



Message from the Secretary of Energy, Bill Richardson

Americans are entering the new millennium with a deeper understanding of our new energy-efficient technologies. The Department of Energy's new report, *Sharing Success – State Energy Program Special Projects Results*, highlights examples of how Federal organizations, State Energy Offices and industry partners are working together to save energy by fostering efficient building, industrial, and transportation technologies.

Congratulations to all of our State and community partners who are committed to the success of the State Energy Program Special Projects. These and other projects like it are helping to propel State and national goals for a cleaner environment, more efficient energy use, a healthier economy, and increased energy security.

Message from the Assistant Secretary for Energy Efficiency and Renewable Energy, Dan Reicher

Sharing Success – State Energy Program Special Projects Results highlights a number of innovative projects, which are helping to promote energy efficiency and provide clean and green energy for the 21st century.

In Ohio, Louisiana, New England, and Puerto Rico, Special Projects are upgrading building codes to improve energy efficiency. Drivers in Arizona, Connecticut, Oklahoma, and other States are learning more about the use of alternative-fuel vehicles as part of the Department of Energy's Clean Cities Program. Americans across the country are being introduced to the energy-savings potential of geothermal heat pumps, the benefits of wind energy use, and photovoltaic systems.

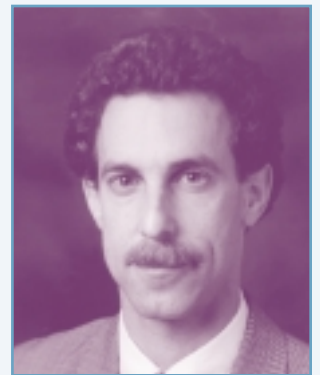
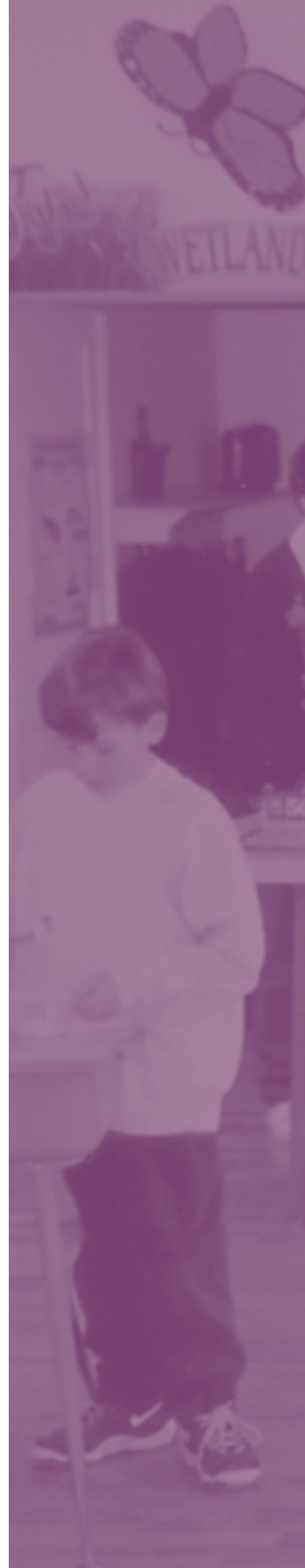


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Introduction

The State Energy Program was created in 1996 by an act of Congress through the consolidation of the State Energy Conservation Program (SECP) and the Institutional Conservation Program (ICP). Formerly, SECP provided funding for a variety of energy efficiency and renewable energy projects, and ICP assisted schools and hospitals with technical analysis and installation of energy conservation measures. Through these programs, more than 8,000 specific State conservation projects have been implemented since 1983 and more than 69,000 buildings have been made more energy efficient since 1979. The Department of Energy's Office of Energy Efficiency and Renewable Energy recognized the value of delivering programs through the States and created Special Projects in 1996.

Energy is a vital component of U.S. citizens' everyday lives and it influences the country's economic growth, national security, public health, and community livability. The Department of Energy's State Energy Program recognizes these essential connections and seeks to strengthen these related concerns through the development and deployment of energy efficiency and renewable energy technologies and practices.

The State Energy Program (SEP) makes it possible for State and Territorial Energy Offices ("States") to design and carry out energy efficiency and renewable energy programs tailored to their State-specific needs, while contributing to national energy priorities. The wide range of activities that the States have carried out under SEP produces tangible energy, economic, and environmental benefits. Increased energy

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efficiency and renewable energy use raises economic competitiveness, creates jobs, reduces industrial waste, avoids emissions, and promotes sustainable development. Increased energy efficiency and renewable energy use enhances national security by diversifying energy sources and providing a stabilizing element in the trade balance.

The State Energy Program enables the States to address both national energy initiatives and local energy priorities through two funding mechanisms: formula grants and Special Projects grants. SEP formula grants are awarded to States according to a national allocation formula derived from the Energy Policy and Conservation Act. States utilize these funds to design and implement energy projects tailored to meet community needs, economic conditions, individual energy situations, and climactic variations.

SEP Special Projects funds are awarded on a competitive basis to States from each of the four end-use sectors (buildings, industrial, power technologies, and transportation) and the Federal Energy Management Program (FEMP) for cost-shared technology projects. Through Special Projects, the end-use sectors and FEMP are able to capitalize upon existing partnerships and programs at the State and community level and utilize the strong SEP infrastructure. These projects represent high-priority activities within each sector's overall program and advance the ability of the end-use sectors to successfully demonstrate and deploy energy efficiency and renewable energy technologies and practices. In many instances, Special Projects serve as the spark which encourages States and Territories to implement broader

energy efficiency and renewable energy projects. Special Projects often provide the data which present new technologies as viable options and train personnel who will implement these projects.

Federal funding for SEP Special Projects has been significantly bolstered by cost share funds from the States. Over the first four years of SEP Special Project grants, DOE has provided \$51.9 million with the States and partners providing a total estimated cost share of \$33 million for 520 projects. The Department of Energy has contributed more than \$24 million for 177 buildings projects, \$10.8 million for 133 transportation projects, \$9.4 million for 96 industrial projects, \$4.9 million for 78 power technologies projects, and \$2.8 million for 36 FEMP projects.

The success of the SEP Special Projects illustrates how effectively the States and DOE's Office of Energy Efficiency and Renewable Energy work together to develop and deploy energy efficiency and renewable energy technologies and practices throughout the country. Each of the Special Projects highlighted in this report demonstrates a unique success within the program. Ground-breaking regional collaboration, replication in other States, substantial private leveraging, widespread information dissemination, and comprehensive data collection are all signs of a successfully executed SEP Special Project. Successful SEP Special Projects utilize the latest technologies, the most innovative practices, and the most visionary partnerships. While this report does not include all the program's successes, it provides a representative cross-section of the Special Projects implemented to date.

Buildings Sector

SEP Spec

The design, construction, and maintenance of our nation's buildings significantly impact the economy and environment. There are more than 76 million residential buildings and nearly 5 million commercial buildings in the United States today. All together, these buildings account for two-thirds of all U.S. electricity consumption and 36% of total U.S. energy consumption. Residential and commercial buildings cost the nation \$240 billion per year to operate. The operation of these buildings also contributes significantly to greenhouse gases and air pollution. By the year 2010, another 38 million buildings will be constructed across the nation. These considerable statistics underscore the buildings sector's pivotal role in the campaign to spread energy efficiency and renewable energy practices.

SEP SPECIAL PROJECTS FUNDING IN THE BUILDINGS SECTOR:

1996	\$6,497,000
1997	\$4,861,000
1998	\$5,185,863
1999	\$7,475,402

total: \$24 million

Across the country, there has been a growing trend towards energy-efficient building construction both in the residential and commercial sectors. Today's homes are, on average, 35% more efficient than those built 20 years ago. Buildings which incorporate energy-efficient technologies are typically more comfortable, have lower energy costs, and a reduced environmental impact. Installation of simple retrofits in existing homes and buildings could reduce energy consumption by 20% to 30%.



ENERGY-EFFICIENT CONSTRUCTION OF RESIDENTIAL BUILDINGS IS A GROWING TREND IN COMMUNITIES ACROSS THE NATION. THE INCORPORATION OF ENERGY-EFFICIENT BUILDING TECHNIQUES CAN RESULT IN A SIGNIFICANT DECLINE IN THE NATION'S ENERGY CONSUMPTION.

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MANY CODES AND STANDARDS SPECIAL PROJECTS RELY ON CLASSROOM TRAINING AS AN INTEGRAL COMPONENT OF ENERGY CODE COMPLIANCE. IN CONJUNCTION WITH THESE CLASSES, ON-SITE TRAINING PROVIDES BUILDERS WITH PRACTICAL, HANDS-ON ENERGY EDUCATION.

Through SEP Special Projects grants, the Office of Building Technology, State and Community Programs (BTS) supports projects which address the creation, expansion, and enforcement of national, regional, and statewide codes and standards in new building construction, as well as projects which promote the conversion and modification of older buildings to incorporate energy efficiency and renewable energy technologies.

CODES AND STANDARDS

Through Codes and Standards Special Projects, States are encouraged to establish comprehensive energy codes. Special Projects also assist States which have existing energy codes but need additional support to expand or enhance their codes to meet or

exceed the 1993 Model Energy Code (MEC) and ASHRAE/IES Standard 90.1 (1989). Through various Codes and Standards projects, BTS is able to directly assist States in reducing energy consumption in residential and commercial buildings and minimize environmental impacts.

Through the *Codes and Standards Special Project*, the State of Louisiana drafted legislation for a statewide energy code for commercial buildings, which the legislature subsequently adopted. The project offered free training, compliance materials, and ongoing education to the State's commercial builders. In the first year alone, over 1,000 new commercial buildings passed compliance regulations, as approved by the Fire Marshall. Louisiana estimates that the





BUILDINGS SECTOR

SEP Spec

Today's homes are, on average, 35% more efficient than those built 20 years ago.

compliant buildings will realize utility bill savings of \$4 million annually and energy savings of 323 billion Btu.

There is burgeoning support for energy codes in the U.S. Territories, as well. In **Puerto Rico**, the *Building Technology Codes and Standards Project* developed the island's first energy code. The code set minimum requirements for the design of new residential and commercial buildings. While Puerto Rico's code was based on existing energy codes, adaptations were made for the island's unique climate and construction methods.

Special Projects also assist States in updating their codes to reflect code modifications and updates on the national level. The

Northeast Regional Building Codes Energy Project is a collaboration between **Connecticut, Delaware, Washington, D.C., Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont**. These partners recognized that their outdated energy codes were resulting in lost energy-saving opportunities for buildings in each State. In addition to energy code upgrades, the partnership offers support for code implementation and provides energy code training to building professionals. The program also encourages utility participation in the form of financing and public education. In New York State alone it was determined that an upgrade to the existing energy code would result in \$3.5 million in annual energy savings.



