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State Energy Program Results:

More Projects That Work

Office of Energy Efficiency and Renewable Energy
Building Technology, State and Community Programs
December 1998

Message from the Secretary of Energy

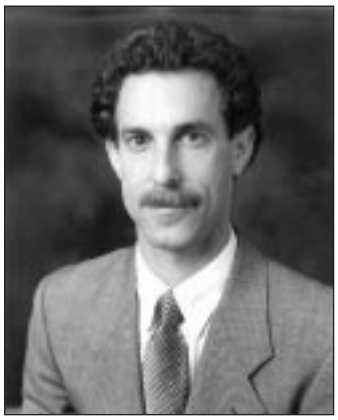
Secretary
Bill Richardson

I am pleased to present ***State Energy Program Results: More Projects That Work***, a product of the Department s successful State Energy Program. This collection of projects represents the breadth and diversity of the effective, energy-saving activities undertaken by States with technical and financial assistance from the Department of Energy and other sources of funding.

Under the Assistant Secretary for Energy Efficiency and Renewable Energy, the State Energy Program has effectively demonstrated how communities, State and Federal organizations, and other partners across the nation can work together to accelerate the deployment of new technologies into all sectors of the economy. These projects are advancing national as well as State and local government objectives for a cleaner environment, a healthier economy, and increased energy security.

I commend the commitment and spirit of our State and community partners, who are moving the nation from the realm of the technologically possible to the concrete reality of "Projects that Work."

Message from the Assistant Secretary for Energy Efficiency and Renewable Energy



Assistant Secretary
Dan Reicher

Since 1976, when Congress established the first State energy grants program, our State partners have played an important role in implementing energy efficiency and renewable energy strategies. There is tremendous potential for accelerating the adoption of energy efficiency and renewable energy technologies in all sectors across the economy. The Department of Energy involves the States in meeting this national challenge through hundreds of projects that overcome local barriers and address significant local opportunities, under the State Energy Program.

More Projects That Work describes just a few of these successful projects. Ranging from institutional building retrofits in Florida, to aluminum recycling in Ohio, to Rhode Island s K-12 energy education curriculum, to irrigation improvements in New Mexico, to "green" power generation in Michigan, and to telecommuting in Oregon, these projects exemplify the innovation, creativity, and entrepreneurship of State Energy Offices. Furthermore, these State designed and implemented projects are distinguished by results—efficiency and productivity of operations, reduced pollution, cost savings, and diversification of energy supplies.

As we tackle the tough national energy challenges ahead, the Office of Energy Efficiency and Renewable Energy will continue its vital partnership with the States, for the benefit of our citizens and businesses in communities from coast to coast.

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Overview of the State Energy Program

Program Goal

The goal of the State Energy Program is to strengthen the capabilities of States to promote energy efficiency and to adopt renewable energy technologies, thereby helping the nation save energy and realize a stronger economy, cleaner environment, and a more secure future.

Background

The State Energy Offices are integral to the nation s energy management programs. The State Energy Offices act as catalysts for developing and deploying energy efficiency technologies and measures. States design and conduct energy projects tailored to meet local needs, economic conditions, and climatic variations. This customized approach maximizes achievement of national goals and results in State benefits multiplied many times over in the local economy. The State Energy Offices, in partnership with the U.S. Department of Energy (DOE), make a critical difference in the nation' s patterns of energy use and in virtually every sector of the economy.

The Office of Building Technology, State and Community Programs division within Energy Efficiency and Renewable Energy (EERE) manages the State Energy Program (SEP) through the six DOE Regional Support Offices.

The SEP was established by Congress in 1976 under the name State Energy Conservation Program (SECP) and was later combined with the Energy Extension Service (EES). In 1996 Congress merged the SECP with another formula grant program, the Institutional Conservation Program (ICP), and named it the State Energy Program (SEP). The SECP provided State funding for a variety of energy efficiency and renewable energy activities, while the ICP concentrated on energy efficiency audits and the application of conservation measures in schools and hospitals. Congress encouraged combining these programs to increase States' flexibility.

The Energy Policy Act of 1992 recognized the crucial energy role played by the States and provided an expanded policy, program, and technology deployment role for the States. The SEP emphasizes the State's role as the decision-maker and administrator for program activities within each State. The SEP structure empowers State officials to select the most beneficial projects for their respective States.

Sources of Funds

Primary sources of funding for the State Energy Program have been:
1) Congressionally appropriated funds.
2) Leveraged funds (including the required 20% match of State funds to Federal dollars). In addition, many States have been innovative in developing third-party financing, loan programs, and other methods to leverage program dollars.
3) Petroleum Violation Escrow (PVE) funds. PVE money resulted from the settlement of legal action taken by the U.S. Department of Energy against petroleum companies that were alleged to have violated Federal price-control regulations. The availability of PVE funding offset a decline in Federally appropriated funds in the 1980 s and greatly expanded State resources for energy efficiency efforts.
4) State Energy Program Special Project funding. Working with funds from the EERE technology sectors, SEP also competitively awards funds to States for cost-shared technology projects that focus on national priorities.

Projects Designed to Meet Unique Conditions

Because States vary widely in their energy resources and uses, State projects are designed to address the specific needs of end-use sectors within the individual State. Their programs match energy efficiency and renewable energy technologies to available resources, regional applicability, and energy-using processes. State regulatory and legislative power directly impact land use, building codes and standards, utility regulation, transportation networks, and dominant industries

For the SEP formula grants, each State sets its own priorities and emphasizes technologies and approaches appropriate for its region. The diverse nature of activities is evident in the projects described in this document.

For the SEP Special Projects, States submit proposals identifying how specific DOE-targeted sector technologies could be implemented in their region of the country, and the U.S. Department of Energy selects the ones that best meet respective national goals for each technology program.

The **success** of the SEP is directly linked to the **creativity** and **insight** which individual State Energy Offices bring to address the problems and opportunities unique to their communities.

Why the State Energy Program Succeeds

The success of the SEP is directly linked to the creativity and insight which individual State Energy Offices bring to address the problems and opportunities unique to their communities. Strong State Energy Offices with their established delivery networks are essential to the achievement of national energy objectives. Multi-State projects promote regional cooperation by bringing together States with common objectives.

The network of State Energy Offices is an essential mechanism for coordinating energy, environmental, and economic policies in response to the new challenges of the 21st century. By engaging in partnership with the U.S. Department of Energy, other Federal agencies, communities, and private entities, the States are able to accelerate the deployment of energy efficiency and renewable energy technologies, leveraging an average of $4 for each $1 of DOE funding.

Federal support for the State Energy Offices helps ensure the national interest in reducing energy dependence. Federal and State partnerships promote a strong economy through diversified applications of cost-effective energy efficiency measures.

Buildings

Energy Efficiency Where We Work, Live, Learn...

OVERVIEW

The building sector is a highly diverse and fragmented industry that has a significant impact on our economy. In 1996, the buildings industry represented more than 8% of the gross national product. It also consumed 36% of the nation's primary energy, with a price tag of more than $232 billion annually. In addition, energy use in buildings is responsible for a significant proportion of carbon dioxide, sulfur dioxide, and nitrogen oxide emissions. If new homes and buildings incorporated the energy-efficiency technologies available today, energy use could be cut by half; existing homes and buildings could reduce energy consumption by 20 to 30% through simple retrofits.

Because of the broad opportunities available for improving the energy use profile for buildings, State buildings projects have proliferated. Through partnerships with State, Federal, and private entities, SEP implements energy-efficiency improvements in schools, hospitals, residential, and commercial buildings. SEP's early focus on mandatory measures, such as establishing and enforcing lighting efficiency standards for public buildings and thermal efficiency standards for new and renovated buildings, has expanded significantly over the years. The States act as catalysts for developing new building technologies and applying advanced efficiency measures. They have advanced lighting efficiency programs from basic conservation measures to sustainable solutions, including daylighting and improved efficiency in equipment. Another progressive solution developed with SEP funds is the integrated design approach, called "whole building design," which greatly reduces annual energy costs and creates work environments conducive to increased productivity. The case studies presented here attest to SEP's considerable success in improving energy efficiency in buildings.

