard waste and 19 tons of food waste during the year. The compost produced was free of toxic contaminants and was used by 31% of the participants, with most voicing their intent to continue after the project was completed. Overall, families composted or recycled 58% of their garbage, diverting 35% to backyard composting. The estimated unit cost of collection, processing and disposal of yard and food waste was used to extrapolate savings to the County and State level.

FINDINGS AND CONCLUSIONS

Minimal negative environmental impacts were noticed (e.g., animals, odors, or complaints from neighbors. about the compost pile. Backyard composting removes material from the waste stream and can reduce costs for individual householders and the community as a whole. SCS' gross cost-savings estimates of $55/ton for food wastes and $140/ton for yard waste are not detailed enough to account for the effects on savings of municipal vs. private collection of food and yard waste, service area, and economies of scale. The report concludes that promoting backyard composting is warranted based on potential gross savings.

REALIZED OR ANTICIPATED BENEFITS

Based on a 1992 survey of yard waste disposal patterns in Orange County, SCS estimated that backyard composting removes 6-10% of the solid waste as yard waste and 0.1-1% of food wastes from the County's waste stream. SCS estimated composting of yard and food waste could be increased through promotional efforts to between 8-14% and 2-3%, respectively. SCS estimated potential incremental savings of $540,000 per year if these increases were attained. Of these savings, 80% is due to increased backyard composting of yard waste.

TECHNOLOGY TRANSFER ACTIVITIES

Technology transfer was a inherent part of the demonstration project. A final report entitled, "Backyard Composting Waste Reduction Demonstration and Evaluation Project - Orange County, NY," will be available from NTIS.

FUNDING	TOTALS
NYSERDA	$ 155,778
Orange County	52,075
TOTALS	$ 207,853

Contractor: Orange County Department of Environmental Facilities and Services, Cornell Cooperative Extension of Orange County and SCS Engineers, P.C.
Site: Orange County (multiple sites)
Contract Duration: 10/92 - 12/97
Key Words: environmental, municipal, compost, yard waste, waste reduction, solid waste
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environmental Research
Subprogram: Municipal Solid Wastes
Contract No.: 1980-ERER-MW-92

-> End-Uses for Wood Ash from Construction and Demolition Waste

Research end-uses for ash produced by burning construction and demolition waste wood.

BACKGROUND

The difficulty of disposing of wood ash from treated wood has limited burning wood to produce energy. If uses can be found for this ash that will not have significant environmental effects, then this limitation on burning treated wood can be reduced and more energy may be able to be recovered from construction and demolition (C&D) wood. The objectives of this project were to test and evaluate the potential for using ash from C&D wood combustion as a liming agent and as an ingredient in flowable fill. Ash samples were obtained from a series of test burns in which clean wood fuel was mixed with five different types of C&D material that made up 11-31% of the input fuel. C&D wood types burned included creosote-treated wood, pentachlorophenol-treated wood, CCA-treated wood, particleboard/ plywood, and processed/mixed C&D waste.

FINDINGS AND CONCLUSIONS

Physical and chemical characteristics were evaluated for these ash samples and for samples of flowable-fill mixes with different percentages of ash. Testing of the ashes for use as a liming agent showed that the particle-size distribution was generally suitable, but that the calcium carbonate equivalence was about one-third of the recommended 60%. Compared to coal ash used for flowable fill, the ashes showed higher loss on ignition, higher percentages of fines, and little pozzolanic activity. Some flowable-fill samples were found to show suitable compressive strengths, densities, and air content. Flow characteristics were not suitable due to the high char content of these ash samples. Metal content and leaching tests were performed to evaluate the potential for a Beneficial Use Determination (BUD) being issued for the use of the C&D wood ash in liming or flowable fill. It was concluded that the ash from the test burn with 11% CCA-treated wood would not receive a BUD. For the other ashes, the leaching test results exceeded some levels likely to be used in BUD determinations, but were not determined to preclude issuance of BUDs supported with further testing applicable to a specific ash source.

REALIZED OR ANTICIPATED BENEFITS

An estimated 1,600,000 million tons of C&D wood are disposed of in New York State each year. Proper combustion of this wood could yield on the order of 150 megawatts of electric power. A greater portion of this potential could be realized if the resulting ash could be used. Cost projections show that wood-burning plants could save on the order of $10-25 per ton if wood ash can be used in flowable fill or as a liming agent. Reducing costs of C&D disposal by developing markets for C&D wood ash also can contribute to controlling the costs of housing construction and urban renewal projects. Using the ash as a liming agent can reduce the acidity of soils, which can increase agricultural productivity and may reduce acid-rain impacts. Realization of these potential benefits depends on further testing to document that some types of C&D wood ash can obtain BUDs, and development of business relationships between wood ash producers and users.

TECHNOLOGY TRANSFER

Technology transfer is being accomplished through publication of a paper summarizing the project results and documentation in the final report.

FUNDING	TOTALS
NYSERDA	$206,537
C.T. Donovan Associates, Inc.	181,989
Resource Cons. Service	18,530
TOTALS	$407,056

Contractor: C.T. Donovan Associates, Inc.
Site: Burlington, VT
Contract Duration: 1/93 - 2/98
Key Words: environmental, assist business, solid waste, construction and demolition, recycling, wood ash, landfill management
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Municipal Solid Waste
Contract No.: 1987-ERER-MW-93

-> Commercial Waste Reduction Program

Demonstrate waste reduction through on-site audits of commercial enterprises.

BACKGROUND

New York State's Solid Waste Management Plan calls for reducing waste generation by at least 8%. Businesses reducing their waste can realize cost savings and reduce overall energy and environmental impacts. This project was aimed at characterizing the waste in three common business sectors, developing methods to reduce it, and assess the program's impact.

ACCOMPLISHMENTS

Forty-five businesses, the retail, hospitality, and small office sectors received waste assessments. Waste from these businesses was characterized by sorting it into 31 different categories. The businesses received written reports of the results along with suggestions for waste reduction. Specific waste-prevention measures were evaluated at five businesses selected as demonstration sites.

FINDINGS AND CONCLUSIONS

For the 45 businesses, the site visit and assessment of waste generation cost about $400 per business and the sorting and characterization about $500 per business. About 30% of the businesses reported implementing at least one of the waste-prevention recommendations. The project demonstrated the difficulty of convincing small businesses to implement waste-reduction measures. The researchers found that several issues needed to be addressed in convincing a small business to implement waste-prevention measures, including cost savings, payback, staff time required, financial resources, top management support, staff willingness to change, and level of stress the company was experiencing.

REALIZED OR ANTICIPATED BENEFITS

The more detailed evaluation of specific recommendations showed only limited success. For example, a fast food restaurant tried eliminating its paper tray liner for three months and projected an annual reduction of 150 pounds in waste disposed, and about $100 and $600 in disposal and purchasing costs, respectively. After the project the restaurant resumed using paper liners because it valued customer perception of cleanliness more than the modest savings at other demonstration sites evaluations either showed similar potential savings or were inconclusive

TECHNOLOGY TRANSFER ACTIVITIES

A workbook and training video were prepared to provide guidance for performing waste assessments. These were presented at a Statewide workshop and are available from Cornell University.

FUNDING	TOTALS
NYSERDA	$161,176
Tompkins County	44,121
Cornell Waste Management Institute	27,822
Cornell Coop. Extension of Tompkins Co.	2,400
TOTALS	$219,685

Contractor: Tompkins County
Site: Tompkins County (multiple sites)
Contract Duration: 11/92 - 8/97
Key Words: assist business, environmental, solid waste, municipal, commercial, waste reduction, audit
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environmental Research
Subprogram: Municipal Solid Wastes
Contract No.: 2026-ERER-MSW-92

-> Leachate Evaporation Demonstration at Brookhaven Landfill

Use landfill gas produced at Brookhaven Landfill to evaporate leachate as energy-saving alternative to transportation and treatment off site.

BACKGROUND

6 NYCRR Part 360, which regulates solid waste management, requires landfill operators to minimize the environmental impacts of their landfills. Leachate, the liquid that percolates down through the landfill, must be collected and treated. The off-gases must be vented or collected to avoid accumulation at or near the site.

Operators of the Town of Brookhaven Municipal Landfill transport the landfill's leachate to a nearby wastewater-treatment plant (WWTP). Transporting leachate off site for treatment is an expensive, energy-intensive process. On-site leachate treatment and beneficial use of the off-gas is an alternative.

ACCOMPLISHMENTS

The contractor built and tested a leachate evaporator that uses landfill gas as the fuel source. The evaporator uses submerged combustion technology, in which the flame is immersed in leachate, which reduces the formation of potentially polluting gas by-products. Operating temperatures and pressures are maintained at a low level to ensure operator safety. The off-gases pass through an enclosed landfill flare that destroys most of the volatile organic compounds. The residual leachate was tested for toxicity to determine if it could be disposed of in the landfill.

FINDINGS AND CONCLUSIONS

The unit operated smoothly and safely. Leachate volume was reduced by 98% and the resulting concentration was greater than 35% solids. No odors were emitted by the system and the concentrated leachate was returned to the landfill for disposal due to its low toxicity levels. Leachate disposal costs for a 20,000 gallon/day unit were estimated to be $0.035/gallon, which is less than the current cost of $0.055/gallon to transport and treat off site.

REALIZED OR ANTICIPATED BENEFITS

New York State landfills produce three billion gallons of leachate per year that must be transported to WWTPs for treatment and disposal, requiring the energy equivalent of 293,000 barrels of oil. These same landfills produce usable methane equivalent to 475,000 barrels of oil, most of which is vented or flared, adding greenhouse gases to the atmosphere. Using this methane to treat the leachate on site will save the energy required to transport, treat, and dispose of the leachate, and reduce the amount of methane emitted to the atmosphere.

TECHNOLOGY TRANSFER ACTIVITIES

A final report is available from NYSERDA.

FUNDING	TOTALS
NYSERDA	$250,000
Wehran Engineers	23,860
Town of Brookhaven	79,632
TOTALS	$343,492

Contractor: Town of Brookhaven
Site: Brookhaven Municipal Landfill
Contract Duration: 4/94-7/98
Key Words: environmental, landfill management, municipal, solid waste
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Municipal Wastes
Contract No.: 3133-ERER-MW-94

-> Collecting, Processing, and Marketing Non-Traditional Recyclables

Develop methods for collecting, processing, and marketing "hard to recycle" materials

BACKGROUND

New York State's municipalities want to recover more recyclable and reusable materials from the waste stream. To do this, most municipalities recycle glass, some types of paper, and plastic because there are markets for these items. Recycling these materials, however, has reduced the waste stream less than 20%; for most municipalities, the reduction has been less than 10%t. To increase these percentages, source-separation of more materials is required and more end-uses and markets for the materials removed from the waste stream must be found. Monroe County implemented a source-separation project aimed at some of these hard-to-recycle materials.

ACCOMPLISHMENTS

Monroe County researched the types of materials that could be added to the existing curbside collection program and ways to effectively collect them. They then designed and implemented an education program and collection and processing system for a test portion of County residents. Both private and municipal waste haulers collected the new materials, which consisted of boxboard, mixed papers (junk mail), and telephone directories, and brought them to the recycling facility for processing and marketing. Data was collected on program costs and energy use to determine if the program was cost-effective and should be implemented Countywide.

FINDINGS AND CONCLUSIONS

Data from the one-year program had to be interpolated to determine before- and after-program costs and energy use due to changing market conditions. Relative constants, such as recycling participation rates and market costs, varied so dramatically that it was difficult to draw valid conclusions about energy efficiency and costs. However, it was determined that, as more materials were collected, total energy use went up, but energy use per ton of materials went down. Adjusted recycling rates for the County went up by about 1%.

REALIZED OR ANTICIPATED BENEFITS

Two tons per day of additional recyclables are now being processed and marketed in Monroe County. If the program were implemented Countywide, the volume of recyclables would increase to 12 tons per day, increasing revenues for the recycling program by 10%. Removing these materials from the waste stream will save energy needed to transport them to a landfill and will save 20 cubic yards of landfill space each day, thereby postponing the need to close the landfill and construct a new one by one year.

TECHNOLOGY TRANSFER ACTIVITIES

A final report will be published and distributed to interested municipal and private waste haulers and solid waste managers.

FUNDING	TOTALS
NYSERDA	$245,125
Monroe County	264,675
TOTALS	$509,800

Contractor: Monroe County Department of Engineering
Site: City of Rochester and surrounding Towns, Monroe County
Contract Duration: 3/94-9/97
Key Words: environmental, municipal, solid waste
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environmental Research
Subprogram: Municipal Solid Waste
Contract No.: 3134-ERER-MW-94

-> Methane Gas Production at Broome County Landfill

Distribute leachate in Broome County landfill to enhance gas production.

BACKGROUND

Leachate, a liquid produced by landfills as rainwater seeps through the waste, must be collected and treated to avoid environmental impacts to ground and surface water. At large landfills, the leachate is usually treated on site at specially designed facilities. At smaller landfills, leachate is transported off site to a sewage treatment plant. Both options are expensive and use large amounts of energy. Controlled recirculation of leachate back into the waste adds moisture and nutrients needed by the bacteria in landfills to stabilize the waste, reduce the pollutant levels in the leachate, and enhance methane production so it can be economically used for energy production purposes. This project investigated building a bioreactor trench in the waste to aid recirculation.

ACCOMPLISHMENTS

A trench was dug in the top layer of the landfill, filled with broken glass and waste plastics from a recycling facility, and dosed with leachate for one year. Testing of the raw leachate and the leachate in the trench indicated that the levels of many pollutant parameters were reduced while in the trench. Gas coming from the trench was tested for quality and quantity and compared to gas from a control area. Although gas from the trench contained a high percentage of methane, it is not known whether gas quantity was enhanced due to recirculation because of the project's short duration.

FINDINGS AND CONCLUSIONS

In 12 months, 1.1 million gallons of leachate were charged to the bioreactor trench. Chemical oxygen demand levels were reduced by 70%, volatile fatty acids were reduced 72%, total organic carbon decreased 73%, and conductivity decreased by 50%. Subsidence points surveyed indicated the area near the trench experienced twice the subsidence of the control area and moisture content in the area adjacent to the trench increased by 70%. Hydraulic conductivity of the waste decreased by 60% in the areas immediately adjacent to the trench and the head in the trench gradually increased over the project duration. Approximately 7-10 feet of capacity was still available in the trench after one year; this capacity could be used for more leachate for treatment and storage purposes. Costs to treat the leachate were estimated at $0.015-0.02/gallon. This compares favorably to the existing on-site pre-treatment cost and transportation and disposal off-site costs that total $0.10-0.12/gallon in Broome County. The county has applied to the DEC to use the bioreactor trench on a larger scale at the landfill.

REALIZED OR ANTICIPATED BENEFITS

The cost to treat leachate in the bioreactor trench was approximately 1/5 the cost of conventional treatment. NYS municipalities could save up to $22 million per year in leachate treatment costs if bioreactor trenches were used to treat all landfill leachate. Also, the project indicated that recirculation of leachate helped the waste settle more quickly, which could provide landfills with additional disposal capacity and increase the operating life of the landfill. This would decrease the need to build new landfills in NYS.

TECHNOLOGY TRANSFER ACTIVITIES

SUNY/Oswego personnel have made presentations on this project at the Sardinia Waste Conference and will be publishing a paper on the project. A final report is available from NYSERDA. This report has been sent to landfill operators around the state.

FUNDING	TOTALS
NYSERDA	$189,987
Broome County	44,680
SUNY/Oswego	24,823
TOTALS	$252,490

Contractor: Broome County Division of Solid Waste Management
Site: Nanticoke Landfill, Broome County
Contract Duration: 3/94-11/97
Key Words: environmental, municipal, landfill management
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environmental Research
Subprogram: Municipal Solid Wastes
Contract No.: 3135L-ERER-MW-94

-> Community Warehouse for Salvageable Materials

Manage used and salvageable materials and construction and demolition debris at pilot community warehouse.

BACKGROUND

Landfills and transfer stations are depositories for large amounts of salvageable materials and construction and demolition debris, much of which is reusable. Building contractors with leftover and usable materials at construction or demolition sites, and business owners and homeowners discarding furniture, computers, etc., often find it too expensive or inconvenient to salvage these materials, and often simply dispose of them. Adding these materials to landfills, especially in large quantities, is expensive, takes up valuable space, and is detrimental to the environment. One solution would be to develop a program to collect, warehouse, organize, refurbish (if necessary), and donate or sell these materials to needy groups or individuals. The Eastern Rensselaer County Solid Waste Management Authority, in conjunction with NYSERDA, Winnett & Associates, Energy Answers Corporation, and Rensselaer County, investigated managing these materials by piloting a community warehouse.

ACCOMPLISHMENTS

A community warehouse was established in Hoosick Falls, NY. The operators of the warehouse devised and tested methods to collect used materials from residents, businesses, government offices, schools, and universities; bring them to the warehouse; refurbish items that needed to be fixed; advertise for customers; and sell the items. Data was collected on the costs and energy usage for operating the warehouse and the environmental impacts of the program.

FINDINGS AND CONCLUSIONS

Data was collected for a one-year period. During this time, all items collected and sold were weighed and measured, and revenues and costs of the program were determined. This data was analyzed and it was determined that the community warehouse concept was a viable method for waste reduction. During the one-year period, the warehouse did not generate enough revenue to cover expenses; however, more than $100,000 worth of materials was collected and 107 tons of waste were removed from the waste stream. In the year since this pilot test ended, revenues have exceeded costs each month, making the warehouse financially self-sufficient.

REALIZED OR ANTICIPATED BENEFITS

The warehouse has created four full- and one part-time job and provides low-cost furniture, computers, office furnishings, and building materials to residents and business owners in a low-income area. It also provides a removal service for businesses, schools, and government offices to get rid of unwanted materials without having to pay to dispose of them. Because the warehouse is a not-for-profit 501(c)(3) organization, businesses and homeowners that donate to it can claim a charitable deduction on their income taxes.

TECHNOLOGY TRANSFER ACTIVITIES

A final report was published that outlines the results of the program. This report can be used by other communities as a guide to starting their own warehouse. In addition, the contractor has presented the findings of the program at several seminars and has made a video with the New York State Department of Enviromental Conservation.

FUNDING	TOTALS
NYSERDA	$301,919
ERCSWMA	268,078
TOTALS	$569,997

Contractor: Eastern Rensselaer County Solid Waste Management Authority (ERCSWMA)
Site: Hoosick Falls, Rensselar County
Contract Duration: 3/94-10/97
Key Words: environmental, solid waste, municipal
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environmental Research
Subprogram: Municipal Wastes
Contract No.: 3169-ERTER-MW-94

-> Evaluating Pulverized-Glass Sand for Environmental Applications

Test pulverized waste glass for water-filtration and other environmental applications.

BACKGROUND

Recycling materials such as glass is expensive for local governments. When recyclable glass is collected and processed at materials recovery facilities (MRF), significant quantities of mixed color glass is broken into unsortable pieces and remains as a process residue. Recycling costs increase when MRFs cannot market the broken glass and have to pay for its disposal. To address such problems, this project was designed to evaluate the potential for using processed broken glass to replace silica sand in slow-sand filtration systems for drinking water.

ACCOMPLISHMENTS

Glass residue was processed through the Andela Pulverizer ™ developed by Andela Tool & Machine of Richfield Springs, NY. The pulverized glass was used to produce glass filter sand meeting the Ten States Standards for uniformity and effective size. Bench-scale tests were performed by filtering water through separate columns of washed glass sand, unwashed glass sand, and a control of purchased silica sand. During 200 days of operation, representing three filtration cycles, filter effluents were tested for turbidity removal. Challenge tests were also conducted for different pathogens. Economic analyses were performed for pulverization systems of several different capacities.

FINDINGS AND CONCLUSIONS

In terms of its physical characteristics, the glass sand had good angularity and showed low solubility, meeting the American Water Works Association standard. Due to this low solubility, the particle-size distribution of the glass sand should remain stable during use, which is not necessarily the case with mined sands containing dissolvable minerals. By the third filtration cycle all filters were achieving greater than 95% turbidity removal, but the glass sand filters reached this level of removal about 30% faster than the control silica sand. Once the filters ripened, all achieved higher than than 99% removal of coliform, giardia cysts, and cryptosporidium oocysts.

REALIZED OR ANTICIPATED BENEFITS

MRFs could achieve significant savings if glass residue could be processed into marketable filter sand. For a 4,000-ton-per-year throughput, costs of processing ranged from $13-$30 per ton depending on process line setup. With product benefits of up to $70 per ton, simple paybacks could range from less than one year to five years. The 15,600 tons of glass sand that could be used each year for this higher-value application would not have to be landfilled. Potential energy savings would result from reduced energy needed for landfilling and transportation.

TECHNOLOGY TRANSFER ACTIVITIES

The final report was distributed to people and organizations involved in water filtration and glass recycling. A follow-up project has begun at the Canajoharie water treatment facility to test the capabilities of glass sand when filtering surface water. Opportunities are being explored for using glass sand in wastewater filtration applications.

FUNDING	TOTALS
NYSERDA	$62,115
Andela Tool & Machine, Inc.	41,497
Syracuse University	10,791
Erie County Water Authority	8,000
Great Lakes Instrument	10,325
TOTALS	$132,728

Contractor: Syracuse University
Site: Syracuse, Onondaga County; Utica, Oneida County; Richfield Springs, Otsego County
Contract Duration: 4/95 -8/97
Key Words: environmental, university, solid waste, municipal, product development
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environmental Research
Subprogram: Municipal Solid Wastes
Contract No.: 4048-ERTER-ER-95

-> Town of East Hampton Landfill Reclamation Feasibility Study

Investigate feasibility of landfill reclamation at two Town of East Hampton landfills.