ONCE DESIGNERS AND BUILDERS HAVE ATTENDED ENERGY CODE TRAINING, THEY CAN EASILY INCORPORATE THESE METHODOLOGIES INTO THEIR WORK.

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IN HAWAII, THE ADVANCED TECHNOLOGIES TRAINING PROGRAM HAS CREATED A MOBILE DISPLAY UNIT TO PROVIDE ACCESSIBLE ENERGY EFFICIENCY TRAINING TO THE BUILDING INDUSTRY.

One of the most important aspects of energy code compliance is the education of the building community, including designers, architects, inspectors, building managers, construction personnel, and contractors. The States of **California** and **Nevada** have partnered with the Building Industry Institute to create one of the most effective Codes and Standards projects in terms of market penetration, entitled *Builder Training on Energy Codes*. Aimed at builders, the program involves a half-day of classroom training in energy codes and a half-day of on-site inspections, with a six-month follow-up session. In just over three years, the program has trained 253 large production builders. Since the training, these builders have constructed 63,000 homes, resulting in an estimated energy savings of \$1.2 million dollars annually for the compliant new homes.

In **Hawaii** the *Advanced Building Technologies Training Program* has successfully disseminated information on advanced techniques to both the building industry and the general public. In addition to holding workshops, the program created five mobile display modules and distributed resource guides. *Codes and Standards* in **Iowa** also created workshops to educate the building community of code requirements and updates. In addition, the project also developed an effective and simplified way for builders to comply with the State's energy code, including Iowa-specific residential and commercial energy code toolkits, Iowa-specific checklists for code compliance, and a "how-to" manual on cost-effective, energy-efficient construction techniques. The program was supported by \$125,000 in Special Projects funds and the State was able to raise a significant \$86,000 in leveraged funds.

Since attending Codes and Standards training in California and Nevada, builders have constructed 63,000 homes, resulting in an estimated energy savings of \$1.2 million annually for compliant homes.



Residential and commercial buildings cost the nation \$240 billion per year to operate.



THE THOROUGH INSPECTION OF WATER HEATERS AND OTHER MAJOR APPLIANCES IS CRUCIAL IN DETERMINING WHICH ENERGY-EFFICIENT ADJUSTMENTS ARE REQUIRED IN NEW AND EXISTING BUILDINGS.

Ohio's Codes and Standards Project employed a multi-faceted approach to encourage code compliance. The project provided 26 sessions of Model Energy Code training and conducted 17 other sessions on energy-efficient lighting and energy-efficient construction, reaching a total of 400 members of the building community. *Wisconsin's Comprehensive Approach to Energy Codes Project* has offered a myriad of educational services, as well. The project held workshops to educate over 1,350 builders, subcontractors, and designers on the Uniform Dwelling Code and offered on-site compliance training for the code.

Some Codes and Standards projects focus on increasing compliance by creating better energy efficiency software programs. The *HiLight Software Program* in **Hawaii** has been extremely successful in educating architects, engineers, and building codes officials about the lighting portion of the Model Energy Code. Hawaii created an integrated software program that allows the user to input the building's lighting specifications,

and then determines whether the building is compliant or suggests the proper changes. Lighting is especially important in tropical climates, as the commercial buildings are air-conditioned twelve months a year and lighting systems can be a significant source of heat. Through proper code compliance, both the electricity and air-conditioning expenses can be lessened considerably. To date, this project's software and training have been utilized by American Samoa, Guam, Wisconsin, Puerto Rico, Washington, D.C., Oregon, and the Federal Energy Management Program (FEMP).

Several States have modernized their State's computerized energy code compliance systems through SEP Special Projects. In **Florida**, the *Codes and Standards Project* created a partnership between the Florida Energy Office and the Florida Solar Energy Center which upgraded the energy efficiency analysis software to a windows-based interface in response to user suggestions.

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Some States have acquired a more hands-on approach to code compliance through the employment of a circuit rider. In **Oregon**, the *Non-Residential Energy Code Circuit Rider* is a full-time position. The Circuit Rider travels to construction sites across the State to offer on-site technical assistance.

As energy-efficient construction can sometimes incur slightly higher costs at the outset, financing can be an impediment. In **Nebraska**, the *Financing Incentives for Increased Energy Efficiency in Nebraska*

Program was established to mitigate this problem. The project enables private lenders to offer low-cost loans to cover the incremental costs of construction in units that reduce energy consumption by 30%. The State was able to supplement the \$400,000 Federal grant by leveraging \$405,000 in private funds. This seed money is kept in a revolving account in order to continue providing low-cost financing to builders. In addition, the designers and builders are educated as to which energy efficiency features are most affordable.

The **Maryland Energy Codes and Building Standards Project** focused on advanced education for building professionals and local code officials. In order to provide easier compliance to the Council of American Building Officials Energy Code, the project created a software tool for use by local code officials at the plan review and inspection phases. Additionally, the project strives to make other educational opportunities a viable option by offering “scholarships” to code officials to attend conference training on various technical subjects.



Rebuild Iowa has implemented \$130 million in retrofits, resulting in \$23 million annual energy cost savings.



REBUILD IDAHO HAS PERFORMED RETROFITS IN BUILDINGS ACROSS THE STATE, FOCUSING ON EDUCATIONAL FACILITIES SUCH AS THIS RURAL IDAHO ELEMENTARY SCHOOL.

REBUILD AMERICA

One of the most broadly-based BTS programs is Rebuild America. Rebuild America is a nationwide initiative that helps communities save money, create jobs, and protect the environment through implementation of energy-efficient retrofits in existing commercial buildings and multi-family housing units. With 250 partnerships in 47 States, Native American Tribes, and in three U.S. Territories, the program is well on its way to reaching its goal of completing energy efficiency retrofits in 2 billion square feet of floor space by 2003. If this goal is achieved, the United States will save \$650 million dollars in energy costs each year and reduce air pollution by 1.6 million tons of carbon dioxide annually. *Rebuild Utah* is an outstanding example of the breadth and diversity of the program. The program has performed retrofits in 24 buildings of the University of **Utah** campus, which will save the school \$1.86 million per year in energy costs.

Partnerships are key to making Rebuild America projects work. *Rebuild Idaho* consists of eleven partners, including two universities, one college, two utilities, three school districts, and five communities. The Rebuild Idaho partnership aims not only to provide cost-saving retrofits, but to establish itself as the foremost program to assist **Idaho's** communities, school districts, businesses, and industries in developing sustainable, long-term energy and resource efficiency strategies.

Rebuild Iowa is a collaborative effort that brings together diverse public and private sector organizations to make cost-effective, energy efficiency improvements in existing buildings. Since the inception of the program, more than \$130 million in retrofits have been implemented, resulting in \$23 million annual energy cost savings for **Iowa's** school districts, local governments, hospitals,

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Location	Estimated Annual Energy Cost Savings
University of Hawaii at Hilo	\$465,000
County of Hawaii	\$61,000
County of Kauai	\$35,000

REBUILD HAWAII PARTNERSHIPS HAVE BEEN PARTICULARLY ACTIVE ACROSS THE STATE, RESULTING IN SUBSTANTIAL ANNUAL ENERGY SAVINGS.

and private colleges. The financing for these improvements has been supported by more than \$800,000 in privately-leveraged funds.

Providing another example of effective partnerships and exceptional leveraging efforts, *Rebuild Hawaii* is comprised of a consortium of more than 20 partners including utility providers, private companies, universities, and Federal, State, and local governments.

Using \$313,000 in SEP Special Projects funds as seed money, local organizations donated a total of more than \$3.0 million. Rebuild Hawaii's mission is to identify and leverage statewide resources, create community awareness, and find additional support for energy efficiency projects. Performance contracts have been implemented at sites across **Hawaii**, identifying significant energy savings.

Rebuild Utah has performed retrofits in 24 buildings at the University of Utah campus, which will save the school \$1.86 million per year in energy costs.



THE REBUILD HAWAII PROJECT PROVIDED FOR THE INSTALLATION OF A 400-TON VARIABLE SPEED CENTRIFUGAL CHILLER AT THE UNIVERSITY OF HAWAII.

The Federal government is the single largest energy consumer in the United States, requiring energy for approximately 500,000 buildings comprising over 3 billion square feet of floor area. Increased efficiency in the Federal government's energy consumption can deliver substantial energy and financial savings to the nation as a whole. Additionally, the successful implementation of energy-efficient practices can act as a catalyst to encourage State and local governments, privately-owned companies, and other entities to emulate these actions. Through the adoption of energy efficiency and renewable energy technologies and practices, the Federal government can provide a working model with proven results for the nation.

SEP SPECIAL PROJECTS FUNDING FOR FEMP:

1996	\$554,000
1997	\$580,000
1998	\$966,000
1999	\$683,349

total: **\$2.8 million**

The Federal Energy Management Program (FEMP) seeks to not only assist in streamlining the Federal budget through cost-saving strategies, but to set an energy example for the nation. FEMP is a customer-oriented program, which seeks to create partnerships, leverage resources, transfer technology, and provide training and support to the thousands of Federal offices nationwide. When agencies commit to these energy efficiency projects, the Federal sector moves closer to achieving broader energy and cost saving



HEADQUARTER I CORPS IS ONLY ONE OF THE MANY BUILDINGS AT FORT LEWIS IN TACOMA, WASHINGTON, THAT WAS MADE MORE ENERGY-EFFICIENT THROUGH FEMP AND SEP SPECIAL PROJECTS.

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goals. One of these goals, set by Executive Order 13123, is to reduce net energy consumption by 35% from FY 1985 to FY 2010. Federal agencies can meet this goal by implementing energy efficiency and renewable energy practices and technologies.

Through SEP Special Projects funding, FEMP conducts three types of activities: project financing, technical guidance and assistance, and planning, reporting, and evaluation. FEMP guides Federal agencies in their energy efficiency efforts and helps Federal Energy Managers identify and procure the best, most cost-effective energy-saving projects. State Energy Offices and FEMP work together to develop innovative ideas to implement their goals on the State and local level.

The State of **Michigan** implemented a standout project with ambitious goals. The *FEMP/Michigan Partnership Grant* employed three key tactics to promote energy and water efficiency: training, on-site technical assistance, and information dissemination. With assistance from the Michigan Department of Consumer & Industry Services, the project used the Internet to identify 180 Federal agency contacts. The project then asked those contacts to submit the most recent 12 months of utility history, along with floor plans and other pertinent information. After professional pre-evaluation, a sub-contractor contacted the agencies for energy audits. Upon completion of the audits, the results were fully explained and cost-cutting strategies were proposed. The agencies were also provided information regarding building operator training, business manager basic energy

training, energy efficiency scholarships, and other FEMP services. To date, the FEMP/Michigan Partnership grant has audited 27 buildings (865,038 square feet) and identified \$864,000 in energy improvements.