"Start-up money provided by the Florida Energy Office allowed this program to get rolling, and we never looked back. Now, we can continue to self-fund improvements with the money saved from energy expenditures."

– Dr. Gary Lott, Executive Vice-President, St. Johns River Community College

SEP Provides Critical Assistance for Retrofits in Schools, Hospitals, and Government-Owned Buildings and Facilities

Faced with spiraling energy costs, St. Johns River Community College in **Florida** embarked on an aggressive campaign to improve energy efficiency. With the assistance of the Florida Energy Office, the college implemented a number of energy efficiency measures, including installation of energy-efficient heating and air conditioning units, modification of the lighting system, and addition of insulation and window reflective film. These measures have really paid off for the college. Energy savings have added up to nearly $1.4 million, exceeding the project costs by three times.

In a similar case, Lakeshore Hospital in **Alabama** faced rapidly rising energy costs due to the excessive energy consumption of aged, inefficient equipment. Unable to self-finance the necessary improvements, the hospital sought assistance through Alabama's Institutional Conservation Program and was granted funds through several cycles of the program. With these funds, the hospital was able to implement a series of energy-efficiency measures, such as installation of a new heating, ventilation, and air conditioning (HVAC) system, lighting retrofits, installation of a heat recovery chiller, and storm windows. Since the beginning of the conservation pro-

St. Johns River Community College in Florida reduced operating costs by implementing energy efficiency measures.

gram, the hospital's energy costs have been reduced by nearly 50%. The savings are particularly impressive because the patient load at the hospital increased significantly during this time. At the onset of the program, the hospital was operating from 30 to 50% of patient capacity, but after the measures were installed operations increased to 80 to 90% of capacity.

Idaho also reports impressive results in making public institutions more energy efficient. Idaho initiated an Institutional Conservation Program in 1979 and administered 18 annual funding cycles through the program. During the funding cycles, Idaho implemented energy-efficiency measures in numerous schools, hospitals, and government-owned buildings. The annual energy savings resulting from these conservation measures is estimated at $2.8 million.

In response to the growing need to finance energy efficiency improvements in public buildings, **Montana** designed a State Buildings Energy Conservation Program to fund capital improvements without tapping general fund budgets. Montana sells general obligation bonds to fund energy efficiency improvements; the bonds are then repaid through savings in energy costs. Once the debt is repaid, the energy savings can be used to fund new services for Montanans. This program has been particularly successful in improving energy efficiency in Montana's schools. In a partnership with Montana Power Company's Electric Conservation Purchase Program, Montana replaced and modified lighting fixtures in three buildings at Montana State University. The lighting improvements in the library and classrooms made it easier for students and teachers to find library materials and follow classroom activities. This project also produced annual energy savings estimated at $33,500 and has been replicated in other university buildings.

Vermont developed an innovative partnership to address energy efficiency problems in the public schools. The School Energy Management Program is funded by the State Energy Program in cooperation with the Superintendents' Association. The objective is to produce long-term efficiency benefits and develop widespread, sound energy management practices. Vermont's program works with local school officials to prioritize the schools that have the highest need for efficiency improvements. By partnering with an established and trusted organization, energy officials have been able to rapidly achieve a high level of acceptance of efficiency services.

Wisconsin's Energy Initiative relies on creative partnerships to improve energy efficiency. Wisconsin worked with the State's utility companies to make basic changes to public buildings, such as installing new lighting fixtures, steam traps, and other technologies. The initiative forecasts a $60 million reduction in State spending over a ten-year period. Energy-efficiency improvements funded through the initiative have already resulted in reduced emissions of carbon dioxide, sulfur dioxide, and nitrous oxides. In addition, the increased demand for energy-efficiency products and services has spurred employment in the State.

Vermont's program works with local school officials to prioritize the schools that have the highest need for efficiency improvements.

States Act as Catalysts for Community-Wide Planning, Use of Energy Efficiency

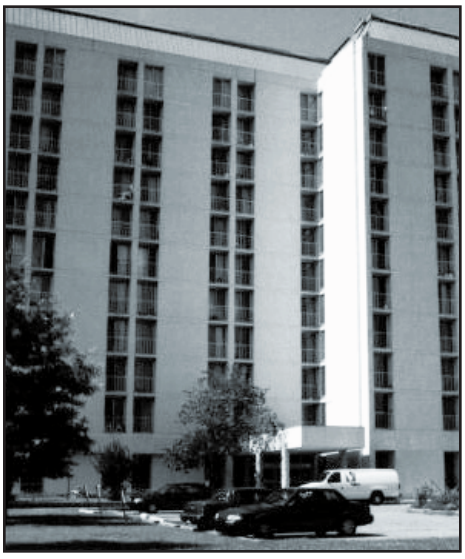
Washington, DC public schools partner with Rebuild America to implement energy efficiency improvements.

In the early years of State energy planning, many States devised their policy and planning based on demonstrations of a particular technology. As more comprehensive and integrated planning evolved, States implemented broadly scoped efforts that encompassed whole communities. In some States, such as **Florida**, the role of the State Energy Office evolved over time from that of a simple "bank," funding initiatives developed by State energy officials, to that of a market facilitator. State Energy Offices designed standards and building code guidelines that shaped whole industries in and around their States. Strong leadership from States like Florida catalyzed energy efficiency applications by industry and county or local government by demonstrating these measures made good business sense.

The strong policies and early successes of the State Energy Offices generated the Rebuild America program, a Federal-State partnership that emphasizes local community leadership in achieving energy savings. Through Rebuild America, States or local communities band together to bring about energy saving projects. Rebuild takes its direction from local leadership, supports community efforts with some financial and planning assistance, and helps organize public-private teams that make a program work.

Working through Rebuild America, the **Iowa** Energy Office used two SEP grants totaling $350,000 to invest in seven communities that have all committed to reducing energy consumption by at least 20%. One outstanding partnership, Rebuild Webster City, has become a model program for others in Iowa. Rebuild Webster City leveraged a small Federal grant into nearly $5 million in retrofits for 20 buildings and was awarded the Rebuild America Partnership of the Year in 1998.

Rebuild America works with local communities to retrofit multi-family housing.



Rebuild America partnerships have flourished in **Connecticut**. Stripper Well funds (compensation from past oil overcharges on petroleum products) were offered in $150,000 increments to six communities as incentives for forming Rebuild America partnerships. In addition, eighteen other communities formed partnerships in 1997 using a $80,000 SEP grant. Energy costs in these communities are projected to decline by more than 25%, with a corresponding reduction in air emissions of carbon dioxide, sulfur dioxide, and nitrogen oxide.

Nebraska's State Energy Office developed a Statewide Rebuild America partnership with 10 marketing partners and 58 building partners to address the needs of the State's multi-family housing and commercial buildings. The Energy Office staffs the program, provides resources, contacts building owners, and markets and packages energy efficiency opportunities. No-cost energy audits are completed by the Energy Office, and information on applicable financing options is delivered to the building owner with the completed audit recommendations. The Energy Office then makes follow-up contact to help determine the implementation rate of partners. The Nebraska Power District, the State's largest utility, joined early on as a dedicated marketing partner and earmarked significant resources toward saving its customers' energy and money through energy efficiency.

There are eighteen **North Carolina** partnerships currently participating in Rebuild America, with great diversity and innovation. The Asheville Housing Authority has been participating in a Rebuild America partnership with the Opportunity Corporation, a non-profit community action agency serving Buncombe County, to adapt an old 8,000 square-foot school building into a Head Start center. Rebuild Shelby

is working to revitalize its town, using energy efficiency to augment goals of historic preservation, job retention, and increased private investment.