BACKGROUND

NYSERDA conducted an eight-project feasibility study program that determined that landfill reclamation (excavating a landfill and separating the reusable and combustible materials) could be an economically and environmentally beneficial alternative to conventional landfill closure. These are the results of the final two studies done at the Springs-Fireplace Road Landfill and the Montauk Landfill in the Town of East Hampton.

ACCOMPLISHMENTS

The Town used a multilayered screening device (CEC "Screen-It"), an air separator, and a self-cleaning magnet to separate the landfill components. Environmental monitoring was conducted to determine emissions from the operations and to protect worker health and safety. Separated components were evaluated to determine which materials could be left on site, which could be sold to generate revenues, and which had to be disposed of off site. The cost and impacts of reclamation vs conventional closing were compared.

FINDINGS AND CONCLUSIONS

The CEC "Screen-It" separated the waste into three fractions. At the Springs-Fireplace Road landfill, 65% of the contents was soil, 20% was a mix of stones, municipal solid waste and construction and demolition waste, and 15% was larger items such as textiles, tires, metal, glass, plastic, etc. The largest materials were separated by hand and the Town attempted to separate the stone from the waste material using the air separator, but failed. At the Montauk landfill, 76.6% of the waste was soil, 8.7% was a mix of stones, municipal solid waste and construction and demolition waste, and 14.7% was larger items. The evaluation determined that since the Montauk landfill contained a greater percentage of soil and less waste, it was cost-effective to reclaim it than cap it. At the Springs-Fireplace Road landfill, the greater percentage of waste and less soil made capping cheaper. Also, this landfill contained more waste than expected, the waste was deep and the bottom of the landfill was below surrounding grade, meaning it would be more expensive to excavate and dispose.

During reclamation of the Montauk landfill, the Town will examine other ways to separate the stone from the waste fraction. If the stone can be easily separated using a coarse separator or a float tank, and sold to decrease net costs, the Town will examine the data and reevaluate the possibility of reclaiming the Springs-Fireplace Road landfill.

REALIZED OR ANTICIPATED BENEFITS

An estimated 350 landfills in New York State are potentially suitable for reclamation and reuse. This could upgrade the environment and provide the State with the capacity to accommodate the waste of its entire population for 6-1/2 years if no other waste-management alternatives were used. Energy recovery would contribute 170 trillion Btu, the equivalent of one million barrels of oil, to the State's energy needs. Usable materials such as ferrous metals, soil, and the land itself could be recovered, and post-closure monitoring costs would be reduced for many municipalities.

TECHNOLOGY TRANSFER ACTIVITIES

A final report detailing project results is available.

FUNDING	TOTALS
NYSERDA	$58,943
Town of East Hampton	59,616
TOTALS	$118,559

Contractor: Town of East Hampton
Site: Springs-Fireplace Road and Montauk Landfills, Town of East Hampton, Suffolk County
Contract Duration: 11/94 -12/97
Key Words: environmental, solid waste, municipal
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Municipal Solid Wastes
Contract No.: 4085-ERTER-MW-95

-> Evaluation of Establishing a Bottle Re-Use Business in New York State

Assess feasibility of collecting, washing, and marketing used wine bottles.

BACKGROUND

The amount of green glass in the waste stream could be reduced if whole wine bottles could be successfully recovered, washed, and re-used. Diamond Beverages, LTD was a soft drink company in Canada that had some experience washing wine bottles. It was considering expanding its operations into New York State. During the project, the soft drink business closed and the bottle-washing operations were purchased and operated as Diamond Glass.

ACCOMPLISHMENTS

Diamond was successful in identifying a good prospect for collecting the bottles. The company that collects deposit containers in the Buffalo area showed some interest in expanding its collection to also pick up wine bottles during its normal stops at restaurants and hotels. Diamond prepared an interim report and proposal for a demonstration, which showed good potential.

FINDINGS AND CONCLUSIONS

The feasibility assessment showed a simple payback of less than three years. Confirmation is needed of projected collection costs and of the ability of the washing operation to produce marketable bottles.

REALIZED OR ANTICIPATED BENEFITS

Direct benefits Diamond. Due to a shortage of capital and a change of management at the deposit container collection company, development of the project has not proceeded.

TECHNOLOGY TRANSFER ACTIVITIES

Dissemination of complete project results is limited by our confidentiality agreement and by the incomplete nature of the results. Diamond Glass has been made aware of the opportunity to resubmit a proposal should it be successful in identifying sources of capital and in addressing concerns about collection costs and marketability of washed bottles.

FUNDING	TOTALS
NYSERDA	$6,525
Diamond Beverages, Ltd.	7,250
TOTALS	$13,775

Contractor: Diamond Beverages, Ltd.
Site: Hamilton, Ontario
Contract Duration: 11/95 - 9/97
Key Words: environmental, solid waste
Project Manager: Tom Fiesinger (518) 862-1090, ext.3218
Program: Environmental Research
Subprogram: Solid Waste Management
Contract No.: 4249-ERTER-ER-96

-> Landfill Gas Clean-up and Use at the City of Albany Interim Landfill

Research ways to collect, clean up, and use landfill gas at a small landfill.

BACKGROUND

Using landfill gas for energy production requires the installation of gas wells, gas collection piping, gas clean-up facilities, and power generation systems. The equipment is usually installed after the landfill has been closed, which means that the methane produced during the operating life of the landfill is lost to the atmosphere. Also, landfill gas-to-energy systems have historically only been economical at larger landfills. This project studied the performance and feasibility of an energy system installed prior to closure at a smaller landfill.

ACCOMPLISHMENTS

Horizontal gas extractors were installed in newly placed waste to evaluate their effectiveness in collecting gas during active operation of the landfill. A countercurrent liquid-gas contactor scrubber using EnviroScrub™ liquid reagent for hydrogen sulfide (H_2S) removal was built and tested and a dual-fuel 100-kilowatt mobile power station was installed. This power station was equipped with fuel controllers so that it could be operated on both diesel fuel and landfill gas and was installed in a trailer so it would be portable.

FINDINGS AND CONCLUSIONS

The horizontal gas extraction system was very successful; overall, gas recovery was high and the practical radius of influence of individual extractors was about 50 feet. The cost of horizontal extraction conduits is much less than the cost of drilling vertical wells in solid waste and provides the additional advantage of odor control and energy recovery during the landfill's operational life. The H_2S scrubber was effective and its use appears feasible at typical H_2S concentrations and gas flows. The dual-fuel mobile power station performed dependably and was able to deliver smooth power output under varying load and landfill gas fuel conditions. The unit has operated 24 hours per day for a year. The landfill gas/diesel control system was tuned to maximize the Btu input from landfill gas and consume only enough diesel fuel to maintain ignition. Heavy load levels were more economical than very light loads.

REALIZED OR ANTICIPATED BENEFITS

The collection, clean-up, and power systems interacted successfully; it would be possible to use any one of the three elements separately at a given landfill site or combine elements as desired. Commercial applications exist for each of the three project elements and the data produced by this research will assist in using these technologies. This type of unit could be used at smaller landfills where electricity is needed in remote areas for landfill gas blowers or other uses exist, or where demand charges from utilities make electricity hook-up too costly. These units could also make the landfill more energy self-sufficient and add 8.5 megawatts of electricity to New York's electric capacity if used at landfills Statewide.

TECHNOLOGY TRANSFER ACTIVITIES

The subcontractor has been planning to expand its manufacturing capability by constructing a new facility in the Port of Rensselaer to build the new products. It is marketing the products to landfill operators across the country in an effort to increase sales. Marketing the gas-cleaning system and mobile power station to sewage treatment plants with anaerobic digestors is also being explored. NYSERDA also sponsored the contractor's participation in the "Producing Energy From Landfill Gas Conference" in November 1997.

FUNDING	TOTALS
NYSERDA	$243,892
City of Albany	96,260
TOTALS	$340,152

Contractor: City of Albany
Site: Albany Interim Landfill, Albany County
Contract Duration: 8/95-6/97
Key Words: environmental, solid waste, municipal
Project Manager: Jim Reis (518) 862-1090 ext. 3251
Program: Environmental Research
Subprogram: Municipal Wastes
Contract No.: 4276-ERTER-MW-95

Establish research center in New York City to facilitate interaction between utilities and their customers, foster energy R&D, and provide technology transfer and technical assistance.

BACKGROUND

The Electric Power Research Institute, utilities, NYSERDA, and other research organizations all have common interests in energy/environmental research in the water, wastewater, and health care industries in New York State and the Northeast. This project will allow NYSERDA to pool its resources with other organizations in New York State to address regional energy and environmental-management problems and other areas of common interest in water systems, wastewater treatment, sludge management, and health care.

OBJECTIVES

To create and participate in activities that develop and market energy-efficient environmental-management technologies in New York State and the Northeast serving the water, wastewater, and health care industries

DESCRIPTION

The contractor will: (1) issue and respond to solicitations for R&D projects in the areas of water, wastewater, and health care; (2) prepare Program Opportunity Notices and Requests for Proposals and respond to outside solicitations; and (3) organize and participate in technology-transfer activities.

BENEFITS

New York State water and wastewater systems use three to four billion kWh of electricity per year. A number of energy-saving technologies have been identified and developed over the past few years that could be implemented easily at these facilities after testing and demonstration. New technologies could be developed with assistance from the Center that could further reduce the amount of energy required for environmental management. Total energy savings for the water and wastewater industries in New York State may reach 1.5 billion kWh per year if these industries maximize the use of the new, energy-efficient technologies.

SCHEDULE AND STATUS

A Healthcare Initiative Program Manager has been hired. Healthcare Initiative projects include a conference and a video planning meeting. Municipal water and wastewater projects include a video planning meeting and a watershed protection demonstration.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$375,000	$125,000	$625,000
Con Edison	750,000	250,000	1,250,000
ESEERCO	375,000	125,000	625,000
Electric Power Research Institute	600,000	200,000	1,000,000
TOTALS	$1,400,000	$700,000	$3,500,000

Contractor: Consolidated Edison Co. of New York, Inc.
Site: Manhattan College, Bronx County
Contract Duration: 8/94 - 12/98
Key Words: environmental, wastewater, water, medical waste, environmental management, utilities
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Municipal Wastewater and Sludge
Contract No.: 3145-ERER-MW-94

-> Application of an Hourly Energy-Pricing Expert System

Develop and test computer software to control energy costs at wastewater-treatment plant.

BACKGROUND

In 1991, the Town of Amherst's wastewater-treatment plant (WWTP) began participating in a time-of-day electricity-pricing schedule offered by Niagara Mohawk. For Amherst to save energy costs under this program, the WWTP must shift electricity use from high- to low-cost periods. Each day, the WWTP receives an hourly electricity-price schedule from Niagara Mohawk for the following business day starting at midnight. Because the schedule is received at 4 p.m., little time is left for energy-use planning for the next day. The WWTP has on-site storage capacity and process flexibility that would allow for storing wastewater or sludge during times of high electricity cost and treating them when the electricity rates are lower. The plant needs an expert system that can assist the operators with process-control and operating decisions, resulting in greater energy savings. Niagara Mohawk has an expert system that was developed to improve an industrial customer's ability to respond to hourly electricity pricing.

OBJECTIVES

To develop algorithms and engineering models that define the operating and performance characteristics of the equipment and processes at the Amherst WWTP, and design an energy-management expert system.

DESCRIPTION

The contractor will: (1) survey the Amherst WWTP operations to identify processes, equipment, operating strategies, and energy use to help in designing the expert system; (2) prepare the algorithms and engineering models; (3) develop and test user and software interfaces; (4) validate the engineering models and operating rules; and (5) train WWTP personnel on the completed system.

BENEFITS

This project will provide the Amherst WWTP with a tool to help the plant operator identify electricity load-shifting opportunities that result in an increase in energy savings from hourly electricity pricing. This tool, if applied at other WWTPs in New York State, could help reduce the $125 million spent annually for electricity.

SCHEDULE AND STATUS

Software design is complete. The consultant has developed the user interface and the engineering models. The software has been tested by the WWTP operators. The final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$121,625	0	$121,625
Town of Amherst	40,542	0	40,542
TOTALS	$162,167	0	$162,167

Contractor: Town of Amherst
Site: Amherst, Erie County
Contract Duration: 4/95 - 6/98
Key Words: environmental, municipal, energy management, wastewater treatment
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Municipal Wastewater and Sludge
Contract No.: 4118-ERTER-MW-95

-> Demonstrating the Selector-Contact Stabilization Process

Install and test selector-contact stabilization at Fredonia wastewater-treatment plant.

BACKGROUND

The Village of Fredonia owns and operates a 3.3-million-gallon-per-day (mgd) advanced wastewater-treatment plant (WWTP) designed in the late 1970s to achieve tertiary-level removal of biochemical oxygen demand (BOD) and total suspended solids (TSS), and remove phosphorus to an effluent concentration of one milligram per liter (mg/l) by chemical precipitation. The WWTP was expected to reach its design capacity by 2000, but instead began to approach it by the early 1990s, when plant-influent BOD loadings were about 30-percent higher than design values, and average plant-influent flows were about 2.2 mgd.

"Selector" means growing and maintaining specific bacteria by controlling their environment. The selector process modifies the activated-sludge processes' conventional contact-stabilization mode. The contact tank is divided into zones or compartments where anoxic and oxic conditions, and related "selector" bacteria, are maintained. A high food-to-(bio)mass (F/M) ratio is maintained in the anoxic zone to degrade organics from the primary settler by rapid growth of bacteria recirculated from the stabilization tank. Mixed-liquor suspended solids (MLSS), a mixture of biomass and organics from the contact tank, also are recirculated from the non-selector zone of the contact tank to the selector zone to provide process stability and a working biomass population.

OBJECTIVE

To install and evaluate an energy-saving wastewater-treatment process at the Fredonia WWTP that has the potential to increase the plant's treatment capacity without increasing its size.

RESEARCH EFFORT

The contractor will: (1) install the selector-contact stabilization process at the WWTP to increase the plant's BOD-removal capacity; (2) monitor and test the selector for 14 months, including process stress-testing and oxygen-transfer efficiency testing; and (3) use a mathematical model to predict the benefits of the selector process for different WWTP sizes.

BENEFITS

The selector process is expected to benefit the WWTP by: (1) increasing plant capacity without increasing its size; (2) removing phosphorus from the wastewater to levels that meet or exceed regulatory requirements; (3) improving settling characteristics of the WWTP sludge; and (4) saving energy due to lower sludge age, faster BOD removal, and an increase in oxygen-transfer efficiency.

SCHEDULE AND STATUS

The selector process was installed and the start-up period completed. Oxygen-transfer testing is complete. Process monitoring began in January 1996. Loss of sludge handling equipment delayed completion of the testing and monitoring task. Testing was completed in September 1997. The final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
Village of Fredonia	273,956	0	273,956
TOTALS	$523,956	0	$523,956

Contractor: Village of Fredonia
Site: Fredonia, Chautauqua County
Contract Duration: 2/95 - 6/98
Key Words: environmental, municipal, wastewater treatment, contact stabilization, process development
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Municipal Wastewater and Sludge
Contract No.: 4068-ERTER-MW-95

Test chlorination/dechlorination and ultraviolet disinfection equipment side-by-side.

BACKGROUND

Nearly all wastewater-treatment plants (WWTPs) in New York State disinfect their treated effluent prior to discharge, most using gaseous or liquid chlorine. Chlorine has been investigated for residual levels and formation of toxic halogenated compounds in the wastewater effluent or receiving water. There seems to be a trend toward lower allowable residual levels with the same pathogen-kill requirement, possibly forcing dechlorination and a subsequent cost increase. Imposing standards for whole-effluent toxicity raises additional uncertainties about using chlorine.

OBJECTIVES

To determine the effectiveness of alternative disinfection technologies under varying water-quality and hydraulic conditions, and compare their costs and benefits.

DESCRIPTION

The contractor will: (1) test several configurations of ultraviolet (UV) disinfection as an alternative to chlorination, (2) test the effect of UV followed by chlorination and dechlorination, (3) test liquid hypochlorite to replace gaseous chlorine, (4) test more energy-efficient injection methods, (5) determine the efficacy of dechlorination as a regulatory compliance tool, and (6) analyze data and economics.

BENEFITS

UV can be more cost-effective than chlorination, particularly if dechlorination is needed; however, UV will use more energy overall. UV disinfection is effective, leaves no residual, and has no known adverse by-products. It has been demonstrated to have a faster reaction time than chlorine, but is impeded by turbidity. Electricity consumption for a liquid hypochlorite system is about 50% less than that for a gaseous system. There would be substantial cost savings for safety, training, and equipment.

SCHEDULE AND STATUS

Bids have been received for the new liquid hypochlorite system. Design of the UV system is complete. Installation of both systems is complete. Testing began in June 1996 and was completed in January 1997. The final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$237,486	0	$237,486
Orange and Rockland Utilities, Inc.	50,000	0	50,000
Rockland County Sewer Dist.	190,315	0	190,315
HydroQual	12,494	0	12,494
TOTALS	$490,295	0	$490,295

Contractor: Rockland County Sewer District
Site: Orangeburg, Rockland County
Contract Duration: 10/94 - 6/98
Key Words: environmental, municipal, wastewater treatment, disinfection
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Municipal Wastewater and Sludge
Contract No.: 4071-ERTER-MW-95

-> Spray-Irrigation for Wastewater Treatment

Use spray-irrigation to remove phosphorus and nitrogen from wastewater treatment plant effluent.

BACKGROUND

Because the current levels of phosphorus in Lake Champlain are producing excess algae growth and aquatic plants that reduce the Lake's desirability as a recreational waterbody, New York State signed a compact with Vermont to reduce the amount of phosphorus in the Lake. The contract calls for reducing the amount of phosphorus that enters the Lake by 2.4 metric tons/year by 2017. Point-source discharges such as wastewater treatment plants are usually good targets for large-volume phosphorus reductions. The Village of Lake Placid would likely be required to reduce the amount of phosphorus from its wastewater treatment plant (WWTP) discharged to the Chubb River, which flows into Lake Champlain. The Village has proposed using spray-irrigation of golf course turfgrass at the Lake Placid Club, adjacent to the WWTP, to meet the plant's new phosphorus-discharge limit. The project would also help New York State achieve 63% of its first-five-years' phosphorus-reduction goal of 0.6 metric tons per year.

OBJECTIVE

To design, construct, and test a phosphorus and nitrogen removal process for wastewater treatment using spray-irrigation on a golf course.

DESCRIPTION

The Village will install a pump in the chlorine contact tank at the WWTP, and construct a pipeline from the WWTP to the adjacent golf course, an irrigation holding pond, and an irrigation pumping station. The pipeline would deliver treated effluent from the WWTP to the golf course's irrigation pond. The Lake Placid Club will install the golf course irrigation system. The plant effluent would be used to irrigate the golf course during the summer and fall, providing nutrients (nitrogen and phosphorus) to the golf course turfgrass and avoiding the discharge of these nutrients to the Chubb River (and ultimately Lake Champlain). The New York State Department of Environmental Conservation (NYSDEC) will monitor the Chubb River for phosphorus-loading reductions during the irrigation season.

BENEFITS

The Village will avoid $700,000 in capital and added operating and maintenance expenditures for conventional phosphorus and ammonia removal. The proposed project will offset a 20-40% increase in energy purchases. The Lake Placid Club will be able to attract more tourists to the area by improving the quality of its golf courses through improved irrigation. The Club's cost for fertilizer and irrigation water will be reduced. New York State will achieve 63% of its first-five-years' goal for reducing phosphorus-loading in Lake Champlain. Reducing the ammonia discharged from the Lake Placid WWTP will allow DEC to upgrade the Chubb River to trout-stream quality.

SCHEDULE AND STATUS

Construction of the irrigation pond, the irrigation pump station, and the force main from the WWTP to the irrigation pond has been completed. Irrigation is scheduled to start shortly.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$230,000	$230,000
Village of Lake Placid	0	60,106	60,106
Placid Gold, LLC	0	400,000	400,000
NYSDEC	0	41,000	41,000
TOTALS	0	$731,106	$731,106

Contractor: Village of Lake Placid
Site: Lake Placid, Essex County
Contract Duration: 7/97 - 12/98
Key Words: environmental, municipal, tertiary wastewater treatment
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Municipal Wastewater Treatment
Contract No.: 4628-ERTER-MW-98

-> Evaluating Alternative Technologies for Disinfecting Low-Grade Wastewaters

Evaluate on pilot-scale potential for using ultraviolet light to disinfect untreated or partially treated wastewaters.

BACKGROUND

Water-quality standard compliance for many receiving water bodies will require that combined-sewer and sanitary-sewer overflows and stormwaters be disinfected before discharge. Chlorination has been by far the dominant disinfectant; however, the issues of residual chlorine and chlorine by-products, and their associated toxic effects in the local aquatic environment, has led to the need to develop alternative disinfection technologies. Ultraviolet light (UV) neither leaves a residual nor produces toxic by-products, but its widespread use as a disinfectant has been hampered by its sensitivity to wastewater quality, the occluding effects of solids, and the ability of damaged microorganisms to repair.

OBJECTIVE

To demonstrate the technical feasibility of disinfecting combined-sewer overflow- (CSO) type, low-quality wastewaters with UV alternative lamp systems.