Some States have shown exemplary dedication to achieving the goals of Executive Order 13123. **New York** has been especially active with the FEMP program, concentrating on achieving energy efficiency at Armed Services facilities across the State.

The *Federal/New York State Energy Management Partnership* conducted three projects at the U.S. Army's Fort Drum. In 1996, the FEMP project evaluated the current ventilation system and recommended energy-efficient options for installing an air-conditioning system. The study identified five technologies as viable: geothermal, desiccant cooling, ice storage, conditioned ventilation, and modular fancoil units. Geothermal was determined to be the most cost- and energy-efficient technology. Fort Drum has designed a GHP ventilation system and is awaiting its installation.

Funding from this SEP Special Project was also used to address the water and wastewater system of Fort Drum and the surrounding area. The analysis showed that the two 350hp wastewater pumps were tremendously oversized, and a single 75hp pump would meet present wastewater needs. Installation of the pump created an energy savings of \$11,500 per year and has reduced the Fort's energy budget by 14% annually. In 1997, the Federal/New York State Energy Management Partnership again assisted Fort Drum, but this project

Installation of a wastewater pump at Fort Drum resulted in \$11,500 annual energy savings and reduced the Fort's energy budget by 14%.



DANGLING ROPE MARINA, UTAH, UTILIZED A NEW GENERATION OF HYBRID PV POWER EQUIPMENT. THIS NEW TECHNOLOGY, COMBINED WITH THE DECLINING COSTS OF PV, CONTRIBUTES TO AN EXPANDING MARKET FOR LARGE-SCALE PV HYBRID POWER SYSTEMS.

addressed the coal-fired water heating facilities at the compound. This system had been costly to operate and, due to the existence of gas lines, the Fort had decided to convert the system to natural gas. The evaluation of that conversion determined that a 147 building retrofit would yield \$292,000 in annual savings. To date, the Fort has converted 150 buildings and plans to convert 300 more.

Another recipient of the Federal/New York State Energy Management Partnership, was the U.S. Air Force's Verona Test Annex at the Rome Research Site. In 1996, FEMP analysis identified \$140,000 in energy efficiency improvements that would save \$13,740 annually in electricity and fuel oil. FEMP again conducted a project at the Rome Research Site in 1997, addressing the cooling system for the compound's high-power laser activities. The existing model cooled 13 lasers with a once-through, portable water system that wasted 4,000 gallons per day and did not adequately cool the lasers in the summer months. The Federal Research Site asked that FEMP

evaluate two different types of cooling systems to replace the existing inefficient method. The analysis determined that a central chiller would save \$87,500 in annual costs and 430,000 kilowatts of electricity per year.

Washington State is providing energy efficiency assistance to a variety of local entities through a partnership between FEMP and Washington State University. The two groups joined forces to launch an energy efficiency information and training network, which developed Resource Efficiency Managers (REMs) within public, private, and government organizations to seek out energy efficiency opportunities and develop energy efficiency projects. The FEMP/Washington State University partnership developed in-person training on resource conservation, promoted a nationwide network of REMs to encourage peer exchange, developed a call-up information service, and began a Total Efficiency Network (TEN) website. The partnership has also created fact sheets, success stories, newsletters, and software, conducted workshops and

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training, and organized conferences. TEN has provided technical assistance to hundreds of people, and has coordinated efforts at U.S. Army Base Fort Lewis, U.S. Navy Station Whidbey Island, U.S. Navy Undersea Warfare Engineering Station, five private utility companies, and various school districts and universities.

One of the most widely successful and diverse FEMP projects to date is *Utah's Energy Program for National Parks*. The project provided technical assistance in a variety of forms to 11 separate parks, monuments, and historic sites within the State's National Park Service. The focus of this project was not only to save energy for the Federal agency, but also to explore alternate energy options. Energy audits were performed at Dinosaur and Timpagos Cave National Monuments, Bryce Canyon and Capital Reef National Parks, and at the Golden Spike Locomotive Building (a historical landmark). The total audited area was 164,000 square feet, and over \$100,000 of energy efficiency projects were identified. The National Park Service estimated an energy cost savings of \$21,000 per year.

Many of the National Parks in **Utah** are located off the power grid and must be powered by generators or other means. Some parks are already utilizing existing photovoltaic (PV) systems, and those sites were subjected to performance verification studies. From these studies, approximately 50 defective modules were replaced under warranty. Six State parks were analyzed based on economic factors and engineering feasibility to determine which alternative power systems were most viable. From this information, it was determined that PV systems were appropriate for several of the sites, including Canyonlands – Maze District, Canyonlands – Needles District, Dangling Rope Marina, and Halls Crossing Marina. Currently, there are seven renewable energy projects that are complete or in process due to Utah's Energy Program for National Parks. Together, these sites resulted in significant environmental benefits, avoiding the use of 284,000 gallons of various conventional fuels per year. Additionally, the parks mitigated 257 tons of carbon dioxide emissions, 4,706 lbs. of nitrogen emissions, and 430 lbs. of sulfur emissions.

Executive Order 13123 requires that the Federal Government reduce its net energy consumption by 35% from FY 1985 to FY 2010.

Location	Initial System Cost (fuel + operating cost)	Annual Savings	Years to Payoff
Needles District PV	\$550,000	\$23,400	23.5
Dangling Rope PV	\$306,000	\$25,600	11.9
Zion Remote Cabin PV (2 PV systems)	\$12,500	\$6,000	2.0
Bryce Canyon Water Pumping (2 PV systems)	\$18,500	\$8,800	2.1
Dinosaur Fire Tower	\$8,700	\$1,300	6.6
Maze District Inverter	\$26,700	\$4,500	5.9

Industrial Sector SEP Spec

Roughly a third of U.S. energy is consumed by the industrial sector, making the sector a critical factor in our country's economic development. It is also the largest solid waste-producing sector in the nation. The United States generates 14 billion tons of industrial waste each year. The effective implementation of energy-efficient practices will improve the competitiveness of U.S.-owned companies, and also assist the nation in maintaining its global economic interests.

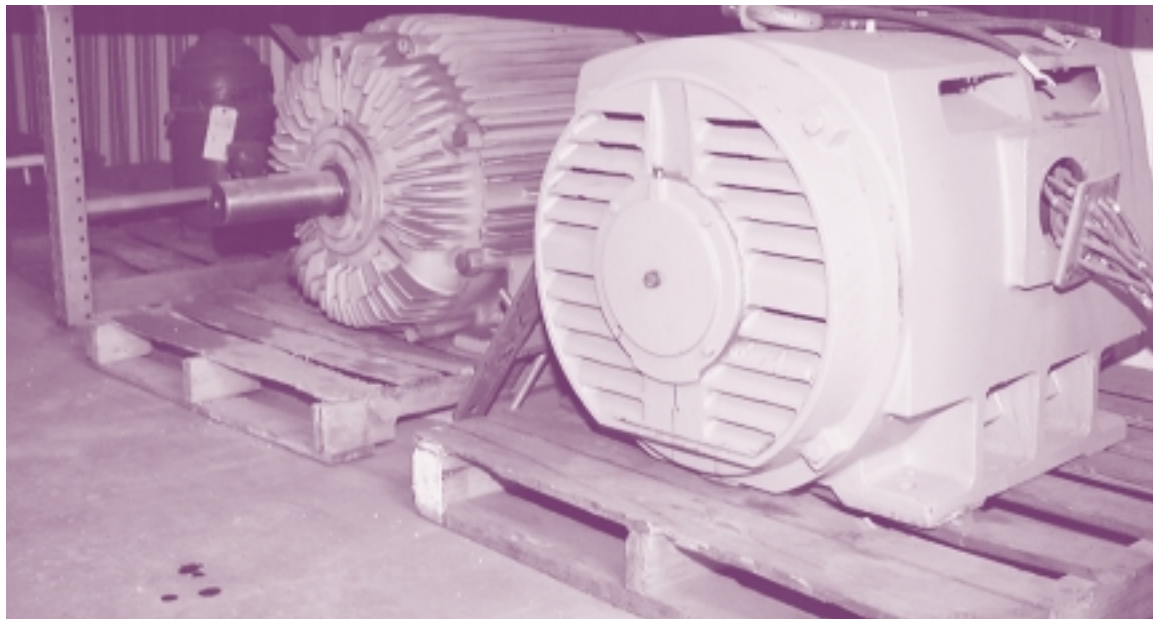
The Office of Industrial Technologies (OIT) aims to improve productivity, reduce waste, and save energy in the industrial sector through the creation of partnerships between manufacturers, government, and supporting laboratories. There is an emphasis on integrated delivery systems, which

SEP SPECIAL PROJECTS FUNDING FOR THE INDUSTRIAL SECTOR:

1996	\$2,000,000
1997	\$1,375,000
1998	\$2,480,000
1999	\$3,504,684

total: \$9.4 million

offer industrial clients a portfolio of energy efficiency recommendations, productivity-enhancing products, valuable services, and cutting-edge technologies. OIT supports thirty Industrial Assessment Centers nationwide, which enable small- and medium-size manufacturers to receive industrial assessments at no cost. Through SEP Special Projects, OIT has supported programs like NICE3 (National Industrial Competitiveness through Energy/Environment/Economics),



THE MOTOR CHALLENGE PROGRAM STREAMLINES THE BASIC MOTORIZED MECHANISMS OF PARTICIPATING PLANTS TO CREATE LONG-TERM ENERGY SAVINGS. THESE MOTORS IN DENVER, COLORADO, AWAIT REPAIRS WHICH WILL ALLOW FOR MORE EFFICIENT UTILIZATION IN INDUSTRIAL ENVIRONMENTS.

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IMPROVEMENTS IN INDUSTRIAL STEAM SYSTEMS CAN PRODUCE SIGNIFICANT COST SAVINGS. REVIEW OF THIS PETROLEUM REFINERY'S BOILER, STEAM DISTRIBUTION, AND CONDENSATE SYSTEMS INDICATED A POTENTIAL SAVINGS OF \$1 MILLION DOLLARS.

Inventions and Innovation, and Best Practices for Motors, Steam, Compressed Air, and Combined Heat. More recently, OIT has launched SEP Special Projects for State “Industries of the Future.”

A number of technologies are vital to a broad cross-section of U.S. industries and due to their widespread use, even small efficiency improvements can produce substantial energy and cost savings. These technologies include sensors and controls, combustion mechanisms, motors, heat and power sources, steam sources, and compressed air machines. The fact that these machines are operated every production day throughout the year is a testament to their savings potential.

Since nearly 70% of all electricity used in industry is consumed by some type of motor driven system, increases in the energy efficiency of existing motor systems will lead to significant nationwide energy savings. SEP Special Projects have addressed this opportunity through the implementation of the Motor Challenge Program. The main goal of the Motor Challenge Program is to work in partnership with industry to increase the market penetration of energy-efficient motor-driven systems.