West Virginia launched a joint effort between its successful Main Street Program, which brings together community partnerships to improve and revitalize downtown districts, and its Energy Efficiency Program. The West Virginia Development Office has a goal of designating 10 Main Street communities as Rebuild America partners within two years to improve the competitiveness of downtown business locations. The program would leverage $100,000 in 50-50 matching grants to each of the 10 communities for program planning and implementation support.

To promote energy efficiency as a tool for rural economic development and to cut energy consumption by 30% (5% more than the 25% required under Rebuild America guidelines), **Tennessee**'s Department of Economic Development targeted five communities for Community Energy Partnerships under Rebuild America. Up to 100 schools, local government facilities, and commercial buildings will be retrofitted for lighting, HVAC improvements, energy management systems, and more. Communities with populations of less than 10,000 are eligible for participation.

Results:

Tennessee estimates the communities will garner a return of more than 40 cents in energy savings per square foot.

This savings would amount to nearly $900,000 worth of electricity (14.65 megawatts at 6 cents/kWh) over the program's five-year lifetime.

Rebuild America emphasizes **local community leadership** in implementing energy-efficiency improvements.

The Rebuild Boston Energy Initiative is an innovative local effort designed to save energy and water in the city of Boston, **Massachussetts**. Improving energy efficiency in multi-family housing is a primary focus of Rebuild Boston. The program offers technical assistance services to management firms, public, or publicly-assisted multi-family housing developments in Boston to determine areas for potential energy savings.

Results:

Rebuild Boston has helped to develop three rounds of performance contracting at the Boston Housing Authority that will provide $40 million in investments in over 9,000 units.

Rebuild Boston assesses existing systems and equipment and suggests areas for potential energy savings.

Lighting Programs Evolve from Demand Reduction to Improved Equipment Efficiency to a New Emphasis on Daylighting

"This program will conserve energy and diversify the island's energy sources."

–Daniel Pagan, Secretary, Department of Natural and Environmental Resources, Puerto Rico

Michigan implemented a pilot program to retrofit exit signs on State-owned buildings as a means to improve energy efficiency and encourage wider implementation of energy-efficiency measures. The program offered rebates to State agencies for the replacement of incandescent and fluorescent exit signs with light emitting diode (LED) models. More than 670 LED exit signs were installed in a total of 17 State facilities, including aircraft hangars, armories, prisons, and office buildings. The total annual cost savings resulting from these replacements amounted to nearly $68,000. In addition, the new signs greatly reduced emissions of carbon dioxide, sulfur dioxide, and nitrous oxides; the reduction in carbon dioxide emissions alone was equivalent to the planting of 7.4 acres of trees.

Tourism is an integral component of **Guam**'s economy, providing a valuable source of tax revenue and supporting numerous jobs. However, the tourist industry is a large consumer of energy and drains Guam's limited energy resources. Hotels in particular, consume a substantial amount of energy in lighting, cooling, and heating buildings. The Guam Energy Office recognized this as a strong candidate for significant energy savings. Focusing on improving lighting efficiency, the Energy Office developed a Commercial Lighting Pilot Program and sought participation of the members of the Guam Hotel and Restaurant Association. Five hotels participated and received grants and engineering support. The results reported by the Guam Energy Office and specifically, Hyatt Regency Guam, were extremely encouraging.

Results:

The energy-efficient lamps with electronic ballasts were nearly 33% more efficient than the previous lighting system.

The payback period from the initial installation was calculated at less than two years.

As a result of the successful pilot program, the Hyatt Regency Guam completed an entire retrofit of their lighting fixtures and lamps.

This program demonstrated that energy-efficient commercial lighting is easy to install and profitable.

The Guam Energy Office partnered with local hotels to implement a pilot lighting program with great success.

Significant gains in lighting efficiency can also be achieved in the residential sector. **Puerto Rico** launched a pilot residential lighting program on the small island of Culebra, population 1,632. In conjunction with the Culebra municipal government and the Polytechnic University, which will monitor the results of the one-year study, the energy office replaced three to five bulbs per home with fluorescent lighting. The fluorescent bulbs were installed in kitchens, living rooms, and bedrooms — the rooms where energy consumption is the greatest. The goal of the program is to reduce energy consumption, improve the environment, and decrease Puerto Rico's dependence

on oil-based fuels. The projected savings from the lighting program was estimated at $67 over the life of each fluorescent bulb.

Energy officials are also encouraging the use of daylighting to offset the need for electric lights. New buildings can be constructed to maximize solar orientation, use architectural features, and integrate lighting and controls to optimize the amount of daylight illumination in work areas. Existing buildings can be retrofitted with certain elements of a daylighting system, such as automated controls and blinds, to improve the energy efficiency of the building. **Wisconsin**'s State Daylighting Retrofit Demonstration Program illustrated the cost effectiveness of active daylighting technologies at the Department of Administration building. The project was purposefully located in the building that houses the State design engineers and architects so that the entire design community could become familiar with daylighting design. As a result of this program, the Public Service Commission of Wisconsin required the State's electric utilities to develop an expansive daylighting promotional program. Wisconsin's daylighting program provides an excellent model for improving energy efficiency in public and private buildings nationwide.

Multi-Family Homes Get Energy Boost in Illinois

Many **Illinois** homes built around the turn of the century provide quaint architecture and charm at a cost of high energy bills. To stem the flow of energy dollars, the Illinois Department of Commerce and Community Affairs created the Illinois Energy Efficient Affordable Housing Program. The program provides super insulation and energy renovation work on existing multi-family housing, and also sets standards for new construction of multi-family and single family homes in the State. Savings are significant. In multi-family homes that received super insulation rehab work during the 1996-1997 heating season, average fuel consumption cost $230 per unit. In contrast, in multi-family homes that received simple rehab work without regard for energy savings, fuel costs were $918 per unit — a $688 difference, or $57 per month when spread over the entire year. Even when incremental energy rehab costs of $2,000 per unit are included (amortized over 20 years), the fuel savings per unit is $39 per month. Illinois plans to complete super insulation work on 30 more multi-family buildings (659 units) in the State.

Results:

Since 1988, Illinois has awarded 30 multi-family rehab project grants, affecting more than 500 units of low-income housing.

When super insulation practices were used, average energy savings are over 70%, compared to buildings that did not receive super insulation measures.

Residents of a 1,000 square-foot unit saved between $100 and $500 on their annual heating bills.

Multi-family housing in Illinois slated for energy efficiency improvements.

Energy Codes Shape State Construction and Economy

Energy codes can guide new construction and renovation work across a State, shape the economy, and also provide better health, protection from disaster, opportunities for job growth, and attractive business development. Climate and the economy influence variations in the building codes in different States. In **Minnesota**, the Department of Public Service has implemented indoor air quality standards and ventilation procedures to exhaust appliances and vent and refresh indoor air. In **Delaware**, the State Energy Office revised the State's commercial and residential buildings' energy codes in 1995. It has conducted a series of workshops targeted to commercial and residential builders, code officials, architects, and engineers in the State.

Several States also offer voluntary home rating programs. The **Kansas** Department of Commerce and Housing established the Kansas Energy Star Program as a voluntary accrediting process that provides an energy efficiency ratings system for both businesses and home buyers. The rating system will inform home buyers of the expected annual energy costs of their new home. **Nevada** also uses a voluntary rating code to encourage participation of the State's strong builder's association. Coupled with new building techniques and the availability of energy-efficient mortgages, the program has spawned a rash of new energy-efficient houses in Las Vegas, with more builders joining the program annually.