DESCRIPTION

The contractor will: (1) review and select equipment for removing particulate from primary and secondary wastewater streams and disinfecting the streams using state-of-the-art UV equipment; (2) design and install a disinfection pilot plant using three UV systems; (3) design and install one or more particulate-removing units to provide screened wastewater to the UV pilot plant; (4) test the pilot UV systems using various types of partially treated wastewaters, including CSO wastewaters from 10 CSO sites; and (5) characterize the particle-size distribution of the influent wastewaters and the UV dose-response.

BENEFITS

Cost and energy-use benefits will be calculated as part of the project scope. UV offers the benefit of no toxic residual or by-products. UV disinfection will provide advantages over chlorination in safety, training, equipment handling, and building requirements.

SCHEDULE AND STATUS

The field work began in June 1997. Additional testing of UV equipment and untreated wastewaters was completed in January 1998. The Final Report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$199,535	0	$199,535
Rockland County	56,203	0	56,203
HydroQual	14,000	0	14,000
Equipment manufacturers	30,000	0	30,000
TOTALS	$299,738	0	$299,738

Contractor: Rockland County Sewer District
Site: Orangeburg, Rockland County
Contract Duration: 6/97 - 6/98
Key Words: environmental, municipal, wastewater treatment, disinfection
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Municipal Wastewater and Sludge
Contract No.: 4442-ERTER-MW-96

-> Demonstrating Alternative Combined-Sewer Overflow Disinfection Technologies

Demonstrate new chlorine dioxide production technology and compare to other systems for disinfecting combined-sewer overflows.

BACKGROUND

Combined-sewer overflows (CSOs) represent significant health, environmental, and aesthetic problems in many cities. During periods of stormwater flow, these overflows directly discharge untreated municipal sewage mixed with various amounts of stormwater to lakes and streams. On average, the pollutant content in CSOs is about one-half that of raw sanitary sewage. Disinfecting CSOs prior to discharge is now required to meet water-quality standards. Chlorine dioxide (Cl_O) disinfection represents a significant advantage over chlorination/dechlorination, both in terms of the toxic effects on the aquatic system and energy consumption.

OBJECTIVES

To: (1) upgrade and place into permanent service the existing Newell Street CSO facility in Syracuse, (2) demonstrate the use of on-site ClO_2 production using ultraviolet (UV) dissociation of sodium chlorite, and (3) document the effectiveness of ClO2 and UV disinfection technologies in terms of capital, operation, and maintenance costs; effluent toxicity; and energy use.

DESCRIPTION

Under a separate Agreement with NYSERDA, Ultra Violet Dioxide, Inc., a New York State company, will design and assemble the ClO_2-production prototype, and then install it at the CSO site. Onondaga County will: (1) upgrade the CSO facility to receive the new equipment, (2) monitor equipment operation during at least eight storms that produce a CSO, (3) complete water-quality sampling and analysis during each of the storms, and (4) complete a life-cycle cost/benefit analysis for the ClO_2 technology and compare it to conventional disinfection systems.

BENEFITS

The UV dissociation method of ClO_2 production is expected to cost 85% less than ozonation and 50% less than chlorination/dechlorination.
Typical energy use for the new technology is about 1/10 of that for ozone equipment (2 vs. 20 kWh/kg).

SCHEDULE AND STATUS

Assembly of the chlorine dioxide generator has been completed. The contractor will install the generator at a CSO site in the City of Syracuse in June 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$150,000	$150,000
Onondaga County	0	625,160	625,160
Ultra Violet Dioxide, Inc.	0	8,064	8,064
TOTALS	0	$783,224	$783,224

Contractor: Onondaga County Department of Drainage and Sanitation; Ultra Violet Dioxide, Inc.
Site: Syracuse, Onondaga County
Contract Duration: 6/97 - 12/98
Key Words: product development, environmental, water pollution control, disinfection,
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Wastewater Treatment and Sludge Management
Contract No.: 4308A-ERTER-MW-98

-> Excess Dredge-Water Treatment System

Develop and document capabilities of system for treating excess dredge water.

BACKGROUND

New York and New Jersey recently agreed to commit $130 million for deepening New York City's harbor to stem losses of economic activity due to sediment deposition. More than 150,000 jobs and $20 billion in annual sales are generated by port commerce. Before recent restrictions on off-shore dumping, about six million cubic yards of sediment were dredged annually. More than one-third of the sediment in the harbor is now classified by the Army Corps of Engineers as Category III material, not suitable for ocean disposal. Disposal is expensive; recently, it cost $118 per cubic yard to dispose of dredge materials containing 50% water. An economical way to make dredge water clean enough to return to the ocean could result in significant savings, both in energy used to transport it to landfills or wastewater-treatment plants, and in the overall costs of sediment disposal in New York City.

OBJECTIVE

Melrose Marine Service, Inc. has invested in a system designed to capture sufficient contaminants from dredge water for it to be returned directly to the ocean. An initial project objective is to develop a plan for bringing the system to market. Research objectives include developing, testing, and documenting system design parameters for efficient particulate removal. If successful, the resulting data will be used to advance the commercialization plan.

DESCRIPTION

Testing will be used to establish process design, equipment arrangements, and dredge-material flow rates that will optimize the energy efficiency and overall economics of the process. A commercialization plan has been developed, and samples collected from four dredge sites. The samples will be analyzed for key parameters, and a testing program undertaken to examine the system effectiveness for different, sediments, hydraulic loadings, and particle size. Test results will be used to update the commercialization plan and begin implementing it.

BENEFITS

If successfully commercialized, the system will reduce costs for disposing of the millions of cubic yards of dredge material that need to be removed from State waterways. In New York harbor alone, dredging costs could be reduced by up to $20 million per year. If successful, the system could contribute to more rapid dredging of New York's harbor and help prevent diversion of shipping to other deep-water ports such as Norfolk, Virginia. This would save the State's consumers from having to pay higher prices to cover the fuel and other costs of trucking goods to New York.

SCHEDULE AND STATUS

Development of the preliminary commercialization plan, site selection, and regulatory approvals have been completed. Bench-scale testing is planned for the fall of 1998 with field testing to follow in the Spring of 1999. Final documentation of system capabilities is to be completed by January 2000.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
Melrose Marine Service, Inc.	199,127	0	199,127
Chesner Engineering, PC	54,141	0	54,141
TOTALS	$503,268	0	$503,268

Contractor: Melrose Marine Service, Inc.
Site: Town of Southold, Suffolk County
Contract Duration: 8/96 - 1/00
Key Words: product development, wastewater treatment
Project Manager: Tom Fiesinger, (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 4452-ERTER-ER-97

-> Non-Chemical Disinfection and Chemical Removal at Wastewater Treatment Plant

Demonstrate performance of non-chemical electromagnetic water-processing and filtration system for removing ammonia and phosphate contaminants from wastewater treatment plant effluent stream.

BACKGROUND

Ammonia and phosphorous contaminants in effluent streams from wastewater treatment plants (WWTP) can lead to accelerated biological growth in receiving bodies of water. Nitrate compounds in effluent streams can contribute to health problems if they enter drinking water sources. Existing processes to remove ammonia, nitrates, and phosphorous rely on the use of energy- and capital-intensive technology and chemical additives for nitrification, followed by denitrification, and phosphorous precipitation as insoluble phosphate salts.

A new, non-chemical treatment technology commercially used for treating swimming pool, car wash, laundry, and industrial wastewater promises to be a low-cost, energy-efficient, retrofit technology for removing ammonia and phosphorous from WWTP effluent. The technology oxidizes soluble contaminants to form insoluble oxides that coalesce into larger particles in the presence of an electromagnetic field, and are removed by filtration. Far less sludge is produced compared to existing chemical additive treatment processes.

OBJECTIVE

To demonstrate the performance of a non-chemical electromagnetic water-treatment process for removing soluble ammonia and phosphate contaminants from a WWTP effluent stream.

RESEARCH EFFORT

The contractor will design, fabricate, install, and operate a non-chemical WWTP water-effluent treatment system. The system will include an activated oxygen pre-treatment ionization process, and a polarized media-filtration unit. Filter backwash residue will be sent to a filter press for dewatering and disposal.

BENEFITS

The project will demonstrate the performance of a non-chemical water-treatment process that will eliminate harmful effluent discharge into receiving streams without generating large quantities of sludge for disposal. The process can be retrofitted at existing WWTPs and is estimated to have lower capital and operating costs, and be less energy-intensive than existing technology. As a result of increasingly stringent environmental regulations, the market for competitive, energy-efficient, and cost-effective water-treatment technology is expected to expand, leading to more equipment manufacturing and permanent jobs.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$125,000	$125,000
Alpha/Omega	0	100,000	100,000
Town of Marion	0	25,000	25,000
TOTALS	0	$250,000	$250,000

Contractor: Alpha/Omega Environmental of New York
Site: Marion, Wayne County
Contract Duration: 3/98 - 3/99
Key Words: environmental, product development, wastewater treatment
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Municipal Wastewater Treatment
Contract No.: 4546-ERTER-ER-98

-> Village of Minoa - Subsurface-Flow Wetlands Wastewater-Treatment System

Monitor and evaluate wastewater-treatment system's performance.

BACKGROUND

Seasonally and during rain storms, the Village of Minoa's wastewater-treatment plant is overloaded and cannot meet its discharge permit. To correct this, the Village is improving its existing facility and plans to increase capacity to treat large and seasonally variable flows. This additional capacity, however, has to be oversized because it is based on peak hourly flow and not the average flow. The Village has proposed using a subsurface-flow wetland (SFW) to attenuate and treat the variable wastewater flow. The SFW, recognized as an innovative technology, is eligible for zero-percent financing from the State Revolving Fund. Construction will be phased. In the first phase, an SFW will be designed, constructed, and tested to treat part of the seasonal flow and to determine the need for additional capacity.

OBJECTIVE

Demonstrate the capability of an SFW to treat primary or secondary effluent.

DESCRIPTION

The contractor will: (1) design, construct, plant, and operate an SFW with three cells that can be operated in parallel and in series, with each cell divided by an impermeable barrier and planted with one of two plant species, leaving one-half unplanted to evaluate the effects of hydraulic residence time, plant species, and mode of operation on performance; (2) improve the existing facility by installing new screening equipment and a wetlands effluent-recycle system, and replacing rock filter media with synthetic cross-flow media in its trickling filter; (3) conduct tracer tests to test hydraulic characteristics of the SFW; (4) install sampling wells and monitor flow, temperature, and conventional wastewater parameters over a two-year period to determine performance; and (5) evaluate the energy and operating costs of the system and compare these to conventional treatment systems.

BENEFITS

If the SFW is successful, conventional capacity can be reduced, lowering capital, operating, and maintenance costs, and saving energy. The SFW approach may offer an economical alternative to other communities in New York State for treating combined sewer-overflow problems.

SCHEDULE AND STATUS

The SFW started up on secondary effluent and switched to primary effluent before the fall of 1995. By August 1996 biochemical oxygen demand removal was lower than expected, while operated under subsurface flow conditions with cells in parallel. An external review committee was formed to troubleshoot the project. The wetland continued to operate poorly under fully subsurface flow despite reducing the wetland flows and loading rates. In the Spring of 1997 a new operating mode was initiated by Village staff with the wetland operating in series. When water levels in the cells were deliberately raised and lowered, performance significantly improved. This operating mode will be documented in the draft final report expected in July 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
U.S. Environmental Protection Agency	200,000	0	200,000
Village of Minoa***	786,000	0	786,000
Clarkson University**	112,633	0	112,633
TOTALS	$1,348,633	0	$1,348,633

*** including an estimated $742,000 for SFW construction. ** in-kind contributions.

Contractor: Village of Minoa; subcontractor: Clough, Harbour & Associates
Site: Village of Minoa, Onondaga County, and Potsdam, St. Lawrence County
Contract Duration: 11/94 - 9/98
Key Words: environmental, municipal, wastewater treatment, constructed wetland
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Municipal Wastewater Treatment
Contract No.: 4066L-ERTER-MW-95

-> Alternative Combination Bio-Treatment/Membrane Technology

Demonstrate membrane treatment of municipal wastewater.

BACKGROUND

The City of New York is currently revising its watershed regulations as part of filtration-avoidance requirements to demonstrate protection of surface waters. The City is going to require that sewage-treatment plants provide microfiltration of the effluent prior to final discharge to surface waters in an attempt to find a barrier to giardia and cryptosporidium microorganisms. In 1993, the City conducted an extensive pilot program of several micro- and ultrafiltration systems to upgrade the City-owned treatment plants. In general, the various membranes achieved complete rejection of the targeted organisms. Based on these results, the City revised its original concept of requiring ultrafiltration down to microfiltration, as microfiltration achieved rejection of the targeted organisms equal to the ultrafiltration membranes. Zenon Environmental has developed a hollow-fiber/activated-sludge process for smaller, non-municipal installations called Z-Weed®. The Z-Weed® process offers simplicity; lower capital, energy, and sludge-handling costs; and will meet the microfiltration requirements established by the City. Zenon will test a unit in a larger, municipal setting.

OBJECTIVES

To: (1) conduct a six-month demonstration of a combination membrane/biological treatment system to demonstrate the technology's ability to meet effluent limits and performance criteria; (2) achieve ease of operation and lower capital costs; and (3) gain acceptance among owners, operators, and regulators as an alternative to traditional treatment.

DESCRIPTION

The contractor will show membrane technology's potential at a municipal plant. The system will be installed and evaluated in an 80,000-gallon-per-day system in Brewster. Existing flows will be shunted to the demonstration units and effluent will be discharged to the sand filter and chlorine contact tank.

BENEFITS

The process allows plants to be upgraded at a lower capital cost and achieve lower electric usage. Primary clarifiers, traditional biological processes, final clarifiers, and polishing sand filters would not be required. The system runs at an elevated biomass level and can achieve treatment within a two-hour hydraulic detention time. This allows the activated sludge to run at high-solids-retention times, which reduces the size of the biological portion of treatment needed and lowers sludge-production rates. Effluent limits for biological parameters would be easily met and phosphorous levels could be reduced with significantly less chemical addition and energy use than conventional processes. This is because only a pin floc needs to be produced, as the membranes are capable of removing smaller flocs. Smaller flocs and fewer chemicals mean less sludge requiring disposal.

SCHEDULE AND STATUS

The project has just begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$192,917	$192,917
O'Brien & Gere	0	17,179	17,179
Zenon Environmental	0	167,698	167,698
North American Laboratories	0	$8,040	$8,040
TOTALS	0	$385,834	$385,834

Contractor: O'Brien & Gere Engineers, Inc.
Site: Brewster Sewage Treatment Plant, Putnam County
Contract Duration: 3/97 - 9/99
Key Words: environmental, product development, wastewater treatment, municipal
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Wastewater Treatment and Sludge Management
Contract No.: 4548-ERTER-MW-97

-> Biological Nutrient-Removal Demonstration

Reduce nitrogen in wastewater effluent to prevent eutrophication of Long Island Sound.

BACKGROUND

Since 1992, the New York City Department of Environmental Protection (NYCDEP) has dewatered its digested sludge. The centrate produced from dewatering about 4.5 million gallons per day from all of NYC's pollution-control plants contains high concentrations of ammonia (about 800 milligrams per liter) and biochemical oxygen demand (BOD). The centrate returned to the head of the treatment plant has increased the amount of nitrogen discharged. About 3.2 million gallons of centrate per day are processed by four plants (Wards Island, Hunts Point, Bowery Bay, and Tallman Island) that discharge to Long Island Sound, where the "no net increase" policy for nitrogen, due to concern about eutrophication, is expected to become a State Pollution Discharge Effluent Standard (SPDES) permit requirement.

OBJECTIVES

To evaluate the performance of a pilot-plant designed to treat digester centrate at operating conditions that simulate full-scale conditions to minimize the need for further scale-up.

DESCRIPTION

The contractor will: (1) design, construct, operate, and monitor a 25,000-gallon-per-day facility to test a new biological nutrient removal (BNR) process at Wards Island; (2) test and evaluate a variety of cross-flow filter membranes, both at bench-scale and pilot-scale; (3) test and evaluate the performance of a variety of oxygen-transfer devices; (4) develop reliable design parameters for full-scale plant design; (5) evaluate the advantages and benefits of this BNR process in terms of energy, capital, and operating and maintenance cost savings and sludge reductions compared to conventional BNR; and (6) communicate the results of this demonstration to NYCDEP, regulators, and others in the technical and environmental community. (Note: The new BNR process includes pH adjustment and direct nitrification by biological treatment in a completely mixed reactor, followed by cross-flow filtration to retain active biomass. The nitrified cross-flow filtration effluent then will be added to an anoxic zone of the activated-sludge process at the Wards Island plant for denitrification.)

BENEFITS

Direct biological treatment of the centrate after dewatering uses the higher-source temperature (about 36°C) of the centrate to promote high rates of biological nitrification. Based on the effect of temperature, reduction in tankage volume of 70-80 percent is possible compared to the volume required at 15°C, due to increases in rate. Cross-flow filtration substituted for secondary clarifiers and return-sludge-pumping leads to further savings in capital and operating cost and reduces the area required for the system. Mixing cross-flow effluent with return-sludge in the anoxic zone of the modified activated-sludge process eliminates the need for methanol to achieve denitrification and leads to savings in storage, dosing, and feedstocks. Using return-sludge will reduce energy needs for both aeration and sludge production.

SCHEDULE AND STATUS

The pilot-plant is nearly complete. Testing may begin in May 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
NYCDEP	1,504,000	0	1,504,000
TOTALS	$1,754,000	0	$1,754,000

Contractor: New York City Department of Environmental Protection
Site: Wards Island, New York County
Contract Duration: 4/95 - 9/99
Key Words: environmental, municipal, wastewater, nitrification, denitrification, centrate, eutrophication
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Municipal Wastewater Treatment
Contract No.: 4065-ERTER-MW-95

-> Using Ash from Sludge Incinerators

Investigate feasibility of using ash from sludge incinerators in pavement mixtures.

BACKGROUND

This project will determine if incinerator ash can be used as a substitute for fine aggregate or as an additive in asphalt and portland-cement concrete mixtures. The Suffolk County Department of Public Works pays more than $75,000 annually for ash disposal. The Department would like to use the ash as a construction material for public works projects in the County.

OBJECTIVE

To determine whether sludge incinerator ash is suitable to use in portland cement and asphalt concrete mixtures for pavements and structures..

DESCRIPTION

The contractor will: (1) determine physical and chemical characteristics of sludge incinerator ash from the Bergen Point Wastewater Treatment Plant; (2) prepare and test laboratory mixtures of asphalt and portland-cement concrete containing ash; (3) determine if ash is suitable as an additive or as a substitute for fine aggregate; (4) prepare and test field-scale pavements and erosion-control structures for durability, wear, runoff, and environmental impact; and (5) develop standard specifications for ash/asphalt and ash/portland-cement mixtures for the building and highway-construction industries.

BENEFITS

If environmentally acceptable, incinerator ash may be used as a construction material by the building and highway industries for erosion control and pavements. Removing this material from landfills will save valuable space and eliminate a possible source of heavy metals and toxics that could contribute to environmental pollution.

SCHEDULE AND STATUS

The ash-characterization plan and the characterization report are complete. Mixtures of portland-cement and asphalt concrete were prepared and laboratory-tested for physical and chemical properties. Pavement slabs of selected mixtures were tested further in the laboratory for runoff and freeze-thaw. One asphalt and one portland-cement concrete pavement section were field-tested in April 1993. The work plan for the Phase II effort is complete. Laboratory work on erosion-control structures was performed in the last quarter of 1994. Field work began in June 1996. A concrete block wall was constructed in a bay subject to wave action. Blocks were removed and tested monthly. The field work has been completed. The final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$575,000	0	$575,000
Suffolk Co./CCNY	643,560	0	643,560
TOTALS	$1,218,560	0	$1,218,560

Contractor: Suffolk County Department of Public Works
Site: Babylon, Suffolk County
Contract Duration: 8/90 - 9/98
Key Words: environmental, municipal, combustion, incineration, ash utilization, sludge management
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Municipal Wastewater and Sludge
Contract No.: 1572-ERER-MW-90

-> Winery Wastewater Treatment using Anaerobic Mobilized-Film Technology

Reduce winery energy use, operating costs, and sludge production with anaerobic wastewater treatment.

BACKGROUND

AnAerobics Inc. (AAI) operated a 10,000-gallon-per-day (gpd) pilot plant using mobilized film technology at Canandaigua Wine Company (CWC) in 1994-95, demonstrating its potential to reduce energy use, and chemical, polymer, and sludge-disposal costs. In January 1996, AAI entered into an agreement with CWC to build and initially operate a full-scale anaerobic MFT treatment system in exchange for a share in CWC's savings from not operating its existing aerobic wastewater-treatment plant. MFT is an expanded-bed-type reactor in which sand particles or other media are kept in motion by up-flowing wastewater and bacterial biomass that attaches to the media to treat the wastewater.

OBJECTIVES

To demonstrate the capability of the anaerobic MFT treatment system to meet the City of Canandaigua's sewer permit requirements and document the costs and benefits of the anaerobic system.

DESCRIPTION

The contractor will: (1) design, fabricate, install, and operate two 26,000-gallon anaerobic MFT modules and other necessary subsystems to treat an average of 50,000 gpd of winery wastewater; (2) develop system check-out, start-up and operating plans; (3) monitor wastewater flow rates, MFTs and total power demand, and energy consumption for the treatment system, biogas production and usage (including, flared gas and supplemental gas usage), total chemical usage (including phosphoric acid, aqueous ammonia, polymer and ferric chloride), and sludge production; (4) sample treatment-plant influent and effluent for total and soluble chemical oxygen demand, biochemical oxygen demand, and suspended and volatile suspended solids, total phosphorus, ortho phosphate, pH, temperature, alkalinity, and total volatile acids; and (5) analyze system and process data collected and evaluate performance.