Many States have found that the Motor Challenge Program is widely integrated and its energy-efficient practices eagerly adopted. The *Alabama Motor Challenge Program* has held eleven conferences in *Alabama* and





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ELECTRICITY DEREGULATION HAS OFFERED MANY OPPORTUNITIES FOR SMALL BUSINESS OWNERS IN MICHIGAN AND OHIO TO IMPROVE THEIR ENERGY EFFICIENCY AND BOTTOM LINES. THE MULTI-STATE PROJECT TO DELIVER INDUSTRY WORKSHOPS PROVIDED TARGETED INFORMATION FOR THESE CONSUMERS.

has made over 500 Motor Challenge contacts, with an estimated \$9,000 in savings per client. The program has also distributed more than 343 copies of its MotorMaster+ software to trained users and held one of the first Motor Challenge Adjustable Speed Drive seminars. Similar results were experienced in Ohio, where the *Motor Challenge Program* partnered with local utilities, leveraging \$200,000 in private funds to subsidize the \$100,000 Federal grant. The Motor Challenge Workshops provided training to almost 300 Ohioans across the State.

Another innovative technology for industry is combined heat and power systems (CHP), which can produce significant increases in fuel use efficiency as compared to conventional thermal electric plants. CHP systems also can result in major reductions in air pollutants and carbon emissions. When fully integrated with a distribution link to

multiple industrial or commercial thermal loads, efficiencies as high as 80% to 90% can be achieved.

The State of Washington's *Combined Heat and Power Project*, in partnership with Washington State University, has developed computer simulation software which provides a heat map model to assist manufacturers in realizing the technical, economic, and environmental benefits of CHP. The software also provides CHP siting criteria and has integrated the capabilities of the district's energy providers.

While each of these projects addresses specific industry needs and produces replicable models for other States, some all-inclusive projects have been created to address common regional concerns. These projects achieve success through extensive State collaboration, leveraging of funds, and on-going partnerships.

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In the Midwest, **Michigan** and **Ohio** collaborated to create the *Multi-State Project to Deliver Industry Workshops*, and held five industry-wide workshops aimed at small- to medium-sized businesses and utilities. The goal was to educate these consumers of the impending electricity deregulation. The workshops emphasized the concepts of energy conservation, peak load demand reduction, cost unbundling, and time-of-use metering and billing. These practices can result in 25% to 30% cost savings for small businesses.

The *Northeast Regional Industrial Technology Collaborative* was created to promote technology exchange across industries and State lines. The partnership included seven States (**Connecticut, Maine, Massachusetts, New Hampshire, New York,**

Rhode Island, and Vermont), the Department of Energy's Boston Regional Office, three Industrial Assessment Centers, four universities, and various community organizations. The partnership was able to raise \$60,000 in private funds to reinforce the \$134,000 Special Projects grant. The Collaborative held three regional meetings to increase communication and peer exchange. These efforts resulted in daily communication between the States which broadened the collective knowledge of the staff, enhanced the delivery of services, and maximized funding resources. The partnership has generated diverse outcomes including Motor Challenge workshops, Industrial Technology workshops, an Energy Expo, and the International Energy and Environment Summit, just to name a few.

States in other regions have also recognized their shared industrial concerns and collaborated to promote energy efficiency. These collaborations between States, private companies, and institutions offer an opportunity for industry to further explore energy efficiency options. For the *Industrial Technologies Project*, Utah and Wyoming joined forces to market various energy efficiency programs, including Climate Wise, NICE3, Green Lights, Motor Challenge, and Steam Challenge. In coordination with State Energy Offices, PacificCorp, Mountain Fuel Supply, and the University of Wyoming, the project held two regional conferences and four workshops.



INDUSTRIES OF THE FUTURE

The Industries of the Future (IOF) strategy is one of OIT's most inventive and dynamic programs. The IOF strategy targets nine energy- and waste-intensive industries, with the goal to assist those industries in reducing their energy use while improving their economic competitiveness. Industry-driven documents outlining each industry's vision for the future coupled with technology road maps to identify those technologies that offer the most significant rewards comprise the mechanisms by which the IOF strategy is executed.

The nine industries targeted by IOF are agriculture, aluminum, chemicals, forest products, glass, mining, metalcasting,

petroleum refining, and steel. As a result of the intense energy-consuming nature of these industries, they realize the greatest benefits from advances in energy efficiency technologies. The program also offers advantages to the industrial laboratories through the identification of high-risk, high-payoff technologies and the subsequent encouragement of industrial and Federal research, development, and deployment efforts.

The State of West Virginia's *Industries of the Future Project* implemented a variety of activities to achieve industrial goals. The project allowed for energy and waste assessments of the wood products industry, implemented NICE3 projects in the steel industry, hosted conferences for metal-

Full integration of Combined Heat and Power systems can increase efficiencies to 80% to 90%.

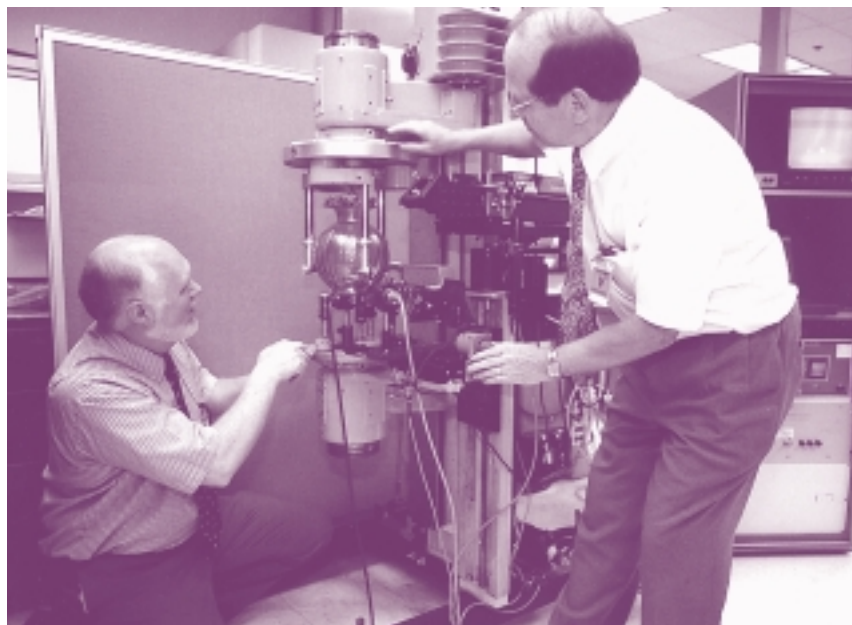


THE FOREST PRODUCTS INDUSTRY EMPLOYS MORE THAN 1.3 MILLION PEOPLE AND RANKS AMONG THE TOP 10 MANUFACTURING INDUSTRIES IN 46 STATES. THE ADOPTION OF ENERGY-EFFICIENT PRACTICES BY THIS INDUSTRY OF THE FUTURE CAN OFFER SUBSTANTIAL ENERGY SAVINGS THAT CAN BE FELT ON A NATIONAL LEVEL.

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SCIENTISTS AT WEST VIRGINIA UNIVERSITY DEMONSTRATE A PROTOTYPE LASER GLASS CUTTING/FINISHING MACHINE. THE STATE IOF PROGRAM HAS PROMOTED THE USE OF THE ADVANCED MACHINES WHICH RESULT IN SUBSTANTIAL SAVINGS FOR GLASS MANUFACTURERS, BOTH BY RAISING PRODUCTIVITY AND DRAMATICALLY REDUCING WASTE.



The industrial sector comprises nearly 1/3 of U.S. energy consumption.

casting manufacturers, and evaluated energy savings in the aluminum industry. Within the State's IOF program, the West Virginia Glass Industry Technical Initiative has been particularly active. Ten conferences have been conducted, involving a cross-section of glass producers in the State, including container glass, flat glass, ceramic and china, and specialty glass manufacturers. The conferences were held to introduce the manufacturers to current advancements in their industry, such as new fiberglass waste procedures and laser glass cutting techniques.

The *Northwest Collaboration for Manufacturing Excellence* (a joint effort between **Oregon** and **Washington**) emphasized providing the States' manufacturing industries with information about the various IOF programs and the full power of IOF resources at their disposal. Through a program conducted at the Plant Engineering Show in Portland, Oregon, the collaboration educated manufacturers from a wide variety of industries in the region. These educational efforts strengthen the industries' ability to compete on both regional and global levels.

Power Technologies Sector

The role of the power technologies sector is expanding in response to many factors, including the nation's growing environmental concerns, widespread utility restructuring, and the increasing trends toward community sustainability and environmental preservation. These opportunities are being addressed through the use of renewable energy options such as photovoltaics, concentrated solar power, wind energy, geothermal energy, hydropower, and biomass power. Increasing use of clean energy will drastically change the power sector by diversifying energy sources, reducing greenhouse gas emissions and pollutants, improving the reliability of service, and lowering energy costs. The development and deployment of renewable energy and energy efficiency technologies will accelerate the integration of alternative energy.

SEP SPECIAL PROJECTS FUNDING FOR THE POWER TECHNOLOGIES SECTOR:

1996	N/A
1997	\$1,352,000
1998	\$1,736,084
1999	\$1,775,855
total:	\$4.9 million

The mission of the Office of Power Technologies (OPT) is to lead the national effort to support renewable technology efforts and to assist in the development of clean, credible, and reliable power technologies for the 21st century. By working with utilities, industries, laboratories, and other stakeholders, OPT maximizes the market potential of renewable energy and energy efficiency technologies. The majority of OPT's Special Projects focus on the construction of demonstration sites and test modules to test the feasibility of the various

THE DATA COLLECTED FROM SMALL-SCALE PV MODULES ARE USED TO ESTABLISH A VARIETY OF LARGER SCALE APPLICATIONS ACROSS THE NATION. ONCE INSTALLED, PV SYSTEMS CAN OPERATE CONTINUOUSLY WITH LITTLE MAINTENANCE AND MINIMAL OPERATING COSTS.



Special Projects Report



POSSIBLE APPLICATIONS FOR SMALL-SCALE PV SYSTEMS INCLUDE RESIDENTIAL HOMES.