The State of **Hawaii** used its Model Energy Code as a guide for voluntary design and building compliance in the residential sector with great success. In addition, Hawaii has provided training and financial assistance to help replicate its code among its neighbors with similar climates: Guam, American Samoa, Puerto Rico, and the Virgin Islands. A spin-off result is that Guam and American Samoa have begun to develop their own "Tropical Code" for climates that are hotter and more humid than Hawaii's and have more tropical storms. Palau and the Commonwealth of the Mariana Islands are interested in this code, as is the Phillippines. It may have broad applications to Caribbean, Central American, and Southeast Asian nations as well.

Louisiana provided energy code training, code materials, computer software, and technical assistance to Louisiana builders, architects, engineers, and the public. Prior to passage of legislation in 1997, Louisiana was the only State in the Southeast with no energy code for commercial buildings. The State now has a new energy code, supported by a $20 fee on new commercial building plan submissions.

Results:

Within ten years, compliance is projected to save Louisiana builders $4 million in energy costs, reduce carbon dioxide emissions by 113 million pounds, and save 323 billion BTUs of energy each year.

Mobile display developed by the Advanced Technologies Training Program at the Hawaii Building Technology Conference.

Homebuyers in **Michigan** typically list a modern eat-in kitchen, dry basement, large living room, and adequate closet space among their top criteria. But the Energy Resources Division of the Michigan Department of Consumer and Industry Services wanted more – it wanted a home that saved energy and modeled healthy construction choices. Michigan created the Five Star Home Grant program and awarded grants for five residences in 1997. The homes all showcased energy efficiency. The "health house" constructed by Terwilliger Homes, Inc. in Davison, Michigan, also modeled features that improve indoor air quality and respiratory health. The home uses a continuous fresh air supply vented and HEPA filtered through a heat exchanger. Low toxicity sealers, carpeting, paints, and caulks were used throughout the home. Particle board was avoided and solid wood cabinets, framing, and permanent wood foundations were installed. The home was super insulated, sealed against outside contaminants and allergens, and fitted with energy-efficient windows and low-flow plumbing.

Manufactured Homes Provide Comfort and Affordability in the Northwest

A joint program of the **Idaho**, **Washington**, and **Oregon** State Energy Offices (SEOs) is bringing new comfort and energy efficiency to owners of manufactured homes built in those States. Nearly 30% of all new single family housing in the Northwest is constructed in factories and these homes must meet Federal Manufactured Housing Construction and Safety Standards. The SEO program provides construction standards and guidelines to 16 major manufacturers in the region who agree to comply with higher efficiency standards for homes using all electric heat (Super Good Cents) or natural gas (Natural Choice). Since 1987, the Oregon Office of Energy has also run a separate program involving manufacturers, utilities, dealers, and home buyers of manufactured housing. The program, Manufactured Housing Acquisition Program (MAP), requires that utility partners in the region pay manufacturers to build all electrically heated homes to high efficiency standards. Partners include the Bonneville Power Administration, the Northwest Power Planning Council, 18 manufactured home builders, State Energy Offices, and utilities.

Results:

Currently, about 60% of new manufactured homes built in the Northwest region are certified to meet the Super Good Cents or Natural Choice standards.

MAP homes use half the energy of homes built to current Federal standards.

MAP homes cut household energy bills by about 30%.

MAP will save the Northwest region's utilities 8 megawatts of electricity annually.

The Manufactured Housing Acquisition Program homes cut household energy bills by about 30%.

Whole Building Design Approach Suggests Future Direction for New Building Construction

Pennsylvania adopted a new approach to building construction when planning its new Department of Environmental Protection headquarters building. They used an integrated design process to develop the building as a system rather than a series of attached components. The goal was to significantly reduce energy consumption and operational costs, maximize use of sustainable materials, and improve the health, motivation, and productivity of the occupants through an improved environment. To meet these goals, the planners combined the latest in energy-efficient equipment and design, including an innovative raised floor system, an individually-controlled heating and air conditioning system, careful solar orientation, and a myriad of sustainable building materials such as partitions produced from recycled soda bottles. The project team integrated many of the sustainable materials into the lobby's design as part of a working exhibit of green technology to educate visitors and building occupants of the building's unique design features.

Results:

Using the integrated design, annual energy costs were reduced from $1.54 per square foot to $0.74 per square foot. Over the life of the building, energy costs are projected to be reduced by $50,000 annually.

The attention given to the connection between building design and worker productivity resulted in a more comfortable work environment. The improvements in lighting, thermal comfort, acoustics, and indoor air quality contributed to an estimated 8% rise in productivity and commensurate decline in absenteeism.

Pennsylvania s integrated approach is being replicated in a sustainable development project in **Louisiana**. The proposed project involves the construction of three large office buildings in the State Capitol Complex area. The project is slated for groundbreaking in 1999.

"This will be the model for government buildings and real estate in the future."

– Darlene Crawford, Spokeswoman for Pennsylvania Department of Environmental Protection

The Northeast **Mississippi** Community College received funds through Mississippi's State Energy Program to install energy-efficient equipment in a new classroom complex. The goal of the project was to create an integrated system of energy-efficient measures. The college used the latest technologies to equip the building, including a photovoltaic system for exterior walkways, a thermal storage chiller, a make-up air system for fume hoods, a natural, environmentally-controlled air system which provides a closed HVAC system equipped with a microprocessor-based energy management system, and a wastewater treatment system. Initial reports demonstrate a substantial reduction in energy consumption in the buildings.

The developers of **New York**'s Four Times Square project tackled the considerable challenge of constructing a commercially-viable private building in the heart of Manhattan that integrates the highest level of green technology possible. The building is the first speculative office tower to be built in Manhattan since 1988 and its designers strive to meet the needs of its corporate tenants while adopting standards for energy efficiency, indoor ecology, sustainable materials, and sound operations. Two key elements of Four Times Square significantly impacted the application of the green design: the vertical nature of the building (48 stories), and the economic constraints arising from the developer/tenant relationship that often results in competing or conflicting design specifications. The developer is constrained in the implementation of certain measures due to the tenants' individual plans for occupying and using the space.

The specific goals in developing the Four Times Square project included providing the greatest amount of daylight penetration; installing energy-efficient, low-emission, CFC-free chillers for the HVAC system; on-site energy generation through fuel cells and photovoltaic cells; and superior indoor air quality in the office spaces. In determining the efficiency savings of various measures, the developers used DOE-2 energy simulation modeling software. The analysis was partially funded by a SEP grant and proved critical in getting the tenants "on-board" with several efficiency measures.

A rendering of the Four Times Square Building in New York City by Fox and Fowle Architects.

Transportation

Economic Independence and a Cleaner Environment

OVERVIEW

The United States is currently dependent on imported petroleum for nearly half the nation's consumption needs and the transportation sector accounts for 66% of total consumption. This dependence led to severe supply disruptions and price shocks during the oil crisis of the 1970's. In response to this crisis, the Department of Energy developed several conservation activities managed through the State grants programs, including right turn on red and promotion of car pools, van pools, and mass transit. Though the energy crisis abated by the early 1980's, reducing the nation's reliance on foreign oil remains a national security issue. In tandem with the drive to reduce greenhouse gas emissions, the Department of Energy's focus has expanded from mandatory conservation measures to encouraging energy-efficient transportation alternatives.

SEP supports the development and deployment of alternative fuels technologies and other creative strategies for improving energy efficiency in transportation. States have played a leading role in demonstrating new transportation technologies through State fleets and refueling networks. Starting in the early 1990's, States began to adopt innovative approaches to reducing transportation expenditures by limiting work-related driving through telecommuting and alternative work schedules. Through these diverse measures States have made impressive strides in reducing oil consumption and related emissions. All SEP activities, including those highlighted here, seek to increase the use and acceptance of alternative fuels, reduce vehicle emissions, and promote the efficient development of the transportation infrastructure.