BENEFITS

The anaerobic MFT system potentially could reduce CWC's operating costs for wastewater treatment by 95 percent and could be used by other wineries and industries with similar waste streams in New York State.

SCHEDULE AND STATUS

Construction began in September 1996 and was completed by February 1997. The facility has been undergoing start-up under widely varying loading conditions. One of CWC's aeration basins is now used for equalization. Currently, the MFT is handling greater than 50 % of CWC's daily flow, and is thermally self-sufficient by its biogas production. Operators hope to shut down one of two of CWC's million-gallon aeration tanks in Summer of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
AnAerobics Inc.	425,764	0	425,764
Canandaigua Wine Company	223,700	0	223,700
C&S Engineers Inc.	102,400	0	102,400
General Contractor	128,000	0	128,000
City of Canandaigua	2,940	0	2,940
TOTALS	$1,132,804	0	$1,132,804

Contractor: AnAerobics Inc.
Site: Canandaigua, Ontario County
Contract Duration: 3/96 - 3/99
Key Words: environment, assist business, industrial, wastewater treatment, anaerobic digestion
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Municipal Wastewater Treatment
Contract No.: 4280-ERTER-MW-96

-> Anaerobic Pretreatment of Sewage: Optimization Studies and Assessment of Post-Treatment Impacts on Conventional Aeration Processes

Determine optimal level of anaerobic pre-treatment based on costs and savings associated with reduced aeration and sludge-management requirements.

BACKGROUND

Anaerobic processes are typically used in wastewater-treatment plants to digest biological solids (sludge), not to treat wastewater. Anaerobic attached-film reactors, however, have shown promise in pretreating wastewater, saving energy and reducing sludge volume.

OBJECTIVES

To determine the performance of an anaerobic expanded-bed reactor as a function of temperature and loading rate, using attached-film media from another NYSERDA project at Cornell University; determine the effect of anaerobic pretreatment on downstream processes using aerobic bench-scale sequencing batch reactors as a function of loading rate and temperature; to develop an analytical model to estimate the optimal process configuration based on performance and cost of a variety of processes, including anaerobic expanded-bed reactors, activated-sludge and trickling filters, secondary clarification, vacuum dewatering, and sludge disposal, and to determine the fate of recalcitrant organics (picric acid) of anaerobic pretreatment followed by aerobic treatment.

DESCRIPTION

The contactor will: (1) conduct bench-scale experiments to evaluate anaerobic pretreatment (APT) of sewage followed by conventional aerobic treatment through bench-scale experiments, (2) use bench-scale processes to investigate APT effects on downstream aerobic processes to determine if these processes still perform as designed, (3) develop a process-optimization model to determine the conditions that make APT favorable, (4) verify the model against local municipal treatment plants near Clarkson University, (5) hold seminars for design engineers and treatment-plant operators, and (6) develop commercial-quality APT model software and a user's manual for test-marketing. The improved APT model will include more processes and features such as nitrification, filter-press dewatering, and user-defined options.

BENEFITS

When cost-effective, APT will reduce the energy required for aeration and the amount of sludge for treatment and disposal.

SCHEDULE AND STATUS

The APT software package was distributed to a test market group of design engineers. Interest by design engineers was weak. Clarkson has decided not to market the software. NYSERDA staff will try to develop a technology transfer strategy that will put the APT software to use. A final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$282,736	0	$282,736
Clarkson University	194,986	0	194,986
Village of Potsdam*	9,300	0	9,300
Walker Process*	6,000	0	6,000
Dupont Chemical**	15,000	0	15,000
TOTALS	$508,022	0	$508,022

*in-kind contribution; **cash contribution

Contractor: Clarkson University
Site: Potsdam, St. Lawrence County
Contract Duration: 6/91 - 9/98
Key Words: environmental, university, anaerobic processes, biological pretreatment, wastewater treatment, biogas, wastewater chemistry
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Municipal Wastewater Treatment
Contract No.: 1772-ERER-ER-91

-> Anaerobic Treatment of Airport De-icing Fluids at Albany County Airport

Demonstrate commercial-scale fluidized-bed anaerobic treatment system at Albany County Airport.

BACKGROUND

Chemicals such as propylene and ethylene glycol, urea, and potassium formate are used to de-ice airplanes and runways. Use of these de-icing chemicals has increased due to Federal Aviation Administration regulations promulgated in response to the crash of USAir Flight 407 at LaGuardia Airport in March 1992. This increases the strength of airport stormwater-runoff, which airports are required to collect and treat under the Clean Water Act. High-strength wastewaters can overload the capacity of local publicly owned treatment works (POTWs) and require more energy for treatment.

OBJECTIVE

To demonstrate that an anaerobic/aerobic system can treat Albany County Airport's (ACA) runoff sufficiently to meet direct stream discharge or the Town of Colonie sewer permit requirements.

DESCRIPTION

The contractor will: (1) collect and evaluate data on costs for pre-treating and recovering de-icing fluids in ACA's runoff, and determine current costs for transportation and disposal; (2) characterize runoff at airports in Syracuse; Rochester; Windsor, CT; and Boston, MA; (3) install a 710-liter anaerobic fluidized-bed (FB) reactor at ACA; design and construct a sand filter to treat anaerobic effluent; and monitor the performance of the system; (4) conduct bench-scale experiments on components of airport runoff and field samples from cooperating airports to determine nutrient requirements, inhibition, kinetics, and temperature effects; (5) evaluate use of intermittent sand-filter for polishing anaerobic effluent; (6) assess airport runoff treatment needs; (7) determine expected energy and operation and maintenance costs for anaerobic/ aerobic treatment; (8) report on results; and (9) provide a commercialization plan for review on a confidential basis.

BENEFITS

Potentially, this project could reduce ACA's cost and save energy for treating airport runoff compared to aeration and discharge to Albany North Wastewater Treatment Plant (ANWWTP). This would allow ANWWTP to accept other wastewater, thereby promoting economic development. Also, sludge production at ACA and ANWWTP would be reduced. And, finally, the project will help commercially develop anaerobic wastewater treatment to treat airport runoff.

SCHEDULE AND STATUS

A final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$173,170	$173,170
Clough Harbour Assoc. Tech. Serv.*	0	29,940	29,940
EFX Inc.,	0	122,371	122,371
Clough Harbour Assoc. Partners	0	5,920	5,920
Albany County Airport Authority	0	14,779	14,779
Rensselaer Polytechnic Institute	0	8,274	8,274
University of Massachusetts	0	21,463	21,463
Other airports**	0	5,000	5,000
TOTALS	0	$380,917	$380,917

* includes in-kind contribution from Applied Science & Technology; ** estimated for airports at Syracuse; Rochester; Windsor, CT; and Boston, MA

Contractor: Clough Harbour Associates Technical Services (CHATS)
Site: Albany County Airport, Albany County
Contract Duration: 2/97- 9/98
Key Words: environment, assist business, industrial, wastewater treatment, anaerobic digestion
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Municipal Wastewater Treatment
Contract No.: 4501-ERTER-MW-97

-> Phosphoric Acid Fuel-Cell Testing using Anaerobic-Digester Gas

Test 200kW phosphoric acid fuel cell and gas pre-treatment unit on anaerobic-digester gas at Yonkers Sewage Treatment Plant.

BACKGROUND

Anaerobic digesters at sewage-treatment plants produce gas that consists mainly of methane, carbon dioxide and hydrogen sulfide (H_2S). Some of this gas is used to operate the plant, but most is flared, adding to the amount of air pollutants and waste heat in the atmosphere. The contractor will install a 200kW fuel-cell power plant and a gas cleanup system at the sewage-treatment plant to produce electricity with a portion of the gas. The PC25 200kW fuel cell and gas-cleaning system has not been used with anaerobic-digester gas before. The ONSI PC25 phosphoric acid fuel cell is the first commercially available fuel cell. Approximately 55 of these 200kW units have been sold throughout the world to various gas and electric utilities.

OBJECTIVE

To construct an anaerobic-digester gas-cleaning system to remove H_2S and use the gas to produce electricity from a fuel cell.

DESCRIPTION

The contractor will: (1) fabricate and install a digester gas-cleaning unit and a PC25 fuel-cell power plant at the Yonkers Sewage Treatment Plant; (2) rigorously test the units and determine if they are successful; (3) evaluate whether other units should be installed in parallel to use as much gas as possible and maximize electricity production; (4) operate the system for three years; (5) conduct a comprehensive gas analysis to characterize oxygen, nitrogen, carbon monoxide, methane, carbon dioxide, ammonia, volatile organics, and sulfur gases; and (6) monitor fuel-cell efficiency, power output, reliability, emissions, and long-term operating costs using an independent contractor to preserve the integrity of the data.

BENEFITS

There are 34 sewage-treatment plants in the New York City area with anaerobic digesters that produce enough gas to generate 5-10 MW of electricity using fuel-cell power plants. A successful application along with an independent monitoring effort would pave the way for other similar anaerobic- digester gas or landfill applications. In addition, this project would provide additional economic development benefits to the New York State manufacturers that provide 29% of the fuel cell's value.

SCHEDULE AND STATUS

The fuel cell construction was completed in the summer of 1997. Modifications to improve efficiency were made in early 1998. The cell will be operated, monitored, and evaluated for a three-year period.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$400,000	0	$400,000
New York Power Authority	$850,000	0	850,000
Electric Power Research Institute	$170,000	0	170,000
U.S. Department of Energy/NREL	$100,000	0	100,000
TOTALS	$1,520,000	0	$1,520,000

Contractor: New York Power Authority
Site: Yonkers Sewage Treatment Plant, Westchester County
Contract Duration: 3/96-3/00
Key Words: product development, environmental, electricity, wastewater treatment
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Solid Waste Management
Contract No.: 4314-ERTER-ER-96

-> Long-Term Fate of Land-Applied Wastewater Sludge Products -- Clarkson University

Compare mobility of metals in variety of sludge products applied to soil.

BACKGROUND

Municipalities can use a variety of processes to manage the sludge produced by wastewater treatment, including composting, digestion, chemical conditioning/stabilization, incineration, and dewatering/drying. All consume energy, and all yield a beneficial sludge residue or by-product that may be used on land as a soil amendment. In addition, ash may be used as a construction material and dried sludge as a boiler fuel. NYS Department of Environmental Conservation (DEC) regulations specify only compost as a beneficial use of sludge, and require other sludge products to apply for a beneficial-use determination on a case-by-case basis. With the end of ocean-dumping and landfill closings, sludge-management practices will depend more on land-application. To ensure that supply does not exceed demand for specific sludge products, municipalities need to have a variety of options for sludge management.

OBJECTIVES

To determine and compare long-term environmental and economic costs and benefits of land-applied sludge products, including compost, anaerobically digested/dewatered sludge, dried sludge, chemically stabilized sludge, and incinerator ash; to evaluate the effect of freeze/thaw and plant-growth cycles on the fate of sludge constituents; and, by cost/benefit and energy-use analysis, to compare the advantages and disadvantages of sludge-management options. The project will be reviewed periodically by a Technical Advisory Committee comprising State and U.S. Environmental Protection Agency regulators, municipal officials, and members of the scientific community.

DESCRIPTION

The research design consists of applying a minimum of eight sludge products to two types of NYS soils, and subjecting the soil/sludge test cells to both freeze/thaw and plant-growth cycles. The contractor will determine the fate of the metal constituents in the sludge product/soil-test cell with respect to soil, leachate, and plant matter. The bioavailability of copper and mercury will be investigated using a genetically altered microorganism that becomes luminescent when these metals are taken in. Gross wastewater-pollutant parameters and PCBs also will be monitored.

BENEFITS

More knowledge about the relationships among sludge-management practice, product composition, and the fate of metals and other constituents of concern will be useful to DEC and the NYS Dept. of Agriculture and Markets when refining regulations concerning the beneficial use of sludge products, and to sludge managers concerned with costs and benefits.

SCHEDULE AND STATUS

A draft final report is due July 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$381,140	0	$381,140
Clarkson University	197,860	0	197,860
General Electric Company *	27,000	0	27,000
TOTALS	$606,000	0	$606,000

* in-kind contribution

Contractor: Clarkson University
Site: Potsdam, St. Lawrence County
Contract Duration: 9/92 - 9/98
Key Words: environmental, university, assist business, sludge management, land application, municipalities
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Municipal Wastewater Treatment
Contract No.: 1990-ERER-MW-93

-> Long-Term Fate of Land-Applied Wastewater Sludge Products -- Cornell University.

Compare mobility of metals in variety of sludge products applied to soil.

BACKGROUND

Municipalities can use a variety of processes to manage sludge produced by wastewater treatment, including composting, digestion, chemical conditioning/stabilization, incineration, and dewatering/drying. All consume energy, and all yield a sludge residue or by-product that may be used beneficially on land as a soil amendment. Ash also may be used as a construction material, and dried sludge as a boiler fuel. NYS Department of Environmental Conservation (DEC) regulations specify compost only as a beneficial use of sludge, and require other sludge products to apply for a beneficial-use determination on a case-by-case basis. With ocean-dumping ending and landfills closing, sludge-management practices will depend more on land-application. To ensure that supply does not exceed demand for specific sludge products, municipalities need to have a variety of options for sludge management.

OBJECTIVES

To determine and compare long-term environmental and economic costs and benefits of land-applying sludge products, including compost, anaerobically digested/dewatered sludge, dried sludge, chemically stabilized sludge, and incinerator ash. The project will be reviewed periodically by a Technical Advisory Committee (TAC) comprising State and U.S. Environmental Protection Agency regulators, municipal officials, and members of the scientific community.

DESCRIPTION

The contractor will: (1) field-sample five "old" sludge-application sites for soil, leachate, plant material, earthworms, and surface runoff, (2) conduct laboratory experiments to study the effects of soil type, sludge-product type, and pH on metals and nutrients movement, including three NYS soil types and five sludge products; (3) procure these five sludge products from a single source; (4) determine the environmental fate of the metal constituents in the sludge product with respect to soil, leachate, and plant materials; (5) develop a model to predict the long-term impact of nutrient movement on groundwater; (6) evaluate the cost/benefit and energy use of the various sludge-processing land-application methods; and (7) compare the advantages and disadvantages of sludge-management options.

BENEFITS

Knowledge about sludge-management practice, product composition, and the fate of metals and other constituents will be useful to DEC and the NYS Dept. of Agriculture and Markets when refining regulations concerning the beneficial use of sludge products, and to sludge managers concerned with costs and benefits.

SCHEDULE AND STATUS

A draft final report is being prepared and is expected shortly.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$273,585	0	$273,585
Cornell University	101,328	0	101,328
Onondaga County*	2,000	0	2,000
TOTALS	$376,913	0	$376,913

* in-kind contribution through Memorandum of Understanding No. 1991A-ERER-MW-93.

Contractor: Cornell University
Site: Ithaca, Tompkins County
Contract Duration: 9/92 - 9/98
Key Words: environmental, university, sludge management, land application, municipalities
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Municipal Wastewater Treatment
Contract No.: 1991O-ERER-MW-93

-> Low-Cost Small-Community Wastewater-Treatment Systems

Evaluate and compare feasibility of small-community wastewater-treatment alternatives.

BACKGROUND

Many small communities have inadequate or failed on-site wastewater-treatment systems, which can lead to adverse environmental and health effects. Conventional central treatment systems (including sewers) cost about $10,000 per household, with operating and maintenance costs of about $150 per household each year, making them prohibitive for many small communities.

Combining individual and clustered septic tanks/sand filters to discharge to one or several absorption-field/wetland (AF-wetland) areas may offer a low-cost, energy-efficient alternative, while meeting secondary treatment standards and ammonia/nitrogen effluent limits. This approach uses a distributed secondary treatment system (DST) rather than a central treatment approach. The AF-wetland can be used as park landscaping, a community greenspace, a jogging trail or bike path, or a tree farm.

This system is being evaluated in seven New York State communities, including a hamlet in the Town of Lafayette, Onondaga County; a hamlet in the Town of Cairo, Greene County; the communities of Ransomville and Romberg Beach in the Town of Porter, Niagara County; the communities of Duane Lake, Mariaville Lake, Duanesburg, and Quaker Street/Delanson in the Town of Duanesburg, Schenectady County; the Village of Morrisville, Madison County; the Village of Lyons Falls, Lewis County; and the hamlet of West Valley in the Town of Ashford, Cattaraugus County.

OBJECTIVES

Evaluate the feasibility of the DST/AF-wetland and conventional wastewater-treatment alternatives.

DESCRIPTION

Each contractor will prepare an engineering report including a preliminary design and life-cycle cost comparison of the DST/AF-wetland with conventional low-cost alternatives. Information will be assembled to allow each community to pursue regulatory approval.

BENEFITS

The project will provide the information each community needs to make loan applications if the approach is found to be technically and economically feasible. The DST system also offers a low-cost wasterwater-treatment alternative for new subdivisions.

SCHEDULE AND STATUS

Preliminary reports were received. A summary report is being prepared by NYSERDA staff. A draft report covering the additional work by the Town of Duanesburg is expected in June 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$292,592	0	$292,592
Town of Cairo	25,000	0	25,000
Town of Porter	11,690	0	11,690
Town of Duanesburg	10,969	0	10,969
Village of Morrisville	12,465	0	12,465
Town of Lafayette	22,190	0	22,190
Village of Lyons Falls	20,956	0	20,956
Town of Ashford	1,750	0	1,750
TOTALS	$397,612	0	$397,612

Contractor: Municipalities listed above
Site: Greene, Niagara, Cattaraugus, Schenectady, Madison, Onondaga, and Lewis counties
Contract Duration: 12/94 - 9/98
Key Words: environmental, municipal, wastewater treatment, small flow, constructed wetlands
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Municipal Wastewater Treatment
Contract Nos.: 3176, 3177, 3178, 3179, 4021, 4022, and 4089-ERTER-MW-94/95

-> Solar Detoxification of Contaminated Waters with Porous Photocatalyst

Develop photocatalyst to help detoxify contaminated waters with solar energy.

BACKGROUND

Transporting fuel oils, manufacturing, and using energy and chemical products contaminate the environment through spills and disposing of the residues in unlined landfills. Spills of oil products such as gasoline are not readily removed from surface waters except through evaporation. Photocatalytic destruction, if perfected, could economically mitigate oil spills and treat waters by converting the contaminants to carbon dioxide and water vapor using solar energy. Photocatalytic destruction of water and air-borne organic contaminates can also be effected in engineered devices using ultraviolet lamps as energy sources.

ACCOMPLISHMENTS

Titanium dioxide (TiO_2) aerogels were synthesized using sol-gel techniques. The effects of sol-gel chemical formulations, washing techniques and techniques, and annealing conditions on the physical and catalytic properties of TiO_2 aerogels were studied. Physical characteristics were determined, such as density (pore volume, skeletal and bulk) and linear dimensions of pore and crystal size. Salicylic acid, phenol, and ill-defined industrial wastewater and municipal landfill leachate were used to study the catalytic behavior of the aerogels. The in-depth work was done with salicylic acid as a model contaminant. A computer algorithm based upon the geometry of fractals was developed to model aerogel pore size dimensions.

FINDINGS AND CONCLUSIONS

The surface area of aerogels are an order of magnitude greater than the finest bulk titania powders available. A comparison of aerogels and powders used in photocatalytic destruction of salicylic acid shows the aerogels to be significantly more efficient than other forms of TiO_2 when available surface area is the limiting factor. In the case of phenol, oxidation does not seem to be limited by the available surface area (as yet unpublished), and the superior bulk properties of the larger crystallites seem to dominate. In this case , aerogels' efficiency is less than the powder. More work is needed to integrate physical characteristics, mass transport, and kinetic effects into a complete theory of porous photocatalysts.

REALIZED OR ANTICIPATED BENEFITS

Catalysis can play an important role in reducing the energy needed for chemical synthesis and destruction of environmental contaminants. Applied research is needed to make use of the basic physical and chemical properties of aerogels.

TECHNOLOGY TRANSFER ACTIVITIES

Nine technical papers were published in peer-review journals.

FUNDING	TOTALS
NYSERDA	$104,542
U.S. Department of Energy	376,598
TOTALS	$ 481,140

Contractor: Brooklyn College/City University of New York
Site: Brooklyn, Kings County
Contract Duration: 11/92 - 12/97
Key Words: environmental, university, wastewater treatment, catalyst, oil spill, solar energy, titanium dioxide, aerogels
Project Manager: Barry Liebowitz
Program: Environment
Subprogram: Municipal Wastewater and Sludge
Contract No.: 1983-ERER-MSW-93

-> Energy Workshops for Municipal Water/Wastewater Treatment Plants

Present energy-efficient technologies to water and wastewater treatment personnel.

BACKGROUND

A major barrier to implementing energy-saving technologies at New York State municipal water (WTPs) and wastewater (WWTPs) treatment plants has been the fact that plant staff most often do not have energy-management training. These same individuals then may make recommendations for WWTP or WTP changes that may not be the most efficient in terms of energy savings.

ACCOMPLISHMENTS

Four workshops were held at the following locations: Southampton, Lake Placid, Middletown, and Gowanda, NY. Approximately 150 WTP and WWTP personnel attended the workshops

FINDINGS AND CONCLUSIONS

The project helped municipalities identify and will possibly help them implement energy-saving technologies at their WTPs and WWTPs.

REALIZED OR ANTICIPATED BENEFITS

Most of the workshop participants found the presentations appropriate and useful. Many felt that what they learned from the workshops would help them make more informed decisions in their work.