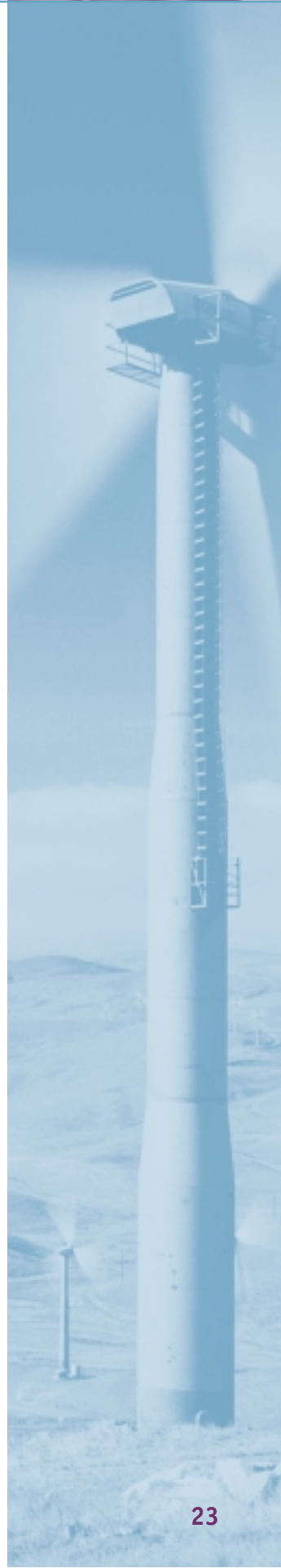
alternative power sources and to educate the public on these technologies. Additionally, OPT's Special Projects are tailored to meet a region's specific power opportunities. Photovoltaics are emphasized in sunnier climates, biomass is explored in farming communities, and geothermal heat is tested in areas where underground heat exchange loops can be easily installed.

PHOTOVOLTAICS

Photovoltaics (PV) systems, or solar cells, are among the most widely used renewable energy sources. PV systems convert light energy into electrical energy and, in addition to being less taxing on the environment, they require little or no maintenance and have low operating costs. PV systems are already commonplace in everyday life in

the form of the simple systems that power calculators. The goal of OPT is to make larger, more complex systems an integral factor in powering communications, lighting, water, and electrical systems.

Photovoltaics for Utility Systems Applications Project (PVUSA) is a national public/private partnership that is assessing and demonstrating the viability of PV systems through a network of smaller projects. The projects conduct demonstration-related research and, as of 1997, operated two dozen grid-tied PV systems across the nation with a combined capacity of 2.3 megawatts. In the first nine years of use, PVUSA generated enough energy to offset the equivalent of 18,000 barrels of oil, or the same as the annual electricity consumption of 2,000 homes. PVUSA is a noteworthy project, both because of its scope, which includes long and



In the first nine years of use, PVUSA generated enough energy to offset the annual consumption of 2,000 homes.



THE CHOPTANK ELEMENTARY SCHOOL, IN CAMBRIDGE, MARYLAND, EXPECTS TO SAVE \$400,000 IN ENERGY AND MAINTENANCE COSTS OVER THE NEXT 20 YEARS AS A RESULT OF ITS GHP USE.

short-term demonstrations, and its funding, which is supported by a partnership of 17 public and private utility and government agency sponsors. Partially funded by SEP Special Projects, the *Small Systems Test Center*, located in Davis, **California**, has enabled PVUSA to perform short-term evaluations of today's commercially promising rooftop scale PV systems. Through SEP Special Projects funding in **Florida**, PVUSA tests large-scale PV systems to be used in utility applications. The results of these projects are entered into a database which is publicly available on the Internet.

PV systems can be a cost-effective technology for supplying electricity in a variety of remote areas. In **Colorado**, the *Installation of PV Applications in Sylvan Lake State Park Project* incorporated PV systems into park construction and performed retrofits on older buildings to provide the park with renewable power. On the remote islands

located in the U.S. Territory of the **Northern Mariana Islands**, PV systems offer more than just a source of power. The *Upgrade of Solar Power System for Seismic Monitoring Stations Project* focused on the modernization of seismic stations on the island of Saipan. Reliable operation of these stations is critical in providing the warning systems which notify the surrounding communities of possible tsunamis and volcanic eruptions. In another example of photovoltaic use increasing public safety, the *Remote Communication Network Project* in **New York** successfully utilized PV technology to improve the police communication systems in mountainous regions of the State.

GEOTHERMAL HEAT PUMPS

Geothermal heat pump (GHP) systems use the Earth's natural thermal energy to heat or cool residential, commercial, and institutional buildings. The only additional energy

Special Projects Report



GHP systems require is the small amount of electricity they employ to concentrate what nature provides and then to circulate high-quality heating and cooling throughout a structure. When used in space heating, GHPs can reduce electricity consumption in homes by as much as 75% and improve indoor air quality.

South Carolina's mild climate and the robust rate of new construction annually render GHP an extremely viable power option for the State. The *Support Installation of Geothermal Heat Pump and Training for Contractors Project* was primarily developed to increase public and building industry awareness of geothermal technology and practices. The project established three GHP demonstration sites

across the State to be viewed by the public and used for on-site training by architects, builders, installers, and engineers. The project advanced the use of renewable energy sources in mainstream construction and effectively leveraged matching funds, raising \$103,000 in funds to supplement the \$90,000 Federal grant.

Maryland's first GHP system was installed at the Choptank Elementary School in Cambridge, Maryland. The *Geothermal Heat Pumps Special Project* funded an information and learning center complete with an interactive kiosk-style video monitor at the school. The learning center features real-time data from several of the system's monitoring points and includes a history of the system's design and installation.

When used in space heating, GHPs can reduce electricity consumption in homes by as much as 75%.



DURING THE INSTALLATION OF A GEOTHERMAL HEAT PUMP, TWO WORKERS DRILL HOLES TO CREATE GROUND-COUPLED HEAT EXCHANGE LOOPS. HOLES FOR GHP USE MUST BE 4 INCHES IN DIAMETER, AND BETWEEN 125 TO 450 FEET DEEP.



A benefit of biomass gasification systems is the ability to adapt to a farm's waste disposal needs at any given time.

A RESEARCHER EXAMINES WOODCHIPS WHICH WILL BE PROCESSED IN A BIOMASS GASIFIER TO PRODUCE ETHANOL.



BIOMASS

Both crop and livestock farmers realize the importance of environmental preservation, as their very existence is dependent upon the land. Many swine, poultry, and dairy producers are becoming more interested in alternative energy sources to reduce environmental damage and biomass offers an ideal solution. Biomass systems convert a variety of farm wastes into gases, which are then used to generate energy. This technology can be widely applied across many agriculture and livestock industries. In the Mid-Atlantic region, and specifically the Chesapeake Bay area, there is an excess phosphorous problem as a result of the poultry industry. In an effort to address regional concerns and mitigate related soil problems, the *Small Scale Biomass Project* in **Maryland** established a model for generating electricity using a co-fired system. The

system would primarily utilize poultry waste, but would also use switch grass and wood chips as fuel.

A benefit of biomass gasification systems is the ability to adapt to a farm's waste disposal needs at any given time. The *Indiana Feedstock Diversification for Downshaft Channel Gasifier Project* constructed a second-generation biomass gasifier. The gasifier processed about one ton per day of feedstock and produce wastes, then fueled an engine which generated 40 kilowatts of electricity per day. This mobile test module was used to test wood chips, switch grass, alfalfa, and manure and is now used as a demonstration module at sites across the State.

In addition to utilizing a variety of farm-waste types, biomass systems often incorporate several technologies for operation. In

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Mississippi, the *Biomass Power Project* developed a farm model which utilized an aerobic digester to manage farm wastes and produce methane. The methane was then used to provide energy and hot water to the farm. The model also incorporated fuel cell and propane technology to provide an example of a self-sufficient farm which incorporates a variety of renewable energy sources.

Another model which effectively demonstrated methane capture was **Iowa's** *Alternate Energy Production Project*, which focused on livestock operations. The project leveraged four times (\$400,000) the Federal grant of \$100,000, and created the methane capture demonstration site. The site was a 4,800-sow, farrow-to-wean operation and produced 40%–60% of the farm's

electricity. Livestock wastes were captured and used to heat the digester, which produced 646,488 kilowatts hours of electricity annually. This generation is equivalent to the annual consumption of 76 U.S. homes. Additionally, this rate would avoid emissions of 808 tons of carbon dioxide as compared to coal combustion.

WIND ENERGY

As more States, utilities, and other groups consider using wind energy to generate electricity, they require more accurate information to determine the cost-effectiveness of wind installations at specific sites. Much of the existing U.S. wind data is in the form of meteorological data from the National Weather Service stations, which are often



AN INCREASE IN THE NUMBER OF WIND RESEARCH PROJECTS PERFORMED AT SITES ACROSS THE NATION HAS PRODUCED A LARGER POOL OF QUALIFIED TURBINE TECHNICIANS. THESE SKILLED WORKERS WILL BE A CRUCIAL FACTOR IN WIDESPREAD USE OF WIND ENERGY.

Increasing use of alternative energy will dramatically change the power sector by diversifying energy sources, reducing greenhouse gas emissions and pollutants, improving the reliability of service, and lowering energy costs.

ULTIMATELY, WIND RESEARCHERS SEE WIND FARMS, LIKE THIS ONE IN VERMONT, SUPPLYING A SIGNIFICANT PORTION OF THE NATION'S POWER.

Wind energy systems could generate electricity at one-quarter the cost of diesel generators in many Alaskan villages.



located in urban areas or near airports. This data is insufficient for the detailed resource measurement information needed to determine the feasibility of a wind installation facility at a particular site. Special Projects assist in obtaining this specific information through the support of wind assessments across the nation.

In New Hampshire, the *Wind Resource Project* created a unique partnership between a private utility company, a State college, and the Federal government. Using SEP Special Project and private funding, four monitoring towers were installed and monitored by students at Plymouth State College. The Natural Science Department used this project to educate students about wind energy techniques, and the students were then designated as official subcontractors. After the initial project was completed, Northeast Utilities provided additional funding to gather data for another two years.

Resource measurement in Alaska is aiding remote villages in determining if wind energy systems can reduce their dependence on small, expensive, and difficult to operate diesel power plants. In many villages the cost of electric power produced by diesel generators can be as much as 40 cents per kilowatt hour. Yet, experience in Alaska has shown that where wind energy systems are used, the cost ranges between 10 to 15 cents per kilowatt hour. As many as 90 villages in the State are thought to have resources adequate to warrant the installation of wind energy systems. SEP Special Projects funding and resources from the State of Alaska are now helping five villages determine if wind energy systems are appropriate energy sources for their needs.

Many States found that the *Wind Resource Projects* increased the quality of data required to site wind energy facilities and enlarged the work force that can conduct



skilled wind resource assessments. The *New Jersey Wind Resource Assessment Project* was conducted by the Liberty Science Center in Jersey City, **New Jersey**. Two wind-speed, wind-direction, and temperature monitors were installed at two different heights. During the study period, the data indicated that the wind speed was greater during the day than at night and that wind production at those sites was sufficient to satisfy only residential demands. The data was made available to the public via computer disk to encourage broader use of the information.