States Promote Car Pools and Public Transportation - Fundamental Elements of Every Transportation-Efficiency Program

The city of Gulfport, **Mississippi**, promotes the use of park-and-ride and public transportation facilities along the Mississippi Gulf Coast Corridor, a heavily-traveled highway. Free parking is provided at a historic rail depot for commuters utilizing a variety of public transportation options. With assistance from a SEP grant, the city developed marketing materials to promote the use of public transport. Transportation efficiency savings from the program, based on operating and ownership costs, are estimated at $1.8 million annually.

The West Windsor Township in **New Jersey** implemented a similar program with initial financing from a SECP grant. The "Rideshare to the Train" project encourages commuters to car pool to the train by providing parking spaces closer to the train facilities. The program increased participation in car pools and train ridership.

Results:

Vehicle miles traveled were reduced by approximately 74,000 miles annually.

The estimated fuel savings amounted to 3,700 gallons annually.

The city of Gulfport, Mississippi, offers free parking at a historic rail depot for commuters utilizing public transport.

Florida considers both energy-efficiency and land-use issues in development of its transportation network. Two major projects—Eastward Ho! and the South Miami Corridor Redevelopment project—evaluated population densities to support mass transit and developed integrated light and medium rail and road systems to encourage multi-modal transport. This strategy allows optimum use of land and maximizes energy efficiency in the transportation system.

North Carolina seeks to improve energy efficiency by encouraging drivers to engage in simple efficiency practices. The marketing campaign "You Have the Power" provides straightforward advice on how to conserve energy and preserve the environment. These tips include changing oil and filters regularly, keeping tires inflated, avoiding "jack-rabbit" starts, sharing rides, and observing speed limits. The program recognizes the value of simple, low-cost practices that can have a significant effect when multiplied by millions of vehicles. The focus of this campaign on conservation reflects the historical development of energy programs from the fundamental tenets of conservation to efficiency and sustainability.

Oregon Telecommuting Program Gains Statewide Participation

Another innovative approach to reduce transportation energy expenditures is to limit the number of employee trips through measures such as telecommuting and alternate work schedules. The **Oregon** Office of Energy has helped establish more than 200 telecommuting programs with over 2,000 participants since 1993. Oregon promotes the concept of telecommuting through several channels. The Office of Energy has developed five pilot telecommuting programs in the public and private sectors, produces an array of educational materials, conducts extensive outreach to employees and employers, and grants tax credits to participating employers. Oregon partners with transit districts, university extension programs, and environmental centers to promote telecommuting programs.

Oregon's programs parallel an earlier telecommuting demonstration conducted in the State of **Washington**. The Puget Sound Telecommuting Demonstration Program, a public-private endeavor sponsored by the Washington State Energy Office, produced substantive results showing the benefits of telecommuting for employers and employees. The Washington study provided a strong model for other State telecommuting projects.

Results:

Greenhouse gas emissions are being cut by 3.8 million pounds annually in Oregon. Miles traveled have been reduced by 4.1 million miles annually, reducing fuel consumption and operating costs.

The Oregon legislature passed a bill requiring all State agencies to adopt telecommuting policies and actively promote this option.

The Oregon Office of Energy has helped establish more than 200 telecommuting programs with over 2,000 participants since 1993.

States Pioneer a Broad Variety of Alternative Transportation Fuels Technology

Kansas promotes alternative fuel vehicles at the annual Vehicle Roundup.

States have led the drive to develop and use alternative transportation fuels. Alternative fuels, such as natural gas, hydrogen, biodiesel, and electricity, reduce consumption of imported oil and reduce emissions. **Kansas** and **West Virginia** have integrated bi-fuel engine vehicles that use compressed natural gas in their State fleets. The **Nevada** State Energy Office is testing a hydrogen/natural gas fueled car, and is planning to build the world's first fleet of hydrogen/natural gas powered buses. **Idaho** is experimenting with the use of waste french fry oil to produce biodiesel fuel. Benefits from the substitution of biodiesel for petroleum diesel include its biodegradability, reduced emissions, and safety. Idaho's On-the-Road Biodiesel Demonstration project uses biodiesel to fuel two pickup trucks to show the advantages of this fuel over petroleum diesel. **Kansas** is advancing the use of solar-powered batteries through the Solar BikeRayce. Competitors race bicycles that use solar-powered batteries to drive engines. **Montana** is testing the use of biomass lubricants for snowmobiles to reduce the documented, excessive emissions from snowmobile engines.

Clean Cities Programs Link State, Local, and Federal Entities

Successful initiatives to develop alternative fuels technology at the State level have often been expanded and replicated on a regional level. One such initiative evolved into the Clean Cities Program, which is co-funded through the State Energy Program and the U.S. Department of Energy s Office of Transportation Technology. Clean Cities participants are locally-based, government/industry partnerships, coordinated by the U.S. Department of Energy to expand the use of alternatives to conventional gasoline and diesel fuels. By combining local decision-making with the voluntary action of partners, the "grass-roots" approach of Clean Cities departs from traditional "top-down" Federal programs. It creates and carries out an effective plan at the local level for establishing a sustainable, nationwide alternative fuels market. The program had created partnerships in 60 communities throughout the country by the end of 1997, and the count continues to increase. The Clean Cities have more than 30,000 operational alternative fuel vehicles (AFVs) that reduce oil consumption and tailpipe emissions. The 2,000-plus stakeholder organizations are committed to significant increases in AFV acquisitions and infrastructure investment over the next five years.

Atlanta, **Georgia**, was designated the first Clean City in America in 1993. Clean Cities Atlanta has a multifaceted program advancing the use of AFVs including natural gas cabs and electric school buses. Atlanta capitalized on the publicity surrounding the 1996 Olympic games to promote alternative fuels. Electric buses transported athletes and spectators to the games and natural gas cars, trucks, vans, and buses served as support vehicles during the international event.

Nevada has actively participated in the development of alternative fuel programs across the State for the past decade. This effort has resulted in the construction of a network of liquefied natural gas stations, acquisition of natural gas-powered street sweepers by the city of Las Vegas, alternative fuels

Natural gas-powered vehicles reduce emissions and increase the nation's energy independence.

incentive program for private fleets in Clark County, and designation of Las Vegas as the fifth Clean City by the U.S. Department of Energy.

West Virginia has shown innovation through diverse programs that demonstrate the practicality of using compressed natural gas (CNG) as a motor fuel. The State purchased 35 bi-fuel automobiles for the State fleet with financing from a light-duty vehicle grant from the U.S. Department of Energy and the West Virginia Clean State Grant Program. The State has developed a network of CNG filling stations to support the growing number of bi-fuel vehicles and is testing the O'Green compressor (a new technology) at two stations. **Kansas** has implemented similar programs. The Kansas Corporation Commission (KCC) installed CNG tanks on a State-owned automobile and converted the car to a bi-fuel engine. The KCC has also partnered with private companies to open CNG refueling stations across the State. Two cities in Kansas have been designated as Clean Cities.

A network of alternative-fuel filling stations is also a priority for **Minnesota**. With assistance from the State Energy Program, Minnesota has created a network of E-85 filling stations across the State. The State constructed 12 outlets and is actively expanding the use of alternative fuels.

Delaware received financing from the 1996 SEP Special Projects to install a compressed natural gas/propane refueling station in the city of Odessa. The station is one of a growing base of stations designed to support the 214 alternative-fuel vehicles currently operating in Delaware. In addition, the Delaware Clean State Program, along with the Greater Philadelphia (**Pennsylvania**) Clean Cities Program and the North Jersey (**New Jersey**) Clean Cities Program, received $200,000 in 1997 for a Multi-State AFV Rebate Program for Private Fleets in support of the Northeast Corridor Alternative Fuels Infrastructure Development Project. As part of another Delaware incentive program, the State fleet administrator ordered 67 AFVs: 51 bi-fuel CNG Ford Contours, 15 methanol Ford Tauruses, and one electric Ford Ranger pickup. The use of alternative fuel vehicles in State and private fleets will reduce emissions and oil consumption as well as increase awareness of the practicality of such vehicles.