TECHNOLOGY TRANSFER ACTIVITIES

The project was a technology transfer activity in conjunction with the New York Rural Water Association.

FUNDING	TOTALS
NYSERDA	$20,469
TOTALS	$20,469

Contractor: Malcolm Pirnie, Inc.
Site: Statewide
Contract Duration: 8/97-10/97
Key Words: environment, municipal, energy efficiency, water, wastewater
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environmental Research
Subprogram: Municipal Wastewater and Sludge
Contract No.: 2034A-ERER-MW-93

Monitor wastewater and sludge-processing energy use.

BACKGROUND

Many of the wastewater-treatment plants (WWTPs) in New York State have unnecessarily high operating costs due to overloading, failing equipment, lack of process-control instrumentation, and operating problems. In addition, landfill closures, new regulations for sludge management, requirements for beneficial use of sludge, volatile organic compound/odor control, storm-water treatment, and nutrient removal from wastewater have driven up the cost of wastewater treatment and sludge management even further and have made the job of operating a WWTP more difficult. These conditions often result in excessive energy and chemical use. To solve these problems, costly plant expansion, new plant construction, or equipment replacement may be proposed and may result in a net increase in energy use and operating cost.

ACCOMPLISHMENTS

Six WWTPs in New York State received on-line process monitoring and electricity submetering. The study used a combination of process and energy audit, and submetering techniques to identify low-capital-cost methods of improving performance and energy efficiency at WWTPs in New York State. Comprehensive site reports were delivered to each participating WWTP, and a summary report of all findings was prepared.

FINDINGS AND CONCLUSIONS

The study recommended changes to operating procedures such as changes to pump-control strategies and to solids handling procedures that had simple payback periods of less than five years. At several sites, replacing older electric motor and drive systems with more efficient units would result in a payback period of no more than five years. Major capital upgrades were identified at each of the participating WWTPs. Most of these investments had payback periods of more than five years.

REALIZED OR ANTICIPATED BENEFITS

Real-time data provide a greater understanding of the dynamic response characteristics of the waste-water treatment and sludge management processes. The impact of energy conservation recommendations on treatment performance is more evident if real-time process performance data isused in the analyses.

TECHNOLOGY TRANSFER ACTIVITIES

Six electric utilities participated in the project both directly and through the Empire State Electric Energy Research Corporation. Copies of the site reports and the summary report will be provided to the utilities to share with their WWTP customers. The Electric Power Reseearch Institute will promote the project results through a series of workshops and will publish a report summary. The contractor will present the results at a Statewide meeting of the New York Water Environment Association.

FUNDING	TOTALS
NYSERDA	$235,748
ESEERCO	150,000
EPRI	50,000
Municipalities	50,000
TOTALS	$485,748

Contractor: CH2M Hill
Site: Statewide
Contract Duration: 4/94 - 3/98
Key Words: environmental, municipal, wastewater treatment, energy-efficiency
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environmental Research
Subprogram: Municipal Wastewater and Sludge
Contract No.: 3172-ERTER-MW-94

-> Oxygen-Enriched Multiple-Hearth Sewage-Sludge Incinerator Demonstration

Demonstrate oxygen-enriched combustion technology for reducing volatile organic compound and odor emissions and natural gas consumption of multiple-hearth incinerator at wastewater treatment plant.

BACKGROUND

Poor combustion efficiency of multiple-hearth sewage-sludge incinerators results in undesirable volatile organic compound (VOC) and odor emissions. Many incinerators are retrofitted with natural gas after-burners to complete the combustion process and minimize emissions. New VOC- and odor-emission regulations will require significant equipment and operational changes at multiple-hearth facilities that may lower incinerator-sludge throughput.

ACCOMPLISHMENTS

A liquid oxygen-storage tank, oxygen vaporizer and metering skid, and oxygen-injection nozzles were designed, fabricated, and installed at Monroe County's Van Lare Wastewater Treatment Plant multiple-hearth sewage-sludge incinerator in Rochester. Sludge throughput, incinerator emissions, and natural gas consumption were measured with and without oxygen injection.

FINDINGS AND CONCLUSIONS

Throughput was increased by 30% while natural gas consumption was reduced 10-24% with oxygen injection compared to baseline operations. Gaseous, particulate, and metals emissions per unit of sludge processed were generally reduced with oxygen injection. Incinerator personnel had no difficulties in operating the oxygen-injection system or controlling incinerator temperatures.

REALIZED OR ANTICIPATED BENEFITS

Oxygen-enriched combustion of multiple-hearth sludge incinerators can be economically viable, with a savings of $30-60 per hour at Van Lare based upon increased sludge throughput and reduced fuel consumption. With the increased throughput, Van Lare's incinerator would not have to operate on weekends. Increased throughput would reduce the need for new incinerators or other sludge-disposal facilities to manage increased loads. The oxygen system controls and injection nozzles would be designed and manufactured at Praxair's Tonawanda, New York facilities.

TECHNOLOGY TRANSFER ACTIVITIES

The contractor, Praxair, is actively marketing the technology. The final project report will be distributed to municipalities, sewage-sludge incinerator operators, and engineering firms that have expressed an interest in the technology. Marketing and sales literature has been prepared for distribution.

FUNDING	TOTALS
NYSERDA	$199,960
Praxair, Inc.	199,960
TOTALS	$399,920

Contractor: Praxair, Inc.
Site: Tarrytown, Westchester County; Tonawanda, Erie County; and Rochester, Monroe County
Contract Duration: 11/94 - 12/97
Key Words: environmental, air quality, product development, sludge management, municipal, industrial
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environmental Research
Subprogram: Air Quality/Environmental Impacts
Contract No.: 4051-ERTER-ER-95

-> Energy-Efficient Wet-Limestone Flue-Gas Desulfurization and Nitrogen Oxide Emission-Control Process Demonstration

Test two technologies supplied by New York State manufacturers in energy-efficient flue-gas desulfurization process demonstration.

BACKGROUND

The U.S. Department of Energy (U.S. DOE) selected the New York State Electric & Gas Corp. (NYSEG) to demonstrate the Saarberg-Holter-Umwelttechnik (SHU) flue-gas desulfurization process and a nitrogen oxide (NO_x) emission-control process at NYSEG's Milliken Station under U.S. DOE's Clean Coal Technology IV program. The SHU process is energy-efficient and capable of high sulfur dioxide removal.

OBJECTIVES

To: (1) design, construct, and operate a test facility lined with ceramic tile manufactured by Stebbins Engineering and Manufacturing Company of Watertown (Jefferson County) at NYSEG's Kintigh Station, for demonstrating tile endurance when exposed to limestone-slurry spray used in the existing flue-gas desulfurization absorbers; and (2) design, construct, and operate a second test facility at NYSEG's Milliken Station for evaluating a process to remove unreacted ammonia in flue gas. Ammonia can combine with sulfur compounds in flue gas and lead to plugging of a heat-pipe air-heater manufactured by ABB Air Preheater of Wellsville (Allegany County).

DESCRIPTION

Effects of limestone slurry on tile and grouting erosion and corrosion are being evaluated at Kintigh, with on-line repair of the tile-lining system demonstrated. At Milliken, catalyst systems to remove unreacted ammonia in flue gas that may combine with sulfur compounds to plug the surfaces of the heat-pipe air heater will be tested to determine the lowest possible operating temperature that would avoid acid-gas condensation.

BENEFITS

A successful demonstration of the energy-efficient SHU flue-gas desulfurization process using Stebbins' ceramic tile-lining system may provide new market opportunities for the New York company, domestically and abroad. Demonstrating the ABB Air Preheater heat-pipe air heater may expand the market for this energy-saving technology, which does not have the gas-leakage problems of commonly used regenerative air heaters.

SCHEDULE AND STATUS

Operation of the test facility for demonstrating scrubber tile endurance is completed. Results indicated that tile repairs could be made externally with the scrubber on-line. The test facility was dismantled in accordance with the contractual agreement.

Baseline testing of a selective non-catalytic reduction (SNCR) process using ammonia was completed at General Public Utilities Seward Station in Pennsylvania. SNCR testing was shifted to the Seward Station, a sister unit to the Milliken Station units. The data is being evaluated for designing a process to remove unreated ammonia which could lead to the formation of deposits that would plug the heat-pipe air-heater at Milliken.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$1,000,000	0	$1,000,000
New York State Electric & Gas Corp.	94,000,000	$3,000,000	97,000,000
ESEERCO	7,000,000	0	7,000,000
Electric Power Research Institute	6,000,000	1,000,000	7,000,000
U.S. Department of Energy	45,000,000	0	45,000,000
Consol	2,000,000	0	2,000,000
TOTALS	$155,000,000	$4,000,000	$159,000,000

Contractor: New York State Electric & Gas Corporation
Site: Milliken Station, Tompkins County
Contract Duration: 2/94 - 12/99
Key Words: environmental, air quality, electricity, coal, utilities, emissions, heat recovery
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Emissions Control/Environmental Impacts
Contract No.: 3167-ERER-ER-94

-> Micronized-Coal Reburn Demonstration at Kodak

Demonstrate performance of micronized-coal reburn system for reducing nitrogen oxide emissions from coal-fired cyclone industrial boiler at Kodak Park.

BACKGROUND

Utility and industrial boiler operators are looking at a number of economic alternatives for controlling nitrogen oxide (NO_x) emissions to comply with current and future emission regulations. Although it is generally believed that selective catalytic reduction technology can meet proposed stringent NO_x emission limits in the Northeast States Coordinated Air Use Management region, lower-cost technologies are being investigated. Combining technologies such as low-NO_x burners, overfire air combustion, and fuel reburn can effectively reduce emissions. Although natural gas is an excellent reburn fuel, availability and price volatility are of concern. Micronized coal may be an economical substitute reburn fuel for natural gas at coal-fired boilers.

OBJECTIVES

To design, retrofit, and operate a micronized-coal reburn system for NO_x control at Eastman Kodak's #15 coal-fired cyclone boiler at Kodak Park in Rochester. The project will evaluate the performance of the micronized-coal reburn system and any performance and operational effects on the boiler.

DESCRIPTION

The contractor will design, fabricate, install, operate, and test a micronized-coal reburn system using two Fuller MicroMills that originally were to have been installed and demonstrated at the Tennessee Valley Authority's Shawnee Plant. NO_x reductions of 50% are targeted, to be in compliance with a recent New York State Department of Environmental Conservation consent decree. The effects of micronized-coal reburn on boiler performance and ash characteristics will be monitored and documented.

BENEFITS

Micronized-coal reburn technology may be able to reduce NO_x emissions effectively and economically without using natural gas. If successfully demonstrated, the technology will make the Kodak Rochester site more competitive in supplying steam to operating divisions, thereby maintaining existing employment levels, and making the site more favorable for product-line expansion and additional job growth.

SCHEDULE AND STATUS

Modifications made to the reburn equipment are udergoing testing.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$ 250,000	0	$250,000
U.S. Department of Energy	2,000,000	$500,000	2,500,000
New York State Electric & Gas Corp.	0	725,000	725,000
Kodak	4,000,000	938,500	4,938,500
ESEERCO	0	250,000	250,000
Energy and Environmental Research Co.	20,000	0	20,000
TOTALS	6,270,000	$2,413,500	$8,683,500

Contractor: New York State Electric & Gas Corporation
Site: Town of Lansing, Tompkins County, and Rochester, Monroe County
Contract Duration: 3/97 - 3/00
Key Words: environmental, product development, emissions control, utilities
Project Manager: Joe Sayer, (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Emissions Control/Environmental Impacts
Contract No.: 4417-ERTER-ER-97

-> Stoker Combustion Airfoil Development

Design, fabricate, install, and test performance of combustion airfoil device for agitating burning coal bed of traveling grate stoker boiler to improve combustion efficiency and reduce emissions.

BACKGROUND

Stoker boilers are less efficient than other boilers. Stokers burn solid fuels on a moving grate and tests have shown there are zones in the burning fuel bed that are oxygen-deficient. Low boiler efficiency is evident in the high unburned-carbon content of the reject ash, and in the high levels of oxygen in the flue gas.

The stoker combustion airfoil (SAF) is a low-cost retrofit device that enhances mixing in the burning fuel bed, and permits injection of combustion air in critical locations to improve combustion efficiency. The SAF lifts the burning fuel bed and air is injected as the solid fuel tumbles back onto the grate. Installing the SAF requires minimal modification to an existing boiler. Improved combustion is expected to reduce fuel consumption, unburned carbon losses, excess air requirements, and gaseous emissions, and may make the boiler ash a marketable material.

OBJECTIVES

To design, fabricate, retrofit, and test an SAF at an existing coal-fueled stoker boiler. Combustion efficiency and boiler emissions will be measured and compared to performance without the SAF.

DESCRIPTION

A SAF will be designed for retrofitting and testing at a host site stoker boiler. The SAF will span the full width of the boiler grate. Boiler performance parameters such as combustion efficiency, unburned carbon losses, excess air, flue gas emissions, and ash composition will be measured and compared to performance parameters without the SAF. Economic analyses will be performed to determine SAF payback.

BENEFITS

SAF technology could reduce unburned carbon losses and improve combustion efficiency and reduce operating costs at existing stoker boilers. Improved combustion efficiency would result in reduced carbon dioxide and other gaseous emissions. Lower unburned carbon in the boiler ash may make it a marketable material, thereby reducing disposal costs. SAF application is targeted for about 3,000 existing stoker boilers, and NYS manufacturing jobs will be created if this market is penetrated.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$50,000	$50,000
NYSEG	0	76,500	76,500
TOTALS	0	$126,500	$126,500

Contractor: New York State Electric & Gas Corporation
Site: Binghamton, Broome County
Contract Duration: 1/98 - 6/99
Key Words: product development, environmental, utilities
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Air Quality/Environmental Impacts
Contract No.: 4657-ERTER-ER-98

-> Advanced Gas-Reburn Demonstration

Demonstrate performance of advanced gas-reburn system in controlling NO_x emissions from coal-fired utility boiler.

BACKGROUND

Utility and industrial boiler operators are looking at economical alternatives for controlling NO_x emissions to comply with current and future emission regulations. Although selective catalytic reduction technology can probably meet proposed stringent NO_x emission limits in the Northeast States Coordinated Air Use Management (NESCAUM) region, lower-cost technologies are under investigation. Combining technologies such as low-NO_x burners, overfire air combustion, and gas reburn can effectively reduce emissions, but not to future compliance levels. Advanced natural gas reburn (AGR) combines gas reburning, a staged fuel-combustion process where a region of the furnace operates at fuel-rich conditions, and selective non-catalytic reduction (SNCR) using ammonia or urea as a reagent. AGR appears to be a low-cost technology that can approach the performance of selective catalytic reduction in controlling NO_x emissions, but has only been proven to date on a 10-million Btu/hr test facility.

OBJECTIVE

To design, retrofit, and operate an AGR system at a New York State Electric & Gas Corp. (NYSEG) coal-fired power-plant boiler to determine system performance and NO_x emission-control costs.

DESCRIPTION

The project involves design, fabrication, and installation of AGR equipment on top of existing gas-reburning equipment at NYSEG's Greenidge No. 6 tangentially coal-fired boiler, and includes design, costing, and test-planning, followed by equipment installation, start-up, and long-term operation. The project will provide verifiable scale-up data necessary to refine AGR performance projections for application at other industrial and utility boilers.

BENEFITS

AGR technology can reduce NO_x, SO_x, CO_2, particulate, and air toxics emissions; increase operating flexibility; improve the ability to comply with proposed NESCAUM emission limits; allow for an additional 0.6 BCF/yr natural gas demand at Greenidge; and reduce ash disposal. Gas-reburn equipment can be manufactured in New York State, contributing to economic development.

SCHEDULE AND STATUS

Testing of the modifications made to the reburn system during the last outage will continue with the start of the ozone season in May.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$100,000	$100,000	$200,000
ESEERCO	150,000	150,000	300,000
Electric Power Research Institute	625,000	0	625,000
Gas DeFrance	50,000	50,000	100,000
New York State Electric & Gas Corp.	765,000	1,000,000	1,765,000
Gas Research Institute	500,000	1,000,000	1,500,000
Orange and Rockland Utilities, Inc.	10,000	0	10,000
TOTALS	$2,200,000	$2,300,000	$4,500,000

Contractor: New York State Electric & Gas Corporation
Site: Town of Dresden, Yates County
Contract Duration: 11/96 - 11/99
Key Words: environmental, emissions control, utilities, product development
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Emissions Control/Environmental Impacts
Contract No.: 4441-ERTER-ER-97

-> In-Situ Oxygenator for Volatile Organic Compound Emission Control

Determine volatile organic compound emissions from new aerator in biological wastewater-treatment plant.

BACKGROUND

Under the Clean Air Act Amendments of 1990, the U.S. Environmental Protection Agency (EPA) is promulgating rules to control air emissions from industries and municipal wastewater-treatment plants (WWTP). To meet the new regulations, many treatment-plant operators either will have to enclose some unit processes, or collect and treat off-gases using energy-intensive steam-stripping and incineration that will double energy consumption. Most emissions from these facilities come from the aeration units. In addition to emissions, aeration consumes from 45 to 75 percent of the energy used to treat wastewater. Praxair, Inc. has developed an in-situ oxygenator (I-SO) that can be installed at existing WWTPs, eliminating the need to collect and treat off-gases. This unit has a high oxygen-transfer rate that may reduce energy needed for aeration.

OBJECTIVE

To determine the effectiveness of the aerator in reducing emissions from WWTPs and in transferring oxygen to the wastewater.

DESCRIPTION

The energy cost, efficiency, and level of volatile organic compound (VOC) emissions of the I-SO system compared to conventional aeration systems will be determined. The contractor will: (1) study solid-suspension characteristics and the effects of inert-gas concentration on transfer-rate and use efficiency; (2) simulate and study stripping of VOCs by oxygen bubbles; (3) develop a process-design and -control strategy to minimize off-gassing; (4) determine scale-up parameters to manufacture full-scale units of the I-SO; (5) build and field-test a pilot-scale unit; (6) compare the performance of the I-SO to conventional aeration units; (7) perform a laboratory simulation of the system; (8) demonstrate the field-scale unit at an operating WWTP; and (9) measure energy use, VOC emissions, and treatment efficiencies.

BENEFITS

Compliance with the Clean Air Act can be achieved by using the I-SO, without the expense of the cover and vent-control option. Due to the high transfer efficiency of the I-SO, energy and operating costs of the oxygen-based system can be lower than with the conventional air system. Commercializing I-SO technology will enable potential industrial and municipal customers to save millions of dollars in capital costs and up to 250 million kWh of electricity Statewide.

SCHEDULE AND STATUS

The Buffalo Sewer Authority has been chosen as the host site. The test unit was constructed in the winter of 1996, and will be installed in a side stream of the WWTP and tested through December 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$248,622	0	$248,622
Praxair, Inc.	291,860	0	291,860
TOTALS	$540,482	0	$540,482

Contractor: Praxair, Inc.
Site: Tarrytown, Westchester County
Contract Duration: 5/95 - 12/98
Key Words: product development, environmental, wastewater treatment, industrial waste
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Municipal Wastes
Contract No. 4125-ERTER-MW-95

-> Rotorfilter Emission-Control Technology Demonstration

Demonstrate Rotorfilter™ performance in controlling fly-ash particulate, sulfur oxide and nitrogen oxide emissions from flue-gas slip-stream at coal-fired utility boiler.

BACKGROUND

Controlling particulate, sulfur oxide (SO_x), and nitrogen oxide (NO_x) emissions at fossil-fuel combustion plants is costly in terms of capital expenditures and energy consumption. Electrostatic precipitators, sulfur dioxide scrubbers, and selective catalytic reactors are volumetrically larger than the typical boiler house. Large, energy-consuming induced-draft and booster fans are required to pull flue-gas through these vessels and into the stack. The Rotorfilter™ is a new technology that has been used commercially for particulate, volatile organic compound and odor, and acid gas removal. The technology may be developed to capture particulate, SO_x, and NO_x effectively in a single vessel, thereby reducing capital and operating costs and energy consumption.

OBJECTIVES

To demonstrate the performance of a Rotorfilter™ for controlling fly-ash particulate, SO_x, and NO_x emissions from a coal-fired power plant flue-gas slip-stream at the Electric Power Research Institute's Environmental Control Technology Center (ECTC) at New York State Electric & Gas' Kintigh Generating Station in Barker.

RESEARCH EFFORT

The contractor will prepare a detailed test plan and coordinate project activities at the test site; design and prepare equipment specifications and layout, and test instrumentation installation; provide, deliver, install, and operate a model R-3000 Rotorfilter™ that is rated at 1400 actual cubic feet per minute at four inches of water-pressure drop; collect and analyze Rotorfilter™ operating data, and prepare a project report; and disassemble and remove the Rotorfilter™ and other test equipment at the conclusion of the project.

BENEFITS

The Rotorfilter™ technology could reduce capital and operating costs and energy consumption for complying with emission regulations compared to existing technologies. A successful demonstration could open up new markets for the Rotorfilter™, which is fabricated and assembled by the contractor in Scotia, and lead to manufacturing expansion and employment opportunities.

SCHEDULE AND STATUS

The contractor experienced financial difficulties and project work is on hold until the cash-flow problem and other obligations are resolved.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$122,635	$95,000	$217,635
Air Purification, Inc.	236,242	200,720	436,962
Electric Power Research Institute	50,000	20,000	70,000
Elf Atochem	5,000	0	5,000
TOTALS	$413,877	$315,720	$729,597

Contractor: Air Purification, Inc.
Site: Barker, Niagara County, and Scotia, Schenectady County
Contract Duration: 7/96 - 12/98
Key Words: environmental, product development, emissions control
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Air Quality/Environmental Impacts
Contract No.: 4446L-ERTER-ER-97

-> Continuous Vent-Gas Fractionator

Design, construct, and operate laboratory-scale continuous vent-gas fractionator to recover and reuse volatile organic compounds that otherwise would be emitted with vent gas.