Wind resource assessments are being conducted across the country and this proliferation is due, in part, to SEP Special Projects. In **New Mexico**, Special Projects established six sites to gather wind data for a two-year observation period. The State also collaborated with **Colorado** and **Hawaii** to assist them in establishing their programs. Wind resource assessment projects were also conducted in **Arizona** and **Vermont**, providing diverse information on the feasibility of wind power throughout the nation.

HYDROGEN

Hydrogen is attractive as an alternate engine fuel because it is extremely clean, renewable, abundant, and potentially affordable. In an effort to accelerate market penetration of this fuel type, **California** conducted the *Development of a Variable Gaseous Fuel Engine to Facilitate Penetration of Hydrogen in the Transportation Sector Project*. Through SEP Special Projects funding, the University of California's College of Engineering (Riverside) developed a variable gaseous fuel engine that burns any mixture of natural gas and hydrogen in a pressurized tank. One of the most important aspects of this project was the selection and testing of both thermal and laser fuel sensors, which are an integral part of the variable gaseous fuel system.



Transportation Sector



BUS FLEETS, LIKE THIS ONE IN PEORIA, ILLINOIS, CREATE CLEAN CITIES ENERGY SAVINGS AND ENVIRONMENTAL IMPROVEMENTS. MASS TRANSIT FLEETS CAN ALSO SERVE AS A HIGHLY VISIBLE REMINDER OF ALTERNATIVE FUEL OPTIONS.

The transportation sector comprises 67% of total U.S. petroleum consumption, and depends on petroleum for nearly 96% of its energy. In 1998 alone, the transportation sector consumed 12 million barrels of petroleum per day. Our nation's dependence on oil imports has created significant economic repercussions over the last 25 years, both in regard to the Federal budget and on the pocket of the average U.S. citizen. The drive to diversify our energy resources will play a large role in the nation's sustainability and security in the 21st century.

Energy consumption by the transportation sector is continuing to increase – in fact, the number of motor vehicles on the road has almost doubled since 1970. The resulting energy and environmental impacts are

problems that plague our urban, suburban, and rural areas. Traffic congestion and noise pollution are on the rise across the country. Emissions pose health risks to our citizens and contribute to environmental damage on land, in the water, and in the air. The consequences of today's transportation choices will continue to be felt by future generations.

In an effort to influence these trends, the Department of Energy's Office of Transportation Technologies (OTT) supports

SEP SPECIAL PROJECTS FUNDING FOR THE TRANSPORTATION SECTOR:

1996	\$2,150,000
1997	\$2,326,000
1998	\$2,655,204
1999	\$3,692,702
total:	\$10.8 million

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several programs which aim to modify the way our nation satisfies its basic transportation needs. Many of these programs focus on the deployment and effective use of progressive transportation technologies, including electric motors, fuel cells, and advanced engines.

Within the transportation sector, SEP Special Projects aim to mitigate both petroleum use and pollution. SEP Special Projects promote the conversion to alternative fuel vehicles (AFVs) by local government and private fleets. SEP Special Projects also support the establishment of a national and regional refueling infrastructure for use by long- and short-haul fleets to ease the transition to AFVs. These activities, coupled with effective dissemination of

information on alternative fuel technologies, are designed to spur the acceptance of AFVs by the general public.

CLEAN CITIES

One of the most successful transportation Special Projects programs is Clean Cities. The Clean Cities Program takes a voluntary approach to AFV development and thrives on strong local initiatives. It offers a flexible approach to the challenge of building alternative fuels markets, providing participants with the option to address problems unique to their cities and fostering partnerships as the mechanism to overcome these problems.

The Northeast region has been especially active in promoting alternative fuel use and

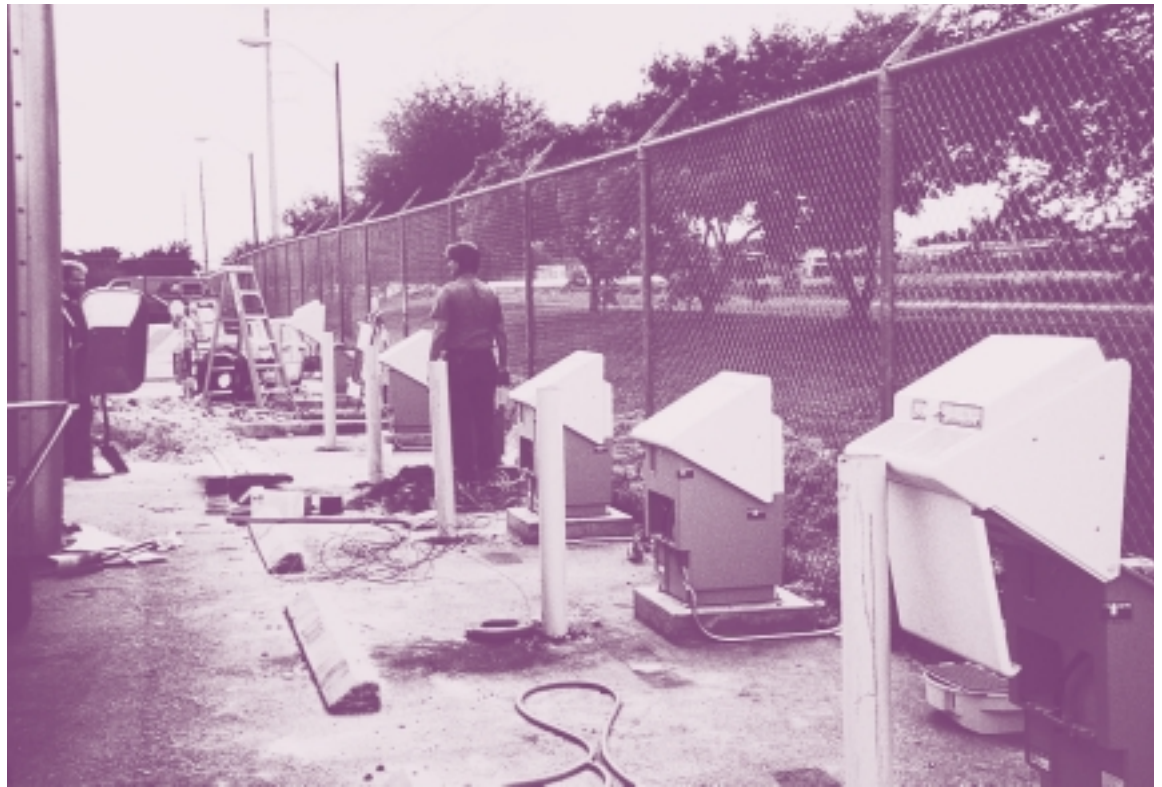


NEW MEXICO PROMOTES ENERGY EFFICIENCY IN THE TRANSPORTATION SECTOR BY PARTICIPATING IN PARTNERSHIPS LIKE CLEAN CITIES, INCREASING THEIR ALTERNATE FUEL FLEET VEHICLES, AND CONTRIBUTING TO THE NATIONWIDE REFUELING INFRASTRUCTURE.





In 1998 alone, the transportation sector consumed 12 million barrels of petroleum per day.



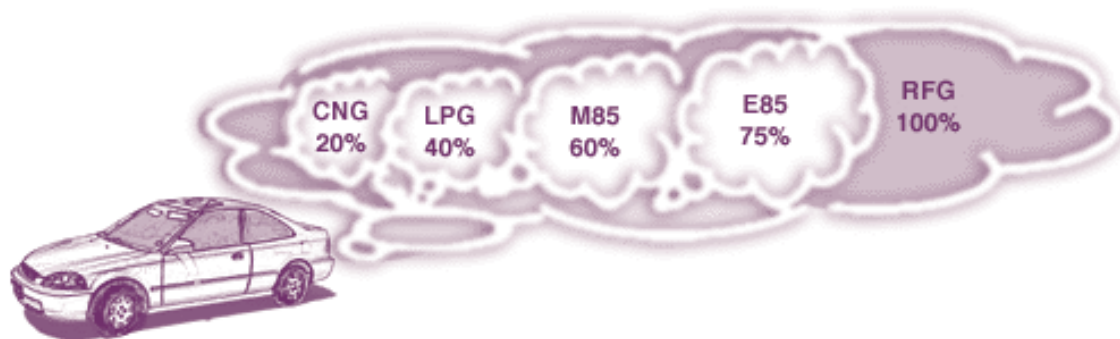
THE CONSTRUCTION OF CONVENIENT REFUELING SITES IS IMPERATIVE TO ENCOURAGE SHORT- AND LONG-HAUL FLEET OWNERS TO CONVERT THEIR VEHICLES TO ALTERNATIVE FUELS.

leveraging funds to support Clean Cities initiatives. The *Capitol Clean Cities Program* in Connecticut, in a partnership with local banks, car dealerships, utilities, and State and Federal government, implemented a program which assists State and private fleet owners in financing alternative fuel conversion. In the 1997 fiscal year, the program solicited \$295,000 in private funds to bolster the \$50,000 Federal grant. In 1998, the program leveraged another \$150,000 in private funds, in tandem with another \$125,000 Special Projects grant. The program's impact extends well beyond leveraging successes. For example, the Taxi Fleet Program with Yellow Cab Company of Bloomfield, Connecticut, was a 1999 Clean Cities National Partner Award winner.

The success of this program was evidenced in the cab drivers' willingness to drive the vehicles, an increase in tips from riders, and the lower operating costs due to both lower



AS PART OF A CONNECTICUT SPECIAL PROJECTS GRANT, THE YELLOW CAB COMPANY OF BLOOMFIELD CONVERTED THEIR FLEETS TO CNG WITH GREAT FANFARE. THE SUCCESSFUL PROGRAM BECAME A 1999 CLEAN CITIES NATIONAL PARTNER AWARD WINNER.



THE DIAGRAM ABOVE SHOWS THE PERCENTAGE OF COMBINED CARBON MONOXIDE AND NITROGEN OXIDE EMISSIONS FOR EACH ALTERNATIVE FUEL AS COMPARED TO REFORMULATED GASOLINE (RFG). FOR EXAMPLE, THE EMISSIONS FROM CNG VEHICLES ARE ESTIMATED TO BE 20%, COMPARED TO 100% EMISSIONS FROM VEHICLES USING RFG. CNG VEHICLES DEMONSTRATE AN 80% REDUCTION IN OZONE-FORMING EMISSIONS.

fuel and maintenance costs. The project includes a Mobile Emissions Credit Reduction program where alternative fuel fleet owners receive refueling “credits” set by the amount of reduction in air pollution from their fleet’s emissions.