The Gold Coast Clean Cities Coalition in **Florida** is working to increase the number of alternative fuel vehicles in the State. Through the State's Stripper Well funding, the coalition is developing a network of filling stations and providing incentives to public and private entities to convert fleets to alternative fuels. The Coalition has already demonstrated significant results.

Results:

The number of natural gas or electric powered vehicles in use in Florida has increased from 540 in 1994 to more than 1100 currently, and the fueling network has grown from 8 to more than 20 stations.

Utah s Salt Lake Clean Cities Coalition is successfully promoting the transition to AFVs.

Industry

Partnerships for Increased Productivity

OVERVIEW

Industry is the largest energy-consuming sector in the nation and the largest waste-generating sector. Without significant waste reduction in this sector, nonproductive expenditures on pollution abatement and control could top $200 billion by 2000. Industrial productivity is a national priority and a key economic issue for the States. By leveraging Federal funds through SEP, States can tailor industrial programs to address local needs and as a result, generate sizable cost and energy savings for American industry. SEP activities originated with technical and energy audits to improve energy consumption patterns in industry. These measures have evolved to include pollution prevention solutions, development of new technologies in heat recovery, energy use, and waste management, and support of integrated industrial complexes.

SEP's activities are often accomplished jointly with programs sponsored by the U.S. Department of Energy's Office of Industrial Technologies (OIT). Intrinsic to OIT's programs is its Industries of the Future approach, which targets seven of the most energy-intensive industries for industry/OIT cooperative projects: petroleum refining, chemical, forest products, steel, aluminum, metal casting, and glass. SEP also collaborates with OIT's NICE3 program (National Industrial Competitiveness through Energy/Environment/Economics). NICE3 provides funding to State-industry partnerships for projects that develop and demonstrate advances in energy efficiency and clean production technologies.

The West Virginia Glass Industry Assistance Program has enabled small West Virginia glass companies to have access to professional engineering expertise most often associated with private laboratories funded by large corporations.

Creative Partnerships Increase Resources for Improving Energy Efficiency in Manufacturing Processes

Many States court industry with tax incentives, road or water projects, or promises of a strong labor pool. **West Virginia** developed an innovative approach with the Industries of the Future (IOF) pilot program. The State has invested its backing and university talent to maintain and improve the glass industry that comprises an important component of the economy. In West Virginia, 30 manufacturing businesses employing nearly 6,000 people produce glass products. Glass manufacturing is energy intensive. To improve energy efficiency and the bottom line, the West Virginia Fuel and Energy Office of the West Virginia Development Office and the West Virginia University College of Engineering provide energy efficiency technical assistance to individual glass companies. Through IOF, teams of senior mechanical engineering students work with individual glass businesses to improve process efficiency.

Results:

The State's technical help has introduced computer-aided design techniques to improve the heat transfer characteristics of molds, preventing production losses.

West Virginia s program introduced computer-integrated manufacturing techniques to increase production efficiency and provided analyses of ways to reduce energy consumption in melting, forming, annealing, and finishing glass products.

The **New York** State Energy Research and Development Authority (NYSERDA) created the Flexible Technical Assistance program—or "FlexTech"—to save energy by connecting various contractors with New York businesses, industries, State and local government entities, and institutions. Services are provided on an individual, negotiated, cost-shared basis. The companies participating in the program have experienced significant cost-savings.

Results:

The Bronxwood Dye Co. will save $225,000 each year because it replaced dye vats, redesigned its processes to reclaim waste heat from dryers and boilers, and launched other measures recommended by FlexTech.

The Buffalo Paperboard Co. will save up to $467,000 each year by implementing several practical measures, most with payback periods of less than two years.

Summit Research Labs, a manufacturer of aluminum chlorhydrate, followed FlexTech recommendations and undertook a boiler heat recovery and chemical reactor process improvement project that will save $15,000 each year in energy costs, and increase reactor productivity by 30%.

New York State Energy Research and Development Authority recommended energy efficiency improvements for Summit Research Labs that will save $15,000 annually in energy costs.

"This process prevents energy and resource loss from by-products of the aluminum industry by utilizing all components as useful materials in manufacturing industrial and commercial products. These energy and material resources would otherwise be lost as landfill waste with pollution potential."

— John Pickens, Technical Director, Alumitech, Inc., Ohio

Aluminum recycling creates more than two billion pounds of black dross and saltcake by-products each year in the United States. The aluminum industry usually landfills these by-products, wasting raw materials and energy, and causing more environmental headaches. But in 1997, Alumitech, Inc., in Cleveland, **Ohio**, used $400,000 in NICE3 funds, and more than $3.3 million of its own money, to develop and install facilities that would separate aluminum, salt, and other useful aluminum recycling by-products. Alumitech then converts the various by-products into useful finished materials, delivering them to other industries and commercial operations.

Results:

The process has eliminated the need to landfill wastes, while creating 20 new jobs and reducing waste by 119

Recycling Waste Heat Reduces Energy Consumption

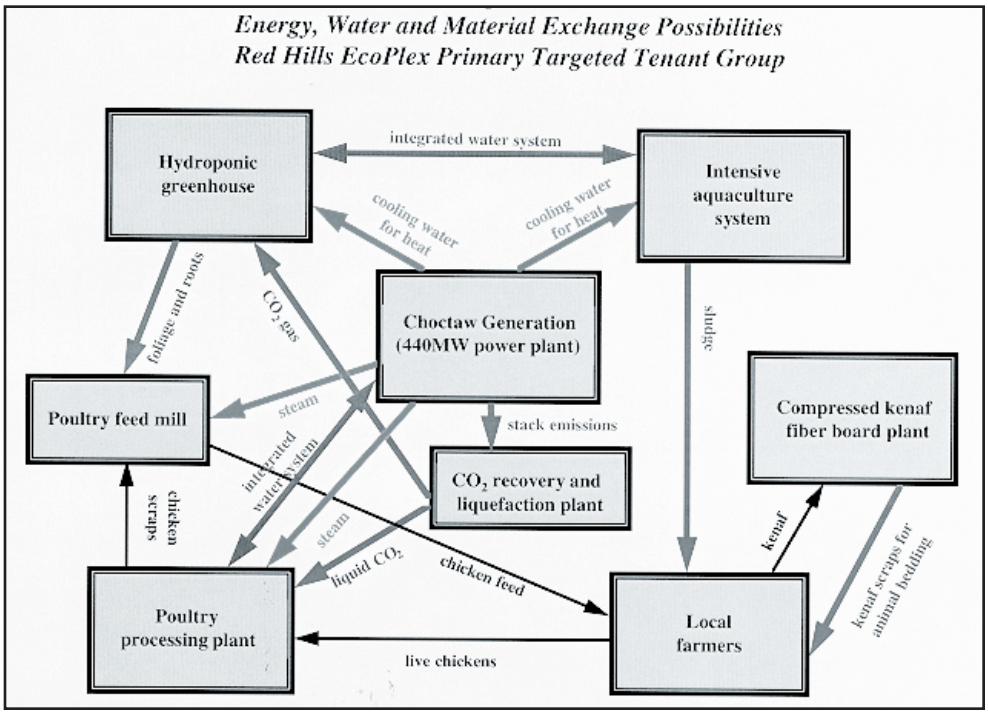
With coordination and financial assistance from the **Washington** State Energy Office (WSEO), the city of Seattle and Boeing Corporation have teamed up to save nearly 2.2 million kilowatt hours of electricity and 48 million gallons of water each year by transforming waste to useful service.

By leveraging a multi-million dollar project, the WSEO can now use effluent, waste discharged into the environment, from Metro Seattle's Renton waste treatment plant to heat and cool Boeing's Customer Services Training Center. The project offsets the need for 20 megawatts of new generation capacity.