BACKGROUND

The 1990 Clean Air Act Amendments require chemical and petrochemical industries to substantially reduce volatile organic compound (VOC) emissions. Conventional commercial VOC emission-control technologies either do not recover these emissions for reuse, or do not collect and recover enough VOCs in the vent gas to comply with new regulations. Technologies that catalytically or non-catalytically destroy VOCs thermally require auxiliary fuel to sustain the VOC-destruction temperatures. Cryogenic and activated-carbon VOC-absorption systems are batch operations and are not able to separate VOC components for reuse.

OBJECTIVE

To demonstrate a continuous vent-gas fractionator to recover and reuse VOCs in a vent-gas stream while complying with environmental regulations.

DESCRIPTION

The project will survey opportunities to collect, separate, and reuse VOCs in vent-gas streams from commercial operating plants in and outside New York State. The project will include the design, fabrication, and operation of a laboratory-scale cryogenic continuous vent-gas fractionator. Advantages and limitations of the proposed technology will be evaluated.

BENEFITS

Commercial development of this technology will allow New York State firms an energy-efficient option for complying with emission regulations while recovering and reusing VOCs. Energy benefits could include collecting VOC emissions and reusing VOCs that otherwise would be vented or destroyed. New York State equipment vendors could benefit directly by fabricating and selling continuous vent-gas fractionation equipment. Praxair could benefit by expanding its market for liquid nitrogen.

SCHEDULE AND STATUS

Preliminary testing indicated that the fractionator cannot sustain a steady liquid holdup on the plates. An attempt to solve this problem by increasing gas flow rates proved ineffective. The fractionator is now being modified by adding teflon seal rings around the plates.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$199,083	0	$199,083
Praxair, Inc.	199,083	0	199,083
TOTALS	$398,166	0	$398,166

Contractor: Praxair, Inc.
Site: Tarrytown, Westchester County
Contract Duration: 11/94 - 12/98
Key Words: environmental, air quality, product development, industrial
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Emissions Control/Environmental Impacts
Contract No.: 4052-ERTER-ER-95

-> Novel Nitrogen Oxide Emission-Control Catalysts

Formulate, characterize, and evaluate new catalysts for destruction of nitrogen oxide in flue gas from fossil-fuel combustion sources.

BACKGROUND

The 1990 Clean Air Act Amendments mandate reduced nitrogen oxide (NO_x) emissions from fossil-fuel combustion and process sources. Existing technology to remove in excess of 80 percent NO_x is expensive and requires the use of toxic ammonia and catalyst materials. New NO_x emission-control catalysts to be investigated in this project have the potential to be more reactive and less expensive, may not require ammonia as a reagent, and are non-toxic and easier to dispose.

OBJECTIVE

To formulate, prepare, and evaluate two types of new catalysts: heteropoly and pillared-clay. Heteropoly catalysts do not require ammonia as a NO_x-reducing gas and operate at flue-gas stack temperatures. The pillared-clay catalysts appear to be more than twice as reactive as existing catalysts and have longer catalytic life.

DESCRIPTION

Catalysts will be prepared and characterized by laboratory techniques such as x-ray diffraction, surface-area measurements, infrared spectroscopy, differential thermal and gravimetric analyses, and chemical analysis. The catalysts then will be tested in bench-scale, laboratory reaction systems where efficiency of NO_x destruction, catalyst performance degradation over time, and temperature-cycling effects will be evaluated. Project results will be used for the process design of a pilot facility to evaluate and develop further catalysts for commercial use.

BENEFITS

These new catalysts may reduce the cost of complying with NO_x-emission regulations. Two New York State companies, a catalyst supplier and a pollution-control equipment manufacturer, have expressed an interest in the technology. Depending on project results, they would consider participating in further catalyst evaluation at the pilot-scale level.

SCHEDULE AND STATUS

The draft final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$100,000	0	$100,000
U.S. Department of Energy (PETC)	140,000	0	140,000
SUNY/Buffalo	36,442	0	36,442
TOTALS	$276,442	0	$276,442

Contractor: Research Foundation of the State University of New York/Buffalo
Site: Amherst, Erie County
Contract Duration: 12/94 -12/98
Key Words: environmental, product development, university, air quality, emissions control
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Emissions Control/Environmental Impacts
Contract No.: 4054-ERTER-ER-95

-> Flue-Gas Treatment Demonstration

Install and operate integrated flue-gas treatment process system to determine pollutant emission-control and energy-recovery performance at oil-fired boiler.

BACKGROUND

The efficiency of boilers can be increased by reducing flue-gas exit temperature. One way to lower the exit temperature is to use a condensing heat-exchanger to recover both sensible and latent heat from the hot flue gas. A Teflon covering on all heat-exchanger surfaces exposed to the flue gas from which condensation of water and acid gases occurs ensures adequate equipment life. A recent improvement in condensing heat-exchanger technology, the integrated flue-gas treatment (IFGT) concept, removes flue-gas pollutants and recovers waste heat. The IFGT appears to be particularly attractive for increasing boiler output with reduced fuel-firing, cost-effectively meeting environmental regulations. The IFGT consists of two condensing heat-exchangers connected by a duct where gaseous pollutants are removed by contact with adsorbent sprays. Particulates and toxics are removed in the condensing heat-exchanger sections.

OBJECTIVE

To install and test the performance of an IFGT unit at Con Edison's Ravenswood A-House oil-fired boiler and to measure IFGT heat recovery and removal of particulates, sulfur oxide, mercury, nickel, and chromium.

DESCRIPTION

The IFGT will be installed to heat boiler feed water and remove pollutants from the 275,000-pounds-per-hour flue gas. Effluent from the IFGT will be analyzed to determine optimum long-term processing to comply with disposal regulations.

BENEFITS

By recovering heat that otherwise would be rejected to the atmosphere, the IFGT technology will increase boiler efficiency and reduce both fuel consumption and production and emission of carbon dioxide. While recovering waste heat, the IFGT will remove particulate, gaseous, and heavy-metal pollutants that otherwise would be emitted to the environment. The ability to control sulfur-oxide emissions may permit the combustion of higher-sulfur-content, lower-cost fuels without exceeding emission regulations. IFGT equipment is manufactured by CHX Corporation in Warnerville, Schoharie County. A successful demonstration at Ravenswood would help market the technology, which could lead to additional manufacturing opportunities.

SCHEDULE AND STATUS

Contractual negotiations for start-up and testing are still ongoing between Babcock and Wilcox Company and Con Edison. The contractor recently experienced a staff reduction, and a new project manager was assigned. Con Edison has issued a request for proposals to perform some of the testing in an effort to contain project costs. A one-year, no-cost contract extension was recently requested. The fate of the project is in doubt because of the ongoing utility restructuring.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
Babcock & Wilcox	100,000	0	100,000
Con Edison	2,400,000	0	2,400,000
TOTALS	$2,750,000	0	$2,750,000

Contractor: Babcock & Wilcox
Site: Ravenswood Station, Long Island City, Queens County; and Warnerville, Schoharie County
Contract Duration: 4/95 - 12/98
Key Words: environmental, product development, air quality, emissions control, heat recovery, utilities
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Air Quality/Environmental Impacts
Contract No.: 4124-ERTER-ER-95

-> Automated Software Development for Emissions Monitor

Develop and test computer software for compact, industrial-grade mass-spectrometer emissions monitor.

BACKGROUND

New environmental initiatives have created a need for reliable, affordable, continuous, on-line exhaust-stack emissions monitors for combustion sources and processing plants. The monitors must be able to detect and quantify emissions for up to 189 chemicals on the U.S. Environmental Protection Agency's (U.S. EPA) toxics list, created in response to the 1990 Clean Air Act Amendments. Compound-specific monitors for many chemicals on this list are unavailable and would have to be developed. A monitor based on mass-spectrometry principles offers the possibility of analyzing a number of compounds with the same instrument. The monitor, designed for industrial applications, is a miniaturized version of a high-resolution, high-sensitivity, research-laboratory-grade instrument that requires no vacuum pumps, but relies on absorption of gases to maintain a vacuum for operation. The monitor detects all compounds on U.S. EPA's toxics list.

OBJECTIVE

To develop software to control operation of a compact, Fourier Transform Ion Cyclotron mass-spectrometer chemical-compound monitor prototype. Software functions will include instrument calibration, normal operation, and data analysis with minimal operator interfacing.

DESCRIPTION

The software will be tested in a laboratory before a prototype monitor is installed in several plants and evaluated under commercial operating conditions. The research and development effort is designed to produce a marketable monitor/software system.

BENEFITS

The monitor/software, which will be produced in New York State, would allow combustion sources and process plants to use emission-control equipment more efficiently for environmental compliance.

SCHEDULE AND STATUS

The contractor moved into a new combination office/laboratory/manufacturing facility in East Syracuse. The contractor is having difficulty in hiring qualified staff for some of the project software development activities. Test sites for demonstrating the monitor are being investigated.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
Jencourt, Inc.	370,125	0	370,125
TOTALS	$620,125	0	$620,125

Contractor: Jencourt, Inc. at Syracuse University
Site: Syracuse, Onondaga County
Contract Duration: 4/95 - 12/98
Key Words: environmental, product development, air quality, emissions control
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Air Quality/Environmental Impacts
Contract No.: 4126-ERTER-ER-95

-> Development of a Field-Effect Cyclone Collector/Separator

Design, fabricate, install, and test innovative, efficient field-effect cyclone particulate collector that can be used to separate different components from dust-laden gas streams.

BACKGROUND

Current cyclone dust-collector designs are efficient in capturing large particles entrained in process-gas flows. Fine particles (less than 10 microns) are not effectively removed, and are emitted with the gas. By installing an electrical grid in the cyclone and energizing it below corona-discharge levels, electric-charge transfer directly to the entrained solid particles may increase collection efficiency. If this process can be demonstrated to work as expected in industrial applications, the expense of installing baghouses for recovering valuable product or for reducing particulate emissions could be reduced. By suitably designing and manipulating the electrical field, different components of multi-component fine-dust streams can be concentrated and separated.

OBJECTIVE

To design, fabricate, install, and test a field-effect cyclone (FEC) collector for removing and collecting entrained particulates from process gas at an industrial site. Performance of the FEC collector will be measured and compared with the performance of current commercial cyclone designs. The FEC collector also will be tested as a concentrator and separator of different components from a multicomponent fine-entrained dust-gas stream.

DESCRIPTION

The contractor will select specific sites for demonstrating the operation and performance of the FEC collector and separator. After designing equipment to meet the specifications for the selected sites, equipment will be fabricated, installed, and tested at those sites. FEC collector and separator performance will be measured and compared with current commercial technology.

BENEFITS

The FEC collector may be an economically attractive technology for recovering valuable material normally inadvertently discarded with process gas, and for complying with more severe particulate-emission requirements. It also may be an economical alternative for collecting specific components from multicomponent dusts entrained in process gas. Clark Specialty Company in Hammondsport will fabricate the new cyclone designs and expand employment opportunities in the region. AET and R&J Laboratories in Penn Yan will design and market the new cyclones and analyze cyclone performance, respectively, thereby providing additional employment opportunities.

SCHEDULE AND STATUS

The Contractor moved to new office/laboratory facilities in Penn Yan. Testing of the FEC with powders from Phillips Lighting in Bath. The Contractor is negotiating with a mining equipment firm to suupply FECs for mineral separations.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$209,720	0	$209,720
AET, Inc.	216,518	0	216,518
TOTALS	$426,238	0	$426,238

Contractor: Advanced Electrostatic Technologies, Inc.
Site: Penn Yan, Yates County, and Hammondsport, Steuben County
Contract Duration: 9/96 - 12/98
Key Words: product development, environmental, emissions control
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Air Quality/Environmental Impacts
Contract No.: 4448-ERTER-ER-97

-> Intelligent Visual Inspection System

Design, fabricate, and test an innovative, robotic optical inspection system for measuring deposit thickness on heat-exchanger surfaces that result in performance inefficiencies, material corrosion and leaks, and flow restrictions.

BACKGROUND

About 0.36% of U.S. annual nuclear electric power production is lost due to internal steam generator deposits. Corrosion under the deposits leads to tube leaks, unscheduled forced outages, and expensive replacement power. If deposits are not monitored and removed by periodic hydraulic cleaning, acid washing is required to restore heat-exchanger performance. Acid washing, on average, costs about $800,000 more than water washing. Moreover, with acid washing, about 60,000 gallons of waste are produced per heat-exchanger. Disposal of this waste costs an additional $1 million per heat-exchanger.

The need for acid washing could be eliminated with periodic, quantitative, internal, visual heat-exchanger inspections. Currently, inspections only record visual data with information given to customers without interpretation or recommendations. A quantitative measurement of internal deposit extent and thickness is required to maintain heat-exchanger performance efficiency without having to resort to acid washing, with its waste by-product disposal expense.

OBJECTIVE

To develop a three-dimensional, laser-based fouling deposit-thickness measurement system, and couple it with robotic positioning equipment used for visual pressurized-water nuclear power plant heat-exchanger inspections.

DESCRIPTION

The project will develop and test a laser-based three-dimensional measurement system on a laboratory optical bench. A robotic mechanism used for visual internal heat-exchanger inspections will be modified to mechanically mount the laser-based deposit-thickness measuring system. Computer software will be developed to control operation of the enhanced inspection prototype device, and to record and store inspection data. Prototype operation will be demonstrated at the contractor's facility.

BENEFITS

Quantifiable internal deposit measurements, conducted during scheduled annual refueling outages, will be used to recommend heat-exchanger cleaning procedures to maintain performance efficiency without resorting to drastic acid washing and attendant waste-disposal problems. The technology developed by this project for nuclear power plant heat-exchangers has applications in petrochemical and other industries subject to heat-exchanger fouling and deposit build-up problems. Commercial sales of the technology will lead to job growth in central New York.

SCHEDULE AND STATUS

Equipment is on order for building the optical test bench at the contractor's laboratory.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$250,000	$250,000
R. Brooks Associates, Inc.	0	383,916	383,916
TOTALS	0	$633,916	$633,916

Contractor: R. Brooks Associates, Inc.
Site: Williamson, Wayne County, and Rochester, Monroe County
Contract Duration: 12/97 - 12/99
Key Words: product development, environmental, utilities
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Air Quality/Environmental Impacts
Contract No.: 4655-ERTER-ER-98

-> Advanced Portable Turbidimeter

Design, assemble, test, and market new portable turbidimeter that conforms to latest U.S. Environmental Protection Agency analytical performance guidelines for water and wastewater analysis.

BACKGROUND

Turbidity in water is measured by the effect of fine suspended particles on a light beam. Turbidimeters are used to measure the clarity of water and industrial fluid streams, and to determine if further treatment is required to meet applicable quality standards. The New York State Department of Environmental Conservation is evaluating the use of turbidity measurements as a surrogate for the presence of giardia and cryptosporidium cysts in potable water.

An inherent problem with commercial turbidimeters is that fluid sample color affects turbidity readings, resulting in measurement errors. The turbidimeter to be developed and marketed under this project will be designed to eliminate this source of measurement errors and will include additional performance-enhancing features.

OBJECTIVES

To design, develop, test, and market a new portable turbidimeter that will rapidly and accurately measure turbidity of clear and colored fluid samples. The turbidimeter will be designed to comply with the latest U.S. Environmental Protection Agency and European Community performance requirements.

DESCRIPTION

The contractor will design a new optical system, microprocessor/microcontroller electronic boards, and operating software that will be able to meet the turbidimeter design specifications. A prototype turbidimeter will be assembled and tested in house and by a certified testing laboratory. Project results will be used to prepare marketing literature.

BENEFITS

Quick, accurate, and reliable measurement of turbidity would provide needed information for controlling water, wastewater, and process fluid treatment operations. The new turbidimeter would minimize the energy consumed to meet water, wastewater, and process fluid quality standards. It would also enable the contractor to stay competitive by expanding its product line with an instrument designed to meet new performance requirements. Additional manufacturing and marketing jobs are anticipated.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$48,000	$48,000
Orbeco Analytical Systems, Inc.	0	95,404	95,404
TOTALS	0	$143,404	$143,404

Contractor: Orbeco Analytical Systems, Inc.
Site: Farmingdale, Nassau County
Contract Duration: 3/98 - 3/99
Key Words: product development, environmental
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Air Quality/Environmental Impacts
Contract No.: 4742-ERTER-ER-98

-> Re-engineering of Stainless Steel Fireproof Boom

Design, fabricate, and test a downsized, re-engineered version of a massive stainless steel fire boom originally designed for deployment in ice-filled arctic waters.

BACKGROUND

Under specific conditions in-situ burning is a quick and effective technique for removing large quantities of spilled oil before environmental damage to coastlines and other sensitive areas occurs. The U.S. Coast Guard is the lead federal agency responsible for oil spill remediation and has recently negotiated and executed a Memorandum of Understanding with the New York State Department of Environmental Conservation outlining specific conditions under which in-situ burning can be used. Of immediate concern is the availability of economical and reliable fire boom equipment that can effectively and efficiently be used for in-situ oil burning. Conventional refractory-fiber fire booms are not durable, suffer extensive damage when used for in-situ burning, and must be replaced frequently. A low-cost, durable, and reliable fire boom is needed.

OBJECTIVE

To downsize and re-engineer Amoco Canada's massive, expensive, stainless steel Dome boom, originally designed and developed for use in ice-filled arctic waters.

DESCRIPTION

The project will design, fabricate, and test a compact, easily deployed stainless steel fire-boom section that will be inserted between two sections of conventional refractory-fabric fire boom. The composite boom would be used to collect and concentrate oil, but burning would be limited to the stainless steel section. Commercial sales of the new re-engineered fire boom, and manufacturing and marketing jobs created, will be documented for 10 years after the end of the project.

BENEFITS

The re-engineered stainless steel/fabric-composite fire boom would be a low-cost, easily deployed version of the Dome boom thsat has been used for in-situ burning in Alaskan waters. The fire boom would be a new product line for Applied Fabric Technologies, Inc. that could lead to increased revenue and new manufacturing and marketing job opportunities.

SCHEDULE AND STATUS

The project is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$49,970	$49,970
Applied Fabric Technologies, Inc.	0	14,150	14,150
U.S. Minerals Management Service	0	85,000	85,000
Alaska DEC	0	50,000	50,000
Canadian Coast Guard	0	36,000	36,000
U.S. Coast Guard	0	20,000	20,000
Petro Canada	0	7,000	7,000
Exxon Production Research	0	5,000	5,000
Alaska Clean Seas	0	5,000	5,000
Cook Inlet Spill Prevention, Inc.	0	2,000	2,000
Clean Sound Spill Response	0	1,500	1,500
TOTALS	0	$275,620	$275,620

Contractor: Applied Fabric Technologies, Inc.
Site: Orchard Park, Erie County
Contract Duration: 2/98 - 9/99
Key Words: product development, environmental
Project Manager: Joe Sayer (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Air Quality/Environmental Impacts
Contract No.: 4747-ERTER-ER-98

-> Least-Cost Options for Ozone Improvements in the Eastern United States

Use computer models to develop least-cost options for improving ozone air quality.

BACKGROUND

While the 1990 Clean Air Act Amendments (CAAA) require states with serious or higher ozone non-attainment areas to develop emission-control strategies to comply with federal air quality standards, northeastern states cannot do so due to ozone and NO_x from midwestern power plants. Because of this the U.S. EPA and 37 eastern states formed the Ozone Transport Assessment Group (OTAG) to coordinate modeling ozone episodes in 1988, 1991, 1993, and 1995. All used the UAM-V model with the latest U.S. EPA emissions database modified by year as needed for individual ozone episodes. Quantitative model-validation and results-acceptance criteria were developed and the baseline project is moving ahead with U.S. EPA funding. The modeling assumes all provisions of the 1990 CAAA were implemented. Some additional modeling is planned to consider additional across-the-board emission controls to meet air-quality standards.

OBJECTIVES

To: (1) establish the baseline model for 1995 and verify its validity and performance with the OTAG, evaluating air-quality effects from combinations of up to eight emission-control options; and (2) develop alternative, spatially focused control strategies and evaluate the emission-control costs associated with them, after which optimal and practical least-cost solutions will be determined.

DESCRIPTION

The project is designed to: (1) use the UAM-V model to determine how various levels of emission control for VOCs and NO_x in the 37 states affect maximum concentrations of ozone air quality in those states, (2) develop emission weights for specified sub-regions of these states that relate emissions from one subregion to ozone concentrations in other sub-regions, (3) link the emission weights with control-cost curves to determine the most cost-effective strategies to reduce ozone concentrations, and (4) based on least-cost results, define a practical-to-implement strategy and verify results using the UAM-V model.

BENEFITS

Provide information to: (1) aid policy-makers in developing cost-effective strategies to meet 1990 CAAA requirements, (2) help U.S. EPA and Congress change the CAAA to account for controlling long-range transport pollution, (3) assist the Federal Energy Regulatory Commission in implementing interregional wheeling on a cost-effective and environmentally sound basis, (4) show disparity in control costs among utilities in the 37 states, and (5) show the benefits of natural-gas-powered vehicles in urban areas.