Another Clean Cities partner which received nationwide attention was the Tulsa (Oklahoma) Public School System, which also received a 1999 Clean Cities National Partner Award. As a member of the *Tulsa Area Clean Cities Coalition*, the system expanded its fleet of alternative fuel vehicles with funding through SEP Special Projects. As the largest district in the State, Tulsa currently owns a fleet of 287 school buses, 147 of which are AFVs. The result of this conversion is impressive: the district saves a substantial \$35,574 per year in fuel costs. School bus conversions can yield exceptional far-reaching results; not only do the fleets offer energy savings, but their high visibility can educate the public about the advantages of alternative fuel use.

The Washington, D.C. metropolitan area has the second worst traffic congestion in the nation and is one of the fastest growing areas in the country. To combat the problems arising from this rapid growth, the *Metro Baltimore-Washington, D.C. Clean Cities Program* was established to cultivate the acceptance of alternative fuels. This Clean Cities program leveraged \$850,000 in private funds to accompany the \$110,000 Special Projects grant. The program provides rebates to private and local government fleets for the purchase of, or conversion to, compressed natural gas (CNG) vehicles. The program offers \$4,000 towards dedicated CNG vehicles and \$2,000 toward bi-fueled vehicles. The alternative fuel infrastructure is also being expanded to include a CNG refueling station in Columbia, Maryland, which is the halfway point between the two cities.

Similarly, rapid growth in Phoenix, Arizona, has resulted in the area being designated “serious” under the National Ambient Air

Energy consumption by the transportation sector is continuing to increase — in fact, the number of motor vehicles on the road has almost doubled since 1970.



The United States transportation sector depends on petroleum for nearly 96% of its energy.

Quality Standard for ozone, carbon dioxide, and other hazardous pollutants. The Maricopa Association of Governments is dedicated to reducing area pollution through the use of alternative fuel vehicles. To applaud the effort, the Association received an award at the 1999 National Clean Cities Meeting for achieving the largest increase in alternative fuel vehicles in the previous year – 1,800. Additionally, the Association partnered with *Tucson Clean Cities* to add electric refueling sites between the two cities.

Many cities are exploring new opportunities to expand AFV use and involve the public in their endeavors. The *Greater Philadelphia Clean Cities Program (Pennsylvania)* has initiated a drive for AFV shuttle operations, specifically at Philadelphia International Airport, local hotels, and universities. The *Bay Area Clean Cities Program, (California)* along with General Motors, has installed a network of forty electric vehicle recharging stations for use by the general public at various sites around the San

Francisco area, including airports, public parking garages, malls, parks, and restaurants. This \$100,000 Federal grant raised more than twice its total (\$225,000) in leveraged funds. **North Carolina** and **South Carolina** collaborated to increase the public awareness of AFVs through *The Electrical Vehicle Education Information Forum Curriculum Development Project*. This collaboration provided non-technical forums for the general public on electrical vehicles and their operation in order to make their use a viable option.

INFRASTRUCTURE

The decline of the nation’s rail transport industry is partially due to a rapid increase in the use of heavy-duty diesel trucks to transport the nation’s goods. These pollutant- and energy-intensive vehicles are a primary target for alternative fuel usage. One of the most critical aspects in the deployment of alternative fuels is the establishment of a refueling infrastructure to support short- and long-haul fleets.

THIS HEAVY-DUTY TRUCK UTILIZES A NETWORK OF NATURAL GAS STATIONS THROUGHOUT CALIFORNIA.



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WITH THE RISE OF COMMERCIAL ALTERNATIVE FUEL USAGE AND ON-GOING NATIONWIDE EXPANSION OF REFUELING CORRIDORS, THE GENERAL PUBLIC BECOMES MORE OPEN TO PERSONAL ALTERNATIVE FUEL USE.

Many regions have instituted Clean Corridor Projects, or enhanced their Clean Cities programs, to include the planning of new station sites and to link current refueling sites across the region in a manner to support commercial fleet industries and the general public. It has been estimated that the *Interstate Clean Transportation Corridor*, which traces from **California** through **Nevada** and **Utah**, will displace 4.7 million gallons of petroleum and mitigate more than 286 tons of pollution annually.

Another demonstration of integrated planning is the *LNG/CNG Fueling Station Project* in Las Cruces, New Mexico. This station is located near the intersection of I-10 and I-25, along the East-West Corridor

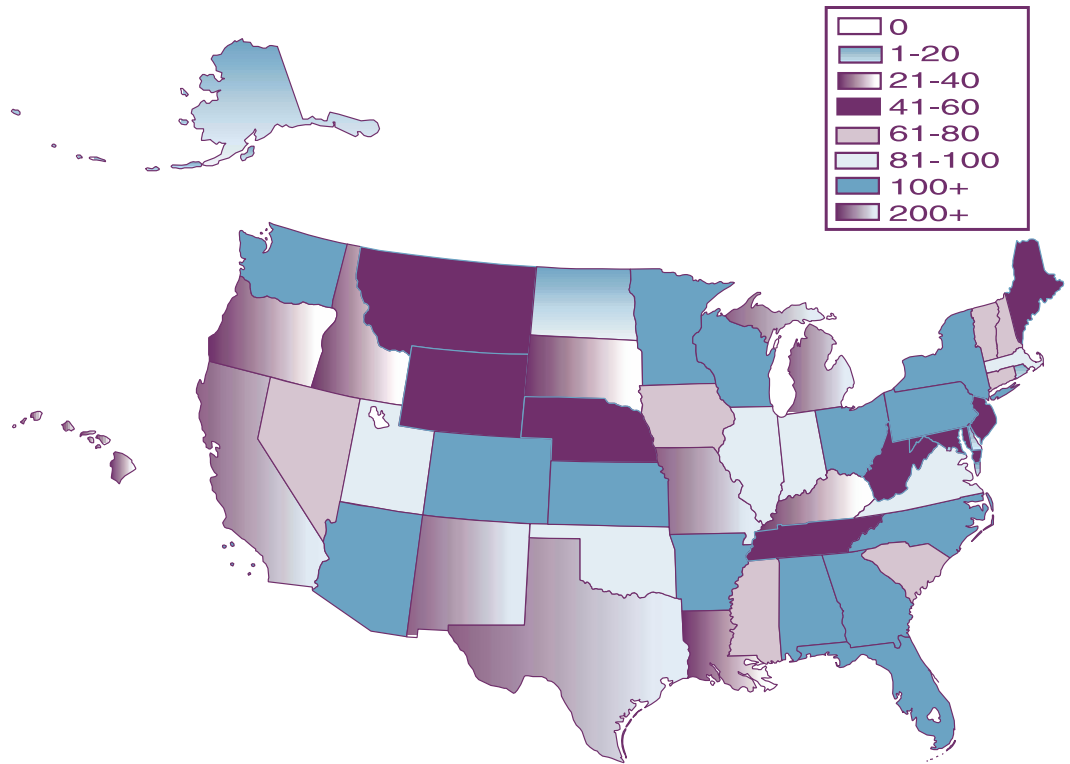
from Florida to California. An outstanding leveraging example, the project secured \$760,000 in private funds and \$150,000 in Special Project funds.

A *Clean Crossroads* partnership comprised of **Kentucky**, **Indiana**, and **Ohio** focused on the creation of a practical infrastructure to serve the tri-State area. The partners tailored efforts to meet the unique needs of each State, while collaborating to develop an effective refueling infrastructure. Indiana installed a natural gas fueling station at the juncture of I-64 and U.S. Highway 41, which are major thoroughfares used by the public and industry alike. Ohio converted several government fleets, including those of the city of Cincinnati, where three underground,

The Interstate Clean Transportation Corridor in California, Nevada, and Utah, will displace 4.7 million gallons of petroleum and mitigate more than 286 tons of pollution annually.



One of the most critical aspects in the deployment of alternative fuels is the establishment of a refueling infrastructure.



U.S. MAP SHOWING REFUELING SITE COUNTS FOR ALL ALTERNATIVE FUEL TYPES (CNG, M85, E85, LPG, LNG, ELECTRIC)

10,000-gallon E-85 tanks were installed. In addition, Kentucky converted service vehicles at Louisville Regional Airport and installed three E-85 fueling stations.

The Clean Cities Program recognizes collaboration is essential in creating an effective infrastructure. Three **Colorado** Clean Cities (Colorado Springs, Denver/Boulder, Weld/Larimer/Rocky Mountain National Park) joined forces to create the *Colorado Front Range Corridor*. These cities realized that clean air was more than a local issue,

and that their air quality goals could be more efficiently met through a coordinated effort. The Corridor integrates the three Clean Cities and the adjacent communities along I-25. The program has created a map of fueling stations, a quarterly newsletter, promotional material, and a kiosk at Rocky Mountain National Park, as well as, efficiency surveys and training for fleet managers.

While many corridor programs rely on collaboration between Clean Cities or States for effectiveness, the sites established

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in the northeast corridor were organized by both the Philadelphia Regional Office and the Boston Regional Office, in conjunction with several Clean Cities. The *Northeast Clean Corridor Project* connects **Washington, D.C.** to Boston, **Massachusetts**, with Philadelphia, **Pennsylvania**, being the central point.

States across the nation have realized the multiple benefits of establishing alternative

fuel refueling sites. The Chicago, **Illinois**, area has the largest density of fleet vehicles in the nation. This necessitates the support of a broad ethanol (E-85) refueling infrastructure and to date, ten refueling sites have been constructed with the help of Special Projects. The *E-85 Infrastructure Construction and Development Program for the Chicago Area Project* was financed through a \$250,000 Federal grant and \$647,000 in privately-leveraged funds.

Some Clean Cities partnerships are laying the groundwork for a more efficient transportation future. The Austin (**Texas**) Clean Cities Coalition has studied the feasibility of using only alternative fuel vehicles at the new Austin-Bergstrom International Airport and has determined that AFV's are appropriate for most airport uses. Complete AFV adoption looks promising, as parking contractors and some airlines are already designated AFV users. In Salt Lake City, **Utah**, a similar airport project is underway.



Future Outlook **SEP Spec**

Since its inception, the State Energy Program has enabled States to address local energy priorities while contributing to national energy initiatives.

The Special Projects portion of SEP has been especially adept at allowing the Department of Energy end-use sectors to capitalize upon the inherent flexibility of SEP, while simultaneously meeting sector-specific goals. Special Projects have given DOE the opportunity to partner with State governments to effectively deploy new energy efficiency and renewable energy technologies across the country.