Industrial Parks Create Synergistic Links Between Manufacturers and Promote Energy-Efficient Practices

The concept of sustainable industrial planning has arrived, and is flexible enough to embrace a variety of energy-efficient practices and renewable energy supplies. A good example is the Red Hills EcoPlex in Choctaw County, **Mississippi**, a public/private partnership between the State, Choctaw County, Mississippi Lignite Mining Co., Tractebel Power, Inc., and the Tennessee Valley Authority. The EcoPlex used a $30 million State grant and contributions from public and private sources to develop an industrial park that carefully matches a variety of tenants to the best cycles of energy and waste streams between businesses. Steam generated by a power plant may go into a pulping facility, which then channels its biomass wastes back to the power plant as fuel. This model development minimizes waste and maximizes profits, while creating numerous new jobs.

The Red Hills EcoPlex in Mississippi matches industrial tenants to the best cycles of energy and waste streams between businesses.



Education

Today's Investment in Tomorrow

OVERVIEW

Energy education is a necessary component in our lives at every level, from elementary schooling to on-the-job training. Moreover, energy education plays a critical role in shifting consumer patterns of energy consumption. There is evidence, particularly with recycling, that children can be effective agents of behavioral change within the family. Lessons learned by children are spread to family, friends, and acquaintances, who then perpetuate the cycle by repeating such lessons in other academic, occupational, and recreational settings. Older students also learn valuable vocational skills that can provide increased employment opportunities after graduation.

States have a long tradition of conducting energy education activities. Grants to States for education and outreach activities began in 1977, under the auspices of the Energy Extension Service (EES), and continue under SEP. These activities provide information and education services that help energy consumers make informed energy choices. Typical projects include energy audits, school curricula development, professional training programs, radio and television announcements and programs, workshops and seminars, and publications. SEP has demonstrated considerable success in training educators nationwide and developing comprehensive energy curricula.

1997 Ohio Bookmark Contest Winner.

Energy Education in Schools Develops Awareness in Youth

The National Energy Education Development (NEED) Project is a national network of students, educators, community, industry, and government leaders committed to developing an energy conscious and educated society. NEED conducts national training workshops for teachers, develops educational materials for students, sponsors a national awards program for students, and evaluates program successes. Several States have developed NEED Projects or modified variations. The **Rhode Island** NEED Project has been coordinated and sponsored by the Rhode Island State Energy Office since 1985. With funding through the State Energy Program, Rhode Island has developed a comprehensive, impartial energy education curriculum for grades K-12. Besides the lessons on energy production, consumption, and efficiency, the student-directed activities empower students to take active roles in educating others about energy issues and identifying potential solutions to energy problems.

The **Tennessee** Energy Education Network (TEEN) is one State variation of the NEED program. TEEN promotes energy education in grades K-12 through classroom instruction and partnerships with community organizations. TEEN services include training workshops for teachers, energy education materials for the classroom, presentations by energy professionals, and a bimonthly newsletter called *Energy Angles*. These services are provided to teachers and students through SEP funding. Another affiliate of the NEED program is the **Maine** Energy Education Program (MEEP). Maine's program challenges students from grades 4-8 to expand their thinking about energy issues. The program sponsors several interactive events, including the Statewide Leadership Workshops and the Junior Solar Sprint Competition.

Middle school winners of Utah s Annual Energy Debate program.

Members of the Energy Patrol team at Wilkins Elementary School in Mississippi perform a daily room audit.

Nevada has developed a broad energy education program to address education needs across the State. The Nevada Environmental/Energy Education Network (NEE-NET) provides instruction and training for teachers, parents, communities, and professionals. It supports youth programs, such as summer camps, national workshops, newsletters, student legislative delegates, and interstate student networking. NEE-NET also disseminates information to the community through a variety of channels, including a clearinghouse, the Learning Resource Center, and a hotline to answer citizens' questions.

Mississippi promotes awareness of energy efficiency issues among students through the Energy Patrol program. Staff from the State Energy Division train elementary students and school coordinators in creating student teams to patrol school buildings and conduct walk-through energy audits. This activity has led to significant energy cost savings for participating schools and has increased students' understanding of energy-efficiency and management issues.

Florida's Solar for Schools (SFS) program is demand side management, energy education, and solar initiative in one program. The emphasis of the program is on implementation of a mix of available solar technologies at public schools, coupled with an energy education component for school children. Contributions to the program are solicited through a "check-off" mechanism in the utility bill. Technologies employed in the program include: passive solar, light colored paints and solar screening for portable buildings, solar desiccant air conditioning, and photovoltaic lights on athletic fields. An interactive solar curriculum is included for participating schools, and a CD-Rom and Web site under development.

The U.S. Department of Energy, through its Boston Regional Support Office, is piloting an on-line education service called the Northeast Energy Education Network (NEEN). The network is a cooperative effort of educators, utilities, public, private, and non-profit organizations to create a community of shared resources for energy education. The NEEN Web site (www.eren.doe.gov/brso) provides on-line access to listings of regional events, grant and funding sources, and other regional energy education Web sites.

Students Gain Valuable Skills Learning How to Conduct Energy Audits

The **District of Columbia** Energy Office (DCEO) formed a partnership with the District of Columbia Public Schools to implement an Energy Audit Training Course at Calvin Coolidge High School. This program was funded by the DCEO through a grant from the Washington Gas Company during the 1996-1997 school year. The course provided basic training in energy auditing through classroom instruction, guest speakers, and hands-on training in the field. The program also encouraged the placement of students in summer internships and jobs in related agencies.

New Hampshire's Savings Through Energy Management (STEM) program teaches students how to conduct energy audits on their own schools. STEM participants learn to identify energy problems in the school, find solutions to reduce energy consumption, and quantify savings achieved through correcting these problems. The students present their findings at the local school board meeting.

Some student teams have partnered with private entities to conduct energy audits on small businesses. In addition to strengthening traditional academic skills, such as math and science, this program teaches vocational skills and prepares students for the realities of the workplace. The New Hampshire Energy Office supports the State's STEM program through SEP funding.

Results:

STEM teams report energy savings of $10,000 to $40,000 annually.

Students learn valuable academic and vocational skills, which better prepare them for the workplace.

Energy audits are provided to small businesses that could not afford audits otherwise. Energy-efficient practices are encouraged in small businesses, reducing energy consumption and stimulating the local economy.

Funding from State Energy Program Enhances Technical Training Programs

The energy office in **Hawaii** encourages the increased use of energy-efficient technologies by sponsoring training courses, workshops, and expositions. In cooperation with public and private sector partners, these events educate and promote the efficient use of energy by commercial, industrial, and government end-users.

The Energy Programs Office in **Alaska** developed a program to educate residential builders and general consumers on the available methods and technologies for building energy-efficient homes appropriate for Alaska's climate. In addition to training builders, the Alaska Craftsman Home Program (ACHP) created voluntary energy efficiency guidelines for new residential construction. Members from the State's real estate, financing, and building industries have teamed with the University of Alaska, the State s energy office, and several government agencies to manage the ACHP. Started with funding under the SECP, the ACHP is now self-sustaining.

Results:

ACHP homes consume up to 80% less energy than conventional Alaskan homes.

Alaska's State legislature requires general contractors to receive training equivalent to the ACHP to obtain a residential construction certificate.

The **California** Energy Commission (CEC) implemented a training program for large production builders in California and Nevada. The CEC partnered with the Building Industry Institute and ConSol to improve builders' understanding of and compliance with energy codes. The training is comprised of a half-day classroom session and a half-day session on the builders site; follow-up sessions are conducted three to six months later.

Results:

More than 1,300 participants from 170 building companies have engaged in the training to date.

These builders account for 31% of the market share in California/Nevada.

The improvement in energy efficiency in homes built by the participants during training is estimated at 96,000,000 KBTUs (Kilo British Thermal Units), or $800,000 annually.