SCHEDULE AND STATUS

A draft final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$281,340	$15,000**	$296,340
NYSDEC	50,000*	0	50,000
SUNY Research Foundation	50,000*	0	50,000
Cornell University	50,000*	0	50,000
Illinois Environmental Protection Agency	0	10,000*	10,000
TOTALS	$431,340	$25,000	$456,340

* in-kind services and overhead reductions

** Agreement No. 4422B issued to Hagler Bailly Consulting, Inc. to develop emission weights from the Greater Chicago and Milwaukee Area

Contractor: SUNY Research Foundation
Site: Statewide
Contract Duration: 8/96 - 9/98
Key Words: environmental, university, policy
Project Manager: Joe Visalli (518) 862-1090, ext. 3205
Program: Environment
Subprogram: Air Quality
Contract No.: 4422-ERTER-ER-97

-> Dual-Fuel Rapid-Mix Burner Demonstration

Demonstrate operating and emissions performance of natural-gas-fired multiburner package boiler retrofit with two dual-fuel rapid-mix burners.

BACKGROUND

The dual-fuel rapid-mix burner (D-RMB) produces less than 10 parts per million (ppm) nitrogen oxide (NO_x) emissions when firing natural gas in single-burner boilers. The burner is a low-cost, front-end alternative for complying with NO_x emission regulations. However, performance and emissions in multiple-burner, load-following boilers remain to be demonstrated. A proposed procedure for achieving low emissions in multiple-burner boilers is to use biased firing, where some burners operate fuel-rich and others air-rich to minimize overall boiler emissions. Biased firing, coupled with flue-gas recirculation, is expected to result in acceptable combustion and emissions performance.

ACCOMPLISHMENTS

Two existing natural gas and oil fuel burners were replaced with two D-RMB natural-gas-fired burners on Con Edison's 59th Street Station steam send-out boiler. Boiler operating and emissions performance was measured while firing natural gas and fuel oil. A new flue-gas recirculation fan and associated ducting were also installed for the demonstration.

FINDINGS AND CONCLUSIONS

The project demonstrated that NO_x emissions less than 15 ppm are attainable in a two-burner boiler retrofit with D-RMB burners with about 17% flue-gas recirculation and biased firing. Carbon monoxide (CO) emissions were essentially zero (less than 5 ppm), even with biased firing. Performance testing on oil had to be terminated because the boiler exceedeed opacity standards four times in two days.

REALIZED OR ANTICIPATED BENEFITS

The project showed that D-RMB burners could be an up-front low-cost technology for reducing NO_x emissions when burning natural gas in multiburner boilers.

TECHNOLOGY TRANSFER ACTIVITIES

Project reports are being sent to the ESEERCO Empire State Electric Energy Research Corporation and member utilities.

FUNDING	TOTALS
NYSERDA	$100,000
ESEERCO	150,000
Electric Power Research Institute	320,000
San Diego G&E	150,000
Con Edison	375,000
Gas Research Institute	150,000
Radian	95,000
TOTALS	$1,340,000

Contractor: Empire State Electric Energy Research Corporation (ESEERCO)
Site: New York, New York County
Contract Duration: 12/96 - 12/97
Key Words: environmental, oil, emissions control, utilities
Project Manager: Joe Sayer (518) 862-1090, ext.3298
Program: Environment
Subprogram: Emissions Control/Environmental Impacts
Contract No.: 4440-ERTER-ER-97

-> Constructing and Testing an Amended Slow Sand Filter

Improve water quality with activated carbon lens in sand filter.

BACKGROUND

The Deansboro Water District serves about 450 rural customers with an average total daily water use of some 20,000 gallons. The District is under orders to develop a second water source. A nearby stream that flows through agricultural land could be used; however, the water would need treatment for turbidity and organic contaminants, including disinfection by-products.

OBJECTIVE

Construct a slow sand filter with a layer of granulated activated carbon in the sand bed to remove the turbidity and organic contaminants, including those that may be precursors to disinfection by-products.

DESCRIPTION

The contractor will: (1) collect data on designing and operating slow sand filters, design the filters and lay out the associated system; (2) construct and start up the filters; (3) test and monitor filter operation for six months; and (4) prepare cost estimates for constructing, operating, and monitoring the filter.

BENEFITS

The filter uses no energy, unlike a conventional water-treatment plant filter that requires pumping. Slow sand filters require no chemical coagulants or sophisticated controls, and produce no filtration residuals that require special treatment. Slow-sand technology is ideal for small rural communities that may be forced to filter their water supplies because of new regulatory requirements.

SCHEDULE AND STATUS

The project design is complete and has received final State and county health department approval. Filter construction has been completed. Sand was added to the filters in April 1997. Testing began in September 1997.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$64,575	0	$64,575
Deansboro Water District	21,525	0	21,525
TOTALS	$86,100	0	$86,100

Contractor: Town of Marshall, Deansboro Water District
Site: Deansboro, Oneida County
Contract Duration: 5/95 - 9/98
Key Words: environmental, municipal, drinking water, filtration
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Drinking Water Treatment
Contract No.: 4136-ERTER-MW-95

-> Town of Long Lake Raw Water Pretreatment

Test in-bank filtration for pretreatment of drinking water.

BACKGROUND

Long Lake Water District #2 provides drinking water for a year-round population of 800. The District uses an impoundment on Sandy Creek as a surface water supply. The water is filtered through four diatomaceous earth (DE) filters. Filter runs vary considerably, but can be less than one day if turbidity is high. The raw water's turbidity rises significantly when there is runoff from snowmelt and measurable rainfalls. The District is proposing to install an infiltration gallery in the banks of the Creek to pretreat the raw water. Water seeping through the in-place soils of the creek bank will provide natural filtration and the sand filter pack around the infiltration gallery will provide the rest.

Many water-treatment systems in NYS that use surface sources are mandated to add filtering facilities that often use pressure filters, which require energy for pumping and for backwashing. A recent New York State Department of Health technology filtration study concluded that in-bank filtration could be an innovative alternative to conventional pressure filtration.

OBJECTIVE

To: (1) provide pretreated raw water with significantly improved quality, (2) improve the length of filter runs between backwash and regeneration, (3) limit raw water turbidity to 5 normal turbidity units, and (4) pretreat the raw water with minimal energy use.

DESCRIPTION

The Town will: (1) determine soil conditions in and near the banks of Sandy Creek, and (2) construct an infiltration gallery there, (3) secure necessary data to evaluate the technology design parameters' effectiveness, and (4) determine energy, capital, and operational costs compared to standard purchased technology.

BENEFITS

Pretreatment should markedly decrease sediment load to the filters, thereby improving the length of time between backwashing and reducing the unit cost of filtration. A low-cost filtering system will be built that will extend the life of the existing DE filters, extend filter runs, lower chemical usage and improve water quality, using no energy other than that required for infrequent redevelopment of the screen pack. This simple solution to a widespread problem could benefit many communities in the Adirondacks and elsewhere.

SCHEDULE AND STATUS

Test pits in the bank have been completed and the screen installation will occur in the Fall of 1997. Monitoring of water quality will continue through Summer of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$30,000	$30,000
Town of Long Lake	0	10,000	10,000
TOTALS	0	$40,000	$40,000

Contractor: Town of Long Lake
Site: Long Lake, Hamilton County
Contract Duration: 6/97-12/98
Key Words: environmental, municipal
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4635-ERTER-MW-98

-> Field-Testing of Slow Sand Filters Using Pulverized Glass Filter Media

Meet drinking water criteria of Surface Water Treatment Rule using pulverized glass in pilot-scale slow sand filters.

BACKGROUND

The Surface Water Treatment Rule of the 1986 Amendments to the Safe Drinking Water Act requires all U.S. community water supply systems that use a surface water source to install filtration. Two hundred of these supplies are in New York State. Many small communities with a population less than 2,000 are using slow sand filtration to meet regulations' requirements. The technology is popular with small communities because of its simplicity and ease of operation. In municipal recycling programs, much of the glass being recovered is used to replace low-valued aggregate material. The economics of municipal and private recycling operations could be improved if higher valued markets could be developed for scrap glass. One higher-valued market could be those water treatment plants that use silica sand for water filtration and have to pay from about $20 to $60 per ton of sand.

OBJECTIVE

To demonstrate the ability of pilot-scale slow sand filters using pulverized glass sand media to meet drinking water criteria of the Surface Water Treatment Rule. To achieve this goal, objectives are to: (1) successfully operate four pilot-scale filters over a one-year period and measure reductions in turbidity, and (2) test the ability of coated-glass media to more effectively remove natural organic material during filtration.

DESCRIPTION

For the one-year field study, the four pilot-plant filters used in the initial study (with on-line turbidimeters and data-acquisition system) will be installed in the Village of Canajoharie's water filtration plant. Three of the four filters will contain glass sand and one will be a control filter using commercial silica sand. Laboratory tests will be run to determine whether coating the glass sand with ferric hydroxide or some other coating will improve removal of natural organic material. The most desirable coating will be applied to one of the pilot filters.

BENEFITS

The cost of producing and delivering pulverized glass sand can be less than the cost of natural sands of equal quality. This can help control costs of water filtration. At the same time, pulverized glass represents a higher-valued market for waste glass than use as an aggregate substitute. This can help control the costs of municipal recycling operations. Systems for producing filter sand can be installed with paybacks of less than one year.

SCHEDULE AND STATUS

The project has just begun.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$92,363	$92,363
Village of Canajoharie	0	12,824	12,824
Syracuse University	0	12,064	12,064
Rust Engineering	0	9,000	9,000
TOTALS	0	$126,251	$126,251

Contractor: Village of Canajoharie
Site: Town of Ephratah, Fulton County
Contract Duration: 9/97 - 12/98
Key Words: environmental, product development, municipal, solid waste
Project Manager: Tom Fiesinger (518) 862-1090, ext. 3218
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4636-ERTER-MW-97

-> Biological Stability of Drinking Water

Measure energy cost of biological growth in treatment plants and distribution systems.

BACKGROUND

Maintaining a chlorine residual is unreliable in preventing bacteria regrowth in water-distribution systems. Pipe surfaces in distribution systems are particularly prone to heavy colonization by microorganisms. Excessive bacteria can contribute to pipe corrosion, reduced flow, and water-quality problems such as bad taste, odor, and appearance. Increasing the dose of chlorine may not be possible if future water-quality regulations strictly control using chlorine to reduce chlorinated organic compounds.

OBJECTIVES

To: (1) assess biological stability and disinfection by-product levels in New York City drinking water, (2) develop correlations between biological stability of drinking water and routinely measured water-quality parameters, (3) evaluate and optimize chlorination practices with respect to biological stability, (4) evaluate various water-treatment unit processes for producing biologically stable water, and (5) determine the energy and other costs of water treatment and disinfection when producing a biologically stable finished water.

DESCRIPTION

The contractor will: (1) sample and analyze water from 10 locations within the New York City water-distribution system, (2) assess the biological stability of the drinking water and the level of disinfection by-products at these locations, (3) use a pilot-scale system TO evaluate the optimum level of disinfection and treatment for biological stability, and (4) estimate the amount of energy used for full-scale treatment systems.

BENEFITS

Bacteria regrowth in water-distribution systems and precursor characteristics of the raw water will be better understood. The cost to control bacteria re-growth using the two most common forms of disinfection, chlorine and ozone, will be quantified. The optimum use of chlorine will minimize the potential for creating undesirable disinfection by-products. Controlling biological growth in distribution systems will lower water-pumping costs.

SCHEDULE AND STATUS

Sampling units for bacteria regrowth have been installed and sampling and analyses are complete. Pilot-scale water-treatment testing began in January 1996 and is complete. The final report is being prepared.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$248,488	0	$248,488
New York City	339,114	0	339,114
CUNY Research Foundation	25,100	0	25,100
TOTALS	$612,702	0	$612,702

Contractor: CUNY Research Foundation
Site: New York City, New York County
Contract Duration: 4/95 - 6/98
Key Words: environmental, municipal, public water systems, disinfection
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Public Water Systems
Contract No.: 4137-ERTER-MW-95

-> Development of an Electrochemical Device to Rapidly Detect Biological Contaminants in Water

Quickly and economically detect and enumerate cryptosporidium parvum in water..

BACKGROUND

Most testing of environmental water samples to identify and enumerate biological contaminants is conducted in a laboratory. These procedures are costly and time-consuming. For example, tests for the protozoan Cryptosporidium parvum, a contaminant of concern in drinking water supplies, costs more than $300 per sample, and typically has a 10-day turnaround. A rapid method would allow water supply managers to develop remedies to protect water supplies in a timely manner.

Methods combining a number of biological, physical, and chemical techniques together can provide timely (less than 90 minutes) results for potentially any biological contaminant in the environment, at one-tenth the cost. These techniques are: immunological (antigen/antibody reactions), genetic amplification, capillary movement on nitrocellulose strips, liposomes (microscopic spheres made up of phospholipids), and electrochemical detectors.

OBJECTIVES

To design and test a prototype device for the timely detection of Cryptosporidium parvum (Cp).

DESCRIPTION

The contractor will: (1) assess immunologic and genetic techniques to identify Cp; (2) identify and synthesize Cp-specific antigens or nucleotides; (3) produce tagged liposomes; (4) optimize the formulation of tagged liposomes with antibody/antigen or using complementary nucleotide sequences on cellulose strips for visual detection; (5) test, evaluate, and optimize sample-handling methods; (6) produce liposomes for electrochemical detection; (7) design and optimize a miniature electrochemical detector; (8) fabricate a prototype-testing device; (9) compare the prototype device with standard laboratory procedures; (10), (11), and (12) work with vendors to design and scale up test kit components including tagged liposomes, electro-chemical cells, test kit chemicals, and other ancillary material; and (13) provide a final report and quarterly progress reports. Some additional tasks will be needed if an nucleic acid approach is taken.

BENEFITS

This project may provide a new technology for environmental testing generally. A rapid detection method would be useful to municipal entities such as the New York City Department of Environmental Protection (NYCDEP) for use in watershed management. This method would provide timely information on Cp contamination, which would help NYCDEP locate sources and design remedial actions more quickly. The alternative to watershed management, water treatment, is expensive and energy-intensive. In addition, the project helps a New York State company and other in-State suppliers develop a new product.

SCHEDULE AND STATUS

Good progress on all aspects of this development effort. Project is on schedule.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$160,808	$160,808
Innovative Biotechnologies	0	156,728	156,728
Vendors*	0	74,000	74,000
TOTALS	0	$391,536	$391,536

* Including Nalco Chemical, Collaborative BioAlliance, TMS Technologies, and Cellular Products

Contractor: Innovative Biotechnologies
Site: Niagara Falls, Niagara County and Geneva, Ontario County;
Contract Duration: 11/97 - 6/99
Key Words: environment, municipal, industrial, product development
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4658-ERTER-MW-98

-> Energy Conservation Through Watershed Management

Use computer model to predict outcome of natural water-treatment systems.

BACKGROUND

The federal Safe Drinking Water Act requires that all surface-water supplies be filtered. New York City was granted conditional filtration avoidance by the U.S. Environmental Protection Agency for its two largest supply systems. To comply with the conditions of this decision, New York City must begin extensive watershed-protection and enhancement research that will ensure certain water-quality parameters are maintained within specified ranges. Wetlands in the watersheds may remove up to 90 percent of the suspended solids in the water, but using wetlands as a definitive means for water filtration needs further research.

OBJECTIVES

To develop and test mathematical models to identify and prioritize areas within the New York City watershed that either significantly enhance or degrade water quality.

DESCRIPTION

The contractor will: (1) use a digital-elevation model and a geographic-information system to derive kinetic and potential energy levels in the streams; (2) define and code stream and wetland segments by their predicted energy levels; (3) use soils, vegetative cover, hydrology, and surface geology to analyze the classified stream and wetland segments; (4) estimate pollutant-loading rates from these parameters through the use of models; (5) monitor the water quality before and after selected watershed modifications, and (6) offer recommendations on implementing the best management practices.

BENEFITS

If New York City can manage its watershed so that non-point-source pollution is controlled and the natural features of the watershed, such as wetlands, are used to remove turbidity, then the City may be able to avoid spending $6 billion for construction of a new water-treatment plant that could use up to one billion kWh of electricity annually. Avoided operating and maintenance costs are estimated at $600 million per year.

SCHEDULE AND STATUS

The literature search has been completed. Sampling and analyses of water from Malcolm Brook has been extended through the Fall of 1998. Work has begun on GIS mapping and mathematical modeling of the watershed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,455	0	250,455
NYC Dept. of Environ. Protection	221,010	0	221,010
City University of New York	147,552	0	147,552
TOTALS	$619,017	0	$619,017

Contractor: CUNY Research Foundation
Site: Valhalla, Westchester County
Contract Duration: 2/96 - 4/99
Key Words: environmental, municipal, public water, watershed management, modeling
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Drinking Water Treatment
Contract No.: 4283-ERTER-MW-96

-> Evaluating Ozone for Water Treatment - City of Dunkirk

Conduct pilot-plant tests of water-treatment system featuring ozone as oxidant and disinfectant.

BACKGROUND

The City of Dunkirk operates a water-treatment plant (WTP) that processes an average daily flow of between 4.0 and 4.5 million gallons per day. Chlorine is now added at the raw-water intake for zebra mussel control and pre-oxidation of natural organic matter. A granular activated carbon (GAC) filter was installed to remove the chlorinated organic compounds and minimize the potential for creating disinfection by-products (DBP) after final chlorination. The raw-water chlorination reduces the life of the GAC filter bed. Breakthrough of the chlorinated organics raises the potential for DBP formation and finished water taste and odor problems. These problems are common among most of the water systems in New York State that use surface water supplies.

OBJECTIVE

To determine whether using ozone in the water-treatment process can improve finished water quality by controlling zebra mussels, cryptosporidium, and natural organic matter, which lead to formation of disinfection by-products and poor taste and odor.

DESCRIPTION

Bench-scale testing of water samples from the Dunkirk WTP will provide ozone dosing and pilot-plant design information. A pilot plant designed to match the processes at the Dunkirk WTP will be constructed at the plant and operated for five months. Experiments are planned that will vary the ozone dose, dosing location, and the level of treatment that the raw water receives. The water will be periodically spiked with cryptosporidium cysts for inactivation/removal challenges. Raw and finished water quality will be monitored throughout the testing period. Niagara Mohawk plans to host a series of technology transfer meetings at the Dunkirk WTP and various locations across New York State to present the project results.

BENEFITS

The project will produce a report that could be used by most of the water systems in New York State as a preliminary guide to the costs and benefits of ozone treatment for drinking water. Using ozone will help WTPs in New York State meet the more stringent regulations that are forthcoming for DBP control. Otherwise, water disinfected with chlorine will need to be treated further to remove the DBPs, adding capital, operation and maintenance, and energy costs to the water-treatment process.

SCHEDULE AND STATUS

The ozone pilot plant has been designed. Bids for construction of the pilot plant have been solicited.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$153,434	$153,434
Niagara Mohawk Power Corp.	0	203,528	203,528
City of Dunkirk	0	12,665	12,665
TOTALS	0	$369,627	$369,627

Contractor: Niagara Mohawk Power Corp.
Site: Dunkirk, Chautauqua County
Contract Duration: 9/97 - 4/99
Key Words: environmental, municipal, water treatment, ozone
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4608-ERTER-MW-98

-> Novel Electrotechnology Water-Treatment Process Demonstration

Demonstrate chlorine-free water-treatment/disinfection electrotechnology at several cooling towers.

BACKGROUND

Conventional technologies for treating potable water, municipal and industrial wastewaters, and process water use chemical additives as filtering aids and chlorine for disinfection. Filtering-aid chemical additives increase residual sludge production, requiring additional energy for acceptable disposal, and can lead to scaling deposits that impair the performance of heat-transfer equipment. Chlorine disinfectants can lead to formation of toxic chlorinated hydrocarbons with adverse environmental impacts.

OBJECTIVE

To demonstrate a new water-purification technology that does not use chemical filtering aids and chlorine-based disinfectants. Originally, the new technology, based on electro-coagulation/magnetic separation, was to be demonstrated on a cooling tower, a chiller, and a high-rise building potable water system. After very positive performance results on a cooling tower at the University of Rochester's Memorial Arts Gallery Museum, the contractor suggested modifying the original agreement and demonstrating the technology at other cooling towers. Cooling tower water treatment represents a huge market for the new technology.

DESCRIPTION

Equipment will be designed, fabricated, installed, and tested at a 550-ton/hr cooling tower in Albuquerque, NM, at an 800-ton/hr cooling tower in IL, and at a 1,200-ton/hr cooling tower in Denver, CO.

BENEFITS

A flocculation chemical additive- and chlorine-free water-treatment process would provide significant energy and environmental benefits by not producing additional sludge for treatment and disposal and by eliminating the discharge of chlorine compounds into the environment. Performance of heat-transfer equipment should not deteriorate with time, as no chemicals that could lead to scale deposits are present in the water. New employment opportunities will be created at the contractor's plant in western New York, where the processing equipment will be manufactured and the control systems assembled and tested.

SCHEDULE AND STATUS

Process demonstration continues at the Taber Center in Denver. Equipment for the cooling tower demonstration at John Deere in Moline was shipped and is being assembled. Equipment for the cooling tower demonstration in Albuquerque is being designed. The contractor requested a contract modification to attract investors for a manufacturing plant in Marion.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$250,000	0	$250,000
Alpha/Omega Environmental	150,000	$100,000	250,000
TOTALS	$400,000	$100,000	$500,000

Contractor: Alpha/Omega Environmental, Inc.
Site: Marion, Wayne County; Rochester, Monroe County; NM; IL; and CO
Contract Duration: 3/96 - 12/98
Key Words: environmental, product development, industrial, water treatment
Project Manager: Joe Sayer, (518) 862-1090, ext. 3298
Program: Environment
Subprogram: Air Quality/Environmental Impacts
Contract No.: 4346M-ERTER-ER-96

-> Using Electrocoagulation to Treat Drinking Water and Remove Nutrients from Reservoirs

Demonstrate use of electrocoagulation as alternative to chemical flocculation for water treatment.