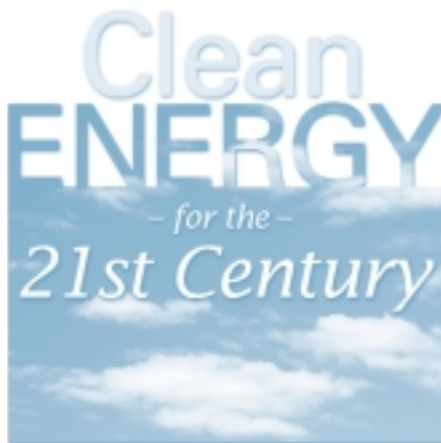


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Each end-use sector has achieved success through the Special Projects program. The Office of Building Technology, State and Community Programs has assisted communities and regional partnerships in improving energy efficiency through the implementation, enforcement, and update of building energy codes and the retrofit of existing buildings. FEMP has facilitated the advancement of energy efficiency, water conservation, and renewable energy in Federal facilities nationwide. The Office of Industrial Technologies has introduced clean production methods and cutting-edge technologies to regional industries. The Office of Power Technologies has promoted the development, testing, and application of renewable energy technologies such as biomass, geothermal, wind, hydrogen, and solar. The Office of Transportation Technologies has accelerated the conversion to alternative fuel vehicles and the establishment of an alternative fuel infrastructure.

The diverse energy efficiency and renewable energy projects implemented through SEP Special Projects have produced energy, environmental, and economic benefits across the nation. These benefits will increase exponentially as the methods and technologies encouraged by Special Projects



continue to be implemented. Special Projects are not simply a short-term fix to the nation's energy concerns; they offer long-term solutions by presenting the nation with practices and policies which can be employed for a secure economy, a clean environment, and a safe energy supply.

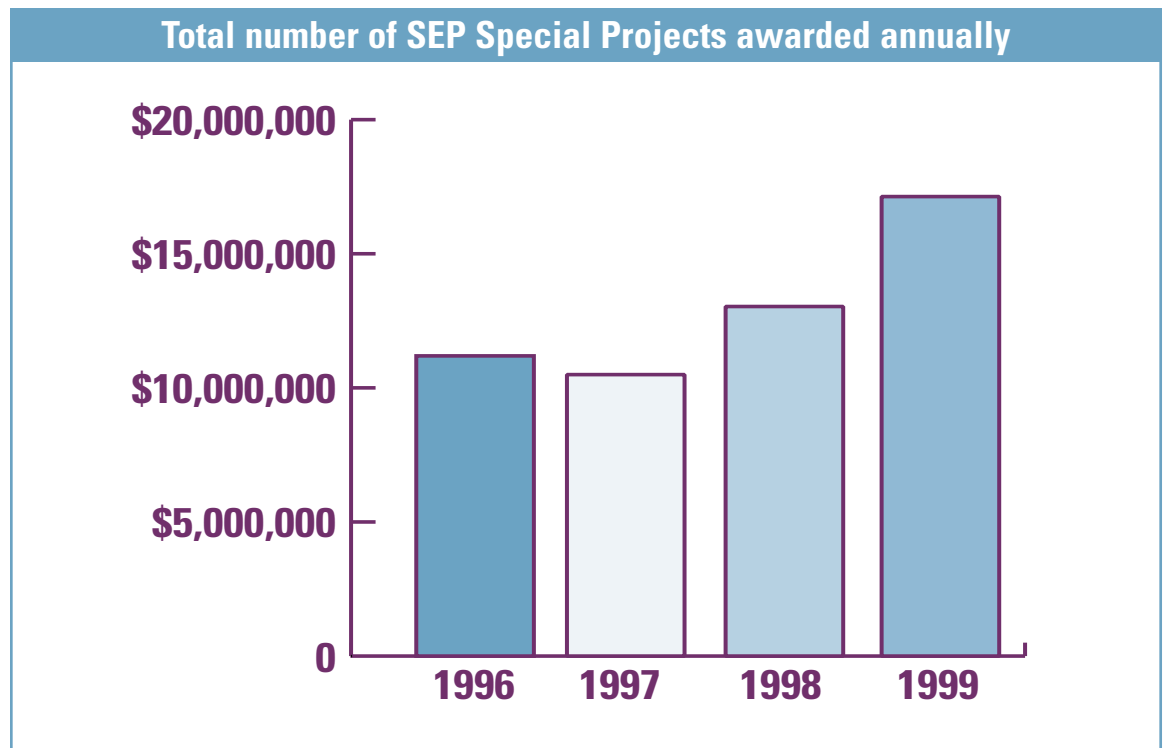
The SEP network faces dramatic challenges today, arising from the evolution in energy markets, increasing environmental concerns, and shifting population patterns. These same trends also offer many new opportunities for the Program to continue deploying new technologies and increasing the use of energy efficiency and renewable energy. SEP's dynamic, State-based delivery system can meet the challenges of today's energy situation and prepare for opportunities on the horizon. In this changing environment, SEP Special Projects will continue to play a key role in developing and deploying clean energy solutions for the 21st century.

The nation will always bear the responsibility of its energy practices and policies. The energy technology development, deployment, and education efforts made possible through SEP Special Projects can assist the nation in creating an energy history which can be proudly displayed to future generations.



Appendix

SEP Special Projects grants are awarded annually on a competitive basis. In order to obtain these funds, each State first sets its own energy priorities and then submits completed proposals to the appropriate DOE Regional Office. Regional Offices forward all submissions to Department of Energy headquarters, where funding decisions are made by each end-use sector offices. Each end-use sector determines which proposals best meet respective national goals and chooses the most potentially successful projects. The proposals are then sent to the Office of Building Technology, State and Community Programs for final approval. This process provides cohesiveness with respect to sector initiatives, while continuing to allow State flexibility.



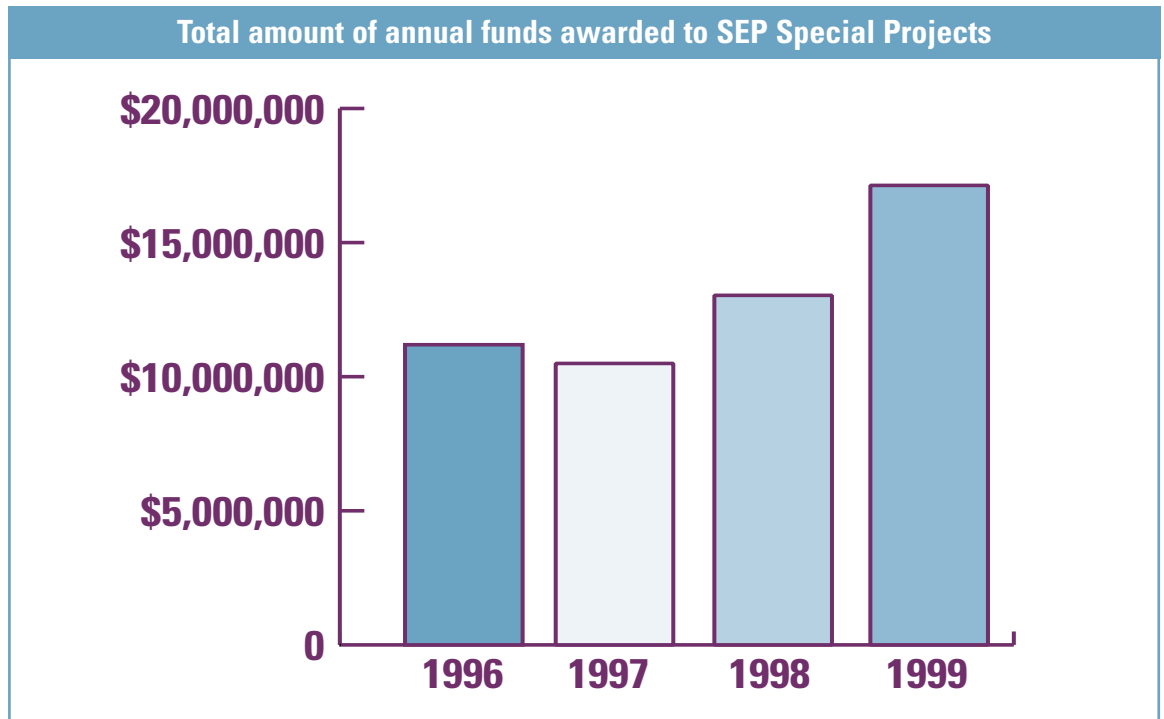
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TOTAL SPECIAL PROJECT FUNDING PER STATE/TERRITORY (1996-1999)

Alabama	\$652,562	Nevada	\$710,000
Alaska	\$180,000	New Hampshire	\$554,249
Arizona	\$451,620	New Jersey	\$633,892
American Samoa	\$95,800	New Mexico	\$870,000
Arkansas	\$562,290	New York	\$3,099,312
California	\$3,779,944	North Carolina	\$335,000
Colorado	\$1,578,342	North Dakota	\$224,055
Connecticut	\$689,850	Northern Mariana Islands	\$12,000
Delaware	\$480,000	Ohio	\$1,884,993
District of Columbia	\$348,323	Oklahoma	\$312,400
Florida	\$1,162,735	Oregon	\$2,084,853
Georgia	\$946,537	Palau	\$63,800
Guam	\$225,000	Pennsylvania	\$934,000
Hawaii	\$1,322,616	Puerto Rico	\$300,000
Idaho	\$975,488	Rhode Island	\$1,618,962
Illinois	\$1,050,000	South Carolina	\$614,514
Indiana	\$938,478	South Dakota	N/A
Iowa	\$1,640,000	Tennessee	\$373,000
Kansas	\$922,634	Texas	\$1,064,103
Kentucky	\$738,493	Utah	\$2,005,375
Louisiana	\$842,000	Vermont	\$1,025,000
Maine	\$1,071,176	Virgin Islands	\$183,000
Maryland	\$1,182,000	Virginia	\$632,124
Massachusetts	\$1,098,327	Washington	\$1,956,329
Michigan	\$677,500	West Virginia	\$957,000
Minnesota	\$847,618	Wisconsin	\$1,739,107
Mississippi	\$614,249	Wyoming	\$177,328
Missouri	\$296,000		
Montana	\$673,355		
Nebraska	\$1,432,810	Total	\$51,860,143

Since 1996, SEP Special Projects has funded projects totaling \$24.0 million for the buildings sector; \$2.8 million for FEMP; \$9.4 million for the industrial sector; \$4.9 million for the power technologies sector; and \$10.8 million for the transportation sector.

	1996	1997	1998	1999	TOTAL
Buildings	6,497,000	4,861,000	5,185,863	7,475,402	24,019,265
FEMP	554,000	580,000	966,000	683,349	2,783,349
Industrial	2,000,000	1,375,000	2,480,000	3,504,068	9,359,684
Power Technologies	N/A	1,352,000	1,736,084	1,775,855	4,863,939
Transportation	2,150,000	2,326,000	2,665,204	3,692,702	10,833,906
	Grand total for all projects				\$51,860,143



Special Projects Report

Acknowledgments

This publication would not have been possible without the information supplied by the State Energy Offices, DOE's Regional Offices, the end-use sector offices, and FEMP. Staff of these organizations supplied information on more than 100 of their most effective and successful projects, as well as photographs. In addition, valuable contributions were made by DOE program managers and staff associated with the State Energy Program in the Office of Building Technology, State and Community Programs.

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