BACKGROUND

The primary function of water treatment is to provide safe, palatable water at an affordable price. U.S. EPA has warned about the need to reduce disinfectants and disinfection by-products (D/DBPs) in drinking water and the need to remove more of such pathogenic microbes as giardia and cryptosporidium through drinking water treatment systems. Electro-coagulation (EC), now used in groundwater remediation and industrial wastewater treatment to remove metals and dyes, may increase the removal of natural organic materials (NOMs), precursors of DBPs; and increase the removal of microbes, and at a lower cost and lower overall energy use than conventional chemical coagulation (CC). The Upper Mohawk Valley Regional Water Board's (UMVRWB) surface water supply is clear, but has relatively high color content due to NOMs. UMVRWB is concerned about meeting proposed standards for DBPs and microbes at its facility.

OBJECTIVE

To: (1) determine whether EC can replace CC for conventional treatment and at what cost, (2) determine and compare how effective the EC and CC processes are for reducing DBPs and microbes and for meeting requirements in U.S. EPA's D/DBP and Enhanced Surface Water Treatment Rules (ESWTR), and (3) evaluate the effectiveness of EC for removing phosphorus and controlling algae formation in reservoirs.

DESCRIPTION

The contractor will: (1) develop an operating, testing and monitoring plan designed to compare the performance of EC and CC processes on a pilot-scale (1 gpm), including microbe spiking tests; (2) collect and analyze samples for parameters listed in EPA's Information Collection Rule (2/10/94), and collect information on the operation of EC and CC pilot systems, including the use of energy, materials, and supplies; (3) evaluate and assess the performance of the EC and CC processes as a function of flow rate over a range of naturally varying raw water quality conditions (e.g., temperature, turbidity, and color); (4) provide a detailed final report and quarterly progress reports; and (5) host a seminar for the New York State Department of Health and prepare abstracts and make presentations to national and regional meetings held by the American Water Works Association and Rural Water Association to describe the results of the work.

BENEFITS

This project may result in a new technology for water treatment that improves drinking water quality at lower cost than conventional water treatment processes, while using less energy. It also will help a New York State manufacturer assess the value its electrocoagulation technology for the drinking water treatment market.

SCHEDULE AND STATUS

Delays have been encountered in simulating the operation of the full-scale water treatment. Work using electro-coagulation will start during the summer of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$125,000	$125,000
UMVRWB	0	54,554	54,554
Andco Environmental Processes, Inc.	0	37,680	37,680
Environmental Engineering & Tech.	0	12,857	12,857
TOTALS	0	$230,091	$230,091

Contractor: Upper Mohawk Valley Regional Water Board
Site: Utica, Oneida County
Contract Duration: 8/97 - 12/98
Key Words: environment, municipal, water treatment, product development
Project Manager: Barry Liebowitz (518) 862-1090, ext. 3248
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4637-ERTER-MW-98

-> Advanced Ceramic-Membrane Filter

Test surface-treated ceramic-membrane elements in water filters.

BACKGROUND

Ceramic membranes hold promise for providing features not found in polymer-based membranes, such as oxidant tolerance, rugged design, and longer prospective life. A superior water-filtering system has been postulated based on new surface-effect ceramic membranes developed by Refractron Technologies, plus high-kinetic-force backwashing, improved vessel design housing the filter and an oxidant contactor, and simplified automated controls. The system features high mass-transfer efficiency, high flux rates, and low head loss. While several elements of the system have been tested individually at bench scale, the entire system has not been evaluated under realistic operating conditions at a larger scale.

OBJECTIVE

To develop and demonstrate a ceramic-membrane-based water-filtering system that will provide drinking water that meets regulatory standards when treating groundwater from wells under the influence of surface water while minimizing energy use, waste streams, and life-cycle costs.

DESCRIPTION

The contractor will: (1) construct and test a bench-scale ceramic-membrane water-filtering system; (2) design, construct, and test a pilot-scale filter plant based on the results of the bench-scale work; (3) analyze water-quality testing results and system-performance data; (4) identify strengths and weaknesses of the ceramic-membrane water-filtering system; and (5) prepare a life-cycle cost analysis of the preferred design and compare to costs for conventional water-filtering systems. Refractron Technologies will manufacture the ceramic-membrane filters in Newark. Rhodes Instruments will provide the instrumentation package and will assemble the water-filtering system at its subsidiary company, Prinz Optics, in Stuyvesant. United Water of New York will test the filtering system at a well site in Spring Valley. O'Brien & Gere Engineers will provide the engineering analyses at their offices in New York City. McSweeney & Company will coordinate the overall effort.

BENEFITS

The ceramic-membrane filter is a compact, in-line device that operates under normal wellhead pressure, requires less water for backwashing, is compatible with strong oxidants, and uses 50-80% less energy for water treatment than flexible membranes or cartridge filters.

SCHEDULE AND STATUS

Bench-scale testing of ceramic filters has been completed. Design and construction of pilot-scale filter assemblies is complete. Testing of the pilot-plant is under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$49,914	0	$49,914
Refractron Technologies	5,941	0	5,941
McSweeney & Company	32,880	0	32,880
United Water of New York	43,250	0	43,250
Rhodes Instruments	10,930	0	10,930
Prinz Optics (Rhodes subsidiary)	0	0	0
O'Brien & Gere Engineers	5,995	0	5,995
TOTALS	$148,910	0	$148,910

Contractor: Refractron Technologies Corp.
Site: Wayne County; White Plains, Westchester County; Stuyvesant, Columbia County; West Nyack and Spring Valley, Rockland County; and New York, New York County
Contract Duration: 12/96 - 7/98
Key Words: environmental, product development, public water
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4492-ERTER-MW-97

Compare ozone treatment to using chemicals for taste and odor control.

BACKGROUND

The Village of Waterloo Water Treatment Plant (WTP) takes water from Seneca Lake to supply an average daily demand of one million gallons. The Village must address several issues to maintain high-quality water for its customers. Carcinogenic trihalomethanes (THM) are formed as a result of chlorinating water that contains organic matter. The THM concentration in Waterloo's treated water often exceeds forthcoming regulations of 80 parts per billion (ppb). Zebra mussels attached themselves to the water intake, reducing the size of the opening and adding to the organic load in the raw water. Controlling the mussels with chemicals often leads to complaints from customers about poor taste and odor.

OBJECTIVE

To determine whether the THM concentration in water provided to the Village of Waterloo's customers can meet the proposed 80 ppb limit in a financially feasible and practical manner without creating or contributing to taste and odor problems by (1) adding activated carbon, potassium permanganate ($KMnO_4$), and a polymer to the prefiltration/disinfection process, and (2) treating the raw or finished water with ozone.

DESCRIPTION

The contractor will: (1) construct chemical feed lines between the WTP and the water intake; (2) add potassium permanganate, chlorine, and a cationic polymer/molluscicide to the raw water at the intake; (3) add an activated carbon slurry in the raw-water well at the WTP; (4) install pilot-scale ozonation equipment and treat raw water for six months; (5) obtain water samples to be analyzed for one year; (6) record energy use and cost data for the chemical feed and ozonation equipment; (7) complete a life-cycle cost economic analysis and a total energy analysis of each treatment option tested; and (8) prepare life-cycle cost and total energy matrices for ozone and chemical treatments for five size ranges of WTPs.

BENEFITS

Waterloo and other WTPs in New York State will receive complete cost, benefit, and energy information on using various combinations of chemicals and ozone for water treatment, and their impact on finished water quality in relation to raw-water parameters. High-quality water will be available for a planned industrial park at the former Seneca Army Depot.

SCHEDULE AND STATUS

Design of the ozonation equipment is complete. Chemical feed lines to the intake structure have been installed.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	$95,000	0	$95,000
Village of Waterloo	77,328	0	77,328
New York State Electric & Gas Corp.	15,000	0	15,000
Electric Power Research Institute	15,000	0	15,000
O'Brien & Gere Engineers	9,600	0	9,600
TOTALS	$211,928	0	$211,928

Contractor: Village of Waterloo
Site: Waterloo, Seneca County
Contract Duration: 1/97 - 3/99
Key Words: environmental, municipal, water treatment
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4491-ERTER-MW-97

-> Waterline Chemical Cleaning and Passivation/Epoxy Lining Demonstration Project

Chemically clean and rehabilitate water-distribution lines.

BACKGROUND

Many owners of water systems are faced with significant liability and costs related to the buildup of iron deposits in distribution systems. In addition to the added energy required to pump water through constricted pipe, system owners face the high cost of either pipe replacement or mechanical cleaning and relining of pipes if tuberculation has progressed to where adequate water supply and fire protection can no longer be provided. Most older public and private water-distribution systems in New York are constructed of unlined cast iron pipe. Much of this pipe is still structurally sound enough to provide years of continued service; however, deposits on the inner pipe walls have significantly reduced pipe capacity. Other than replacement, the only conventional remedy to rehabilitate pipes has been mechanical cleaning with rotary scrapers, followed by cement mortar lining to prevent further corrosion. Both options are expensive, time-consuming, and disruptive. An alternative has been developed that can reduce the cost and disruption associated with conventional remedies. An organic oxide product, when pumped through isolated sections of piping, has been successful in eliminating buildup in less time and at lower costs than mechanical cleaning methods.

OBJECTIVE

To evaluate technical and economic issues of using the proposed chemical pipe-cleaning and passivation/epoxy lining methods in a full-scale project setting, and to compare the process to mechanical cleaning and cement mortar lining.

DESCRIPTION

The City of Buffalo will evaluate chemical cleaning of pipe and the lining/passivation process. After cleaning, a spray epoxy lining will be applied to re-coat the pipe interior, and an alternative process called passivation will be tested on other pipe sections. Passivation involves short-term treatment of piping with high levels of anticorrosion compounds. This process can eliminate repeated corrosion of pipe when maintained through a standard dosage of anti-corrosion chemicals. The effectiveness of relining with epoxy will be compared to the passivation process, and then both processes will be compared to both conventional cleaning and replacement with new piping. Energy, economic and environmental impacts will be determined.

BENEFITS

This project is expected to demonstrate that this new procedure will be able to accomplish restoration of pipe service to a higher degree and more quickly than conventional pipe cleaning/lining methods, and at lower overall cost. Improvements in flow, volume, pressure, and in the overall roughness factor of the pipes are expected. By improving restored pipe roughness factors, energy savings are expected. This process is also exptected to be less destructive to the distribution system than mechanical methods, resulting in labor, equipment, and materials savings for the system owners, and reducing temporary impacts associated with construction in an urban setting. If the project is successful, a new New York State business will be started.

SCHEDULE AND STATUS

Design will be completed during the winter of 1997-98. Construction will begin in Spring of 1998.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$125,000	$125,000
City of Buffalo	0	603,962	603,962
TOTALS	0	$728,962	$728,962

Contractor: City of Buffalo
Site: Buffalo, Erie County
Contract Duration: 7/97-12/98
Key Words: environmental, municipal, assist business
Project Manager: Jim Reis (518) 862-1090, ext. 3251
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4634-ERTER-MW-98

-> Small Reservoir Management Technologies -- Ilion Water Commission

Investigate use of innovative technologies for improving drinking water quality in small reservoirs.

BACKGROUND

The Ilion water supply consists of three interconnected reservoirs of varying water quality. Water from Reservoir Nos. 2 and 3 is piped to Reservoir No. 1, the terminal supply reservoir prior to treatment. The water from Reservoir No. 1 is treated using slow sand filters and an auxiliary diatomaceous earth filter. Algae growth has contributed to excessive use of chlorine and copper sulfate in the reservoirs for algae control, but results have been unsatisfactory. Algae clogs the slow sand and diatomaceous earth filters causing excess headloss and frequent cleaning. The slow sand filters are often out of service for two to three weeks each time they are cleaned.

OBJECTIVE

To determine the technical and economic feasibility of using watershed best management practices (BMPs), nutrient inactivation, hypolimnetic aeration/oxygenation, biomanipulation, and ligand exchange for algae prevention, control, treatment, or removal in the reservoirs.

DESCRIPTION

The contractor will: (1) monitor water treatment plant activities, (2) obtain water and sediment samples for analyses, (3) prepare and submit technology evaluation plans, (4) conduct an engineering feasibility study of each technology, (5) prepare a final report, and (6) present project findings at a technology transfer workshop.

BENEFITS

The reservoir management technologies are expected to provide the following benefits: (1) lower energy costs, (2) reduce water treatment plant sludge, (3) increase filter runs, (4) eliminate copper loading in the reservoir added when using copper sulfate as an algicide, and discontinue using chlorine for water pretreatment, and (5) lower the amount of operator time required for filter backwashing and maintenance.

SCHEDULE AND STATUS

The water quality sampling and analyses work has been completed. Technology evaluations are under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$75,000	$75,000
Ilion Water Commission	0	36,260	36,260
New York State Department of Health	0	7,000	7,000
TOTALS	0	$118,260	$118,260

Contractor: Ilion Water Commission
Site: Ilion, Herkimer County
Contract Duration: 5/97 - 6/98
Key Words: environmental, municipal, public water, reservoir management
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4624-ERTER-MW-98

-> Small Reservoir Management Technologies - City of Port Jervis

Investigate use of innovative technologies to improve small-reservoir drinking water quality.

BACKGROUND

The City of Port Jervis water system supplies a population of about 9,000, as well as area businesses, with an average of 1.2 million gallons per day of potable water originating from three upland reservoirs. The City's water-treatment plant was constructed in 1992 and features a pre-ozonation step for iron and manganese control. Algae growth in the reservoirs has contributed to excessive use of ozone and coagulant, increased frequency of filter backwashing, and additional residuals-processing and handling requirements. Copper sulfate has been added to the reservoirs to control algae, but results have been unsatisfactory.

OBJECTIVE

To determine the technical and economic feasibility of using watershed best management practices (BMPs), nutrient inactivation, hypolimnetic aeration/oxygenation, enhanced mixing, biostimulant, and biomanipulation for algae prevention, control, treatment, or removal in the reservoirs.

DESCRIPTION

The contractor will: (1) monitor water-treatment plant activities, (2) obtain water and sediment samples for analyses, (3) prepare and submit technology evaluation plans, (4) conduct an engineering feasibility study of each technology, (5) prepare a final report, and (6) present the project findings at a technology transfer workshop.

BENEFITS

Reducing the amount of algae in the reservoir would lower the cost of water treatment in terms of energy, chemicals, labor, sludge management, and wasted water, and improve water taste and odor. Approximately 40% of the City's water-treatment costs are for energy, due to energy-intensive ozonation.

SCHEDULE AND STATUS

The water quality sampling and analyses work has been completed. Technology evaluations are under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$63,887	$63,887
City of Port Jervis	0	20,080	20,080
New York State Department of Health	0	7,000	7,000
TOTALS	0	$90,967	$90,967

Contractor: City of Port Jervis
Site: Port Jervis, Orange County
Contract Duration: 5/97 - 6/98
Key Words: environmental, municipal, public water, reservoir management
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4625-ERTER-MW-98

-> Small Reservoir Management Technologies - Town of Rosendale

Investigate use of innovative technologies to improve small-reservoir drinking water quality.

BACKGROUND

The Town of Rosendale Water District supplies drinking water to 2,200 residents from Still Pond Reservoir. A 200,000-gallon-per-day water treatment plant, consisting of chemical feed, sedimentation, and filtration was constructed in 1992 to comply with the Surface Water Treatment Rule. Algae growth in the reservoir has contributed to inadequate water supply to meet demand, short filter runs, and excessive backwashing. Approximately 60% of the water system operator's time is devoted to managing the nuisance algae problems and up to 30% of the production water is lost for filter cleaning. Replacing lost filter media costs $8,000 per year. Pumping water from an auxiliary supply doubles the Water District's energy costs.

OBJECTIVE

To determine the technical and economic feasibility of using sediment phosphorus inactivation, nutrient interception, and biomanipulation for algae prevention, control, treatment, or removal at Still Pond Reservoir.

DESCRIPTION

The contractor will: (1) monitor water-treatment plant activities, (2) obtain water and sediment samples for analyses, (3) prepare and submit technology evaluation plans, (4) conduct an engineering feasibility study of each technology, (5) prepare a final report, and (6) present the project findings at a technology transfer workshop.

BENEFITS

The reservoir management technologies are expected to provide the following benefits: lower energy costs by 20%, reduce water-treatment plant sludge by two-thirds, eliminate copper loading in the reservoir when using copper sulfate as an algicide, and lower the amount of operator time required for filter backwashing and maintenance.

SCHEDULE AND STATUS

The water quality sampling and analyses work has been completed. Technology evaluations are underway.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$36,994	$36,994
Town of Rosendale	0	13,586	13,586
New York State Department of Health	0	8,600	8,600
TOTALS	0	$59,180	$59,180

Contractor: Town of Rosendale
Site: Rosendale, Ulster County
Contract Duration: 6/97 - 6/98
Key Words: environmental, municipal, public water, reservoir management
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4626-ERTER-MW-98

-> Small Reservoir Management Technologies - Town of Bolton

Determine feasiblity of using innovative technologies to improve drinking water quality in small reservoirs.

BACKGROUND

The Town of Bolton Consolidated Water District supplies an average of 750,000 gallons per day of drinking water from Edgecomb Pond to the residents and businesses of the Town. The Water District does not have a water treatment plant (a new filtration plant is under construction and scheduled for completion in October 1997) and currently adds only chlorine as a disinfectant. Algae growth in the reservoir has contributed to the water's poor taste and odor. A majority of customer complaints occur during the peak demand periods in summer. Adding copper sulfate to Edgecomb Pond has been the method of choice for algae control, but annual application has not been consistently practiced and results have been unsatisfactory.

OBJECTIVE

To determine the technical and economic feasibility of using sediment removal, sediment phosphorus inactivation, hypolimnetic aeration, filter-feeding aquatic organisms, and native macrophyte competition for algae prevention, control, treatment, or removal at Edgecomb Pond.

DESCRIPTION

The contractor will: (1) monitor water treatment activities, (2) obtain water and sediment samples for analyses, (3) prepare and submit technology evaluation plans, (4) conduct an engineering feasibility study of each technology, (5) prepare a final report, and (6) present the project findings at a technology transfer workshop.

BENEFITS

Reducing the amount of algae in the reservoir would lower the cost of water treatment in terms of energy, chemicals, labor, sludge management, and wasted water, and improve water taste and odor.

SCHEDULE AND STATUS

The water quality sampling and analyses work has been completed. Technology evaluations are under way.

FUNDING	Past Years	FY 1997-98	Total Anticipated
NYSERDA	0	$52,365	$52,365
Town of Bolton	0	10,135	10,135
Lake George Association	0	2,500	2,500
Darrin Fresh Water Insttitute	0	500	500
Rensselaer Polytechnic Institute	0	9,728	9,728
New York State Department of Health	0	7,000	7,000
TOTALS	0	$82,228	$82,228

Contractor: Town of Bolton
Site: Bolton Landing, Warren County
Contract Duration: 5/97 - 6/98
Key Words: environmental, municipal, public water, reservoir management
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Drinking and Process Water Treatment
Contract No.: 4627-ERTER-MW-98

-> Influent Hydropower Feasibility Study - City of Lockport

Determine feasibility of influent hydropower station at Lockport wastewater treatment plant.

BACKGROUND

The City of Lockport wastewater treatment plant (WWTP) is at the bottom of an escarpment with a vertical drop of approximately 100 feet. Raw wastewater is conveyed from the top of this escarpment to the WWTP by two interceptor sewers. The City has a combined sewerage system that increases WWTP flow during wet weather. The WWTP typically has an electricity demand of 400-500 kW. Based on a gross available head of 100 feet, the potential generating capacity of an influent-flow hydroelectric facility at the Lockport WWTP is 70-180kW.

ACCOMPLISHMENTS

An engineering and economic feasibility study was completed for an influent hydropower generating facility at the Lockport WWTP. The analysis included evaluating upstream storage to optimize hydropower generation and wastewater treatment.

FINDINGS AND CONCLUSIONS

The study found that installing an influent hydropower facility on the main interceptor could potentially generate up to 700,000 kWh of electricity per year. Because raw sewage is used as the generating medium, electricity-using equipment is needed to protect the hydropower turbine from debris. The energy consumed by the ancillary equipment and building systems would consume about 260,000 kWh per year. Upstream storage of wastewater flows during storms would not significantly increase the generating capacity of the hydropower facility.

REALIZED OR ANTICIPATED BENEFITS

The net energy benefit of the hydropower facility is approximately 440,000 kWh, or $46,000 annually. The cost estimate for the hydropower plant is approximately $930,000, resulting in a 32-year payback.

TECHNOLOGY TRANSFER ACTIVITIES

The final report will be distributed to interested WWTPs and engineers.

FUNDING	TOTALS
NYSERDA	$24,870
City of Lockport	24,886
TOTALS	$52,756

Contractor: City of Lockport
Site: Lockport, Niagara County
Contract Duration: 4/97 - 3/98
Key Words: environmental, municipal, wastewater, hydropower
Project Manager: Larry Pakenas (518) 862-1090, ext. 3247
Program: Environment
Subprogram: Wastewater Treatment and Sludge Management
Contract No.: 4311-ERTER-MW-97