Nebraska Energy Office employee and student intern complete a blower door test in an apartment in a housing authority in Chadron, Nebraska.

States Develop Creative Tools for Consumer Information

The Conservation Update was established in January 1985 as an information exchange and technology transfer tool for State Energy Program managers and other interested parties in the States and U.S. Territories, including national laboratories, private companies, and individual consumers. The Conservation Update is produced monthly by the **Kentucky** Division of Energy. The newsletter publishes short articles from the State Energy Offices and the U.S. Department of Energy describing existing and new programs, soliciting ideas, and sharing reports, studies, and evaluations. By listing a contact person for each article, readers have the opportunity to follow up on items of specific interest. Conservation Update is available on the Internet at the following address: http://www.eren.doe.gov/events/cu/.

Arizona developed an innovative program to address energy and water conservation issues while providing social service information and a referral program for senior homeowners. Senior volunteers are trained by an energy program administrator to give conservation information to program participants and install donated energy-efficient materials in homes. Staff from the State Energy Office provide technical expertise and administrative oversight to ensure both cost-effective conservation methods and a safe and healthy environment for senior homeowners. This free service is available to senior homeowners and disabled homeowners of any age.

Results:

Arizona has serviced over 20,000 homes since the inception of the program in 1985.

Senior homeowners report a reduction in individual utility bills by $120 to $240 per year.

Agriculture

Advanced Conservation Practices Benefit the Environment

OVERVIEW

Agriculture is a key component of the nation's economy and the largest economic sector in many States. Profit margins are often narrow because of weather and market fluctuations; this makes farmers extremely sensitive to changes in energy prices and supply. Energy costs in the agricultural sector exceed $15 billion annually. By reducing energy consumption and implementing efficiency measures farmers can greatly increase the competitiveness of American agricultural products. Such measures will minimize the environmental impact of energy consumption including pollution, soil erosion, and groundwater depletion. SEP works through the existing rural networks established by States, other Federal agencies (primarily, the U.S. Department of Agriculture), and local community groups to improve efficiency in agriculture. States promote conservation measures, conduct energy audits, and assist in the deployment of energy-efficient technologies. The innovative approaches developed by States such as no-till farming, photovoltaic-powered sensors for water pumping, and efficient irrigation practices, are saving money and time for farmers. Without SEP funding, these technologies might otherwise be out of reach for the individual farmers.

Irrigation Practices and Groundwater Depletion Pose Major Efficiency Concerns for Agriculture

Many measures are simple changes that pay for themselves within one year...

There are more than 8,000 active irrigation pumps in **New Mexico**, serving the $1 billion agricultural economy. To reduce irrigation costs, the State partnered with the University of New Mexico in 1988 to field a team of irrigation analysts who could evaluate each farm's pumping plants, conveyances such as ditches or piping, and field applications. The State team evaluates the farm operation and calculates efficiency measures. The team then makes recommendations for repairs, replacement, or design changes to save energy and money. Many measures are simple changes that pay for themselves within one year, such as using surge irrigation rather than a steady flow of water, lining ditches with concrete to prevent loss, or even reducing the size of fields to conserve water.

Arkansas farms produce nearly 42% of the nation's rice crop, and Central Arkansas' Grand Prairie region produces the lion's share of that rice. Inefficient irrigation practices, however, were draining up to two feet of water per year from aquifers used to irrigate Grand Prairie rice fields, threatening nearly 721,000 acres of this rich agricultural area. To stem the flow, the Arkansas Energy Office awarded $725,000 in oil overcharge funds to the Grand Prairie Irrigation Project. The project organizes farmers in the area to create water boundaries, then designs ways to better use surface runoff and to irrigate. Simultaneously, some water is diverted from the Arkansas and White Rivers to supplement groundwater supplies.

Results

The project reduces farmers' irrigation costs and saves both the White River and Bayou Metro Irrigation Districts an estimated $4 million annually.

It also creates opportunities for waterfowl habitat restoration and development.

No-Till Crop Cultivation Reduces Soil Erosion and Provides Energy Savings

Another major concern for farmers is the yearly loss of topsoil due to wind and water erosion. To address these issues, the **Florida** Energy Office and Suwannee River Resource Conservation and Development Council worked together to develop a no-till farming procedure. No-till farming sharply reduces soil loss because less than 10% of the soil surface is disturbed. In addition, the process decreases the number of passes across a field from eight to only three or four. Even though no-till farming can increase yields, the cost of experimenting with new technologies can often discourage a farming family. However, the financing provided by this program allows many farmers to get the equipment needed to start using this new technology.

SEP funds enable farmers to apply advanced procedures such as no-till farming.

Photovoltaic Fencing Offers a Cost-Effective Alternative to Traditional Fencing Systems

Photovoltaic powered electric fencing systems are being monitored in the Commonwealth of the **Northern Mariana Islands**, on the islands of Saipan, Rota and Tinian. Electric fencing is much cheaper than barbed-wire fencing for the farmer and enables farm families to more easily shift cattle from field to field. The practice of rotating grazing animals more often also protects grasslands from erosion. Photovoltaic fencing saves farmers time and money and reduces environmental damage.

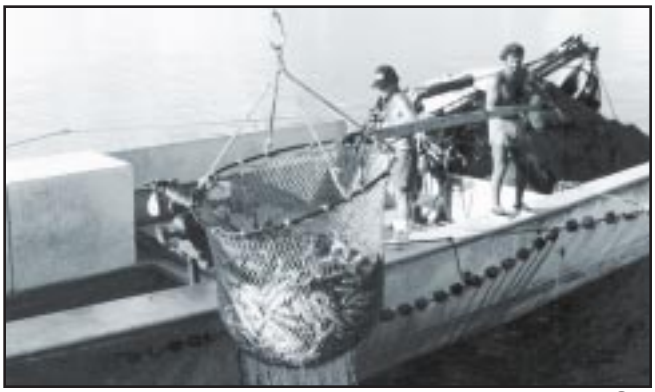
Improved Trawling Efficiency Generates Big Savings for Commercial Fishing

The Gulf of Mexico produces more than 160 million pounds of shrimp each year, driving a $1.5 billion industry for shrimpers, marketers, grocers, and restaurants. These delicacies come at a price, however. Gulf shrimp trawlers consume more than one-third of all diesel fuel burned in U.S. waters; a poor catch combined with high fuel costs could easily wipe out a fishing family's low profit margin. The State of **Texas** partnered with Texas A&M and the Marine Advisory Service to test hi-tech fibers for shrimp netting. The team was searching for a synthetic fiber that would be lighter, more durable, and smaller, allowing trawlers to be more fuel efficient. Several fibers were tested for more than a year, with SPECTRA synthetic fibers delivering the best results.

Results:

The SPECTRA fibers delivered a minimum of 15% more shrimp, with an average of 10-15% better fuel efficiency.

These netting improvements built on **Louisiana**'s earlier contribution of the "Easy Rig" rigging system, another project developed with SEP grants in the early 1990's. Using existing equipment, the "Easy Rig" system improved fishing fleet diesel fuel efficiency by 21 to 43%. Fishing families that use the system save up to $1,000 annually.



Improved fibers for shrimp netting delivers greater yield and increased fuel efficiency.

Financial Incentives

Reducing Barriers to Implementation

OVERVIEW

SEP financing programs are designed to stimulate the investment of non-Federal funds in energy efficiency. SEP allows States to use grant funds to offer energy efficiency loans and rebates and requires the consideration of energy efficiency in procurement practices. Many States have effectively launched loan programs, rebates, and procurement practices that have a significant impact on their energy budgets. These programs serve a broad range of beneficiaries, including small and large businesses, schools, hospitals, local governments, and individual citizens. The availability of SEP funds removes financial barriers to implementation of energy-efficiency improvements and provides working capital for these projects.

As a result of the mandatory requirement for States to incorporate cost-effective, energy-efficient purchases into their procurement standards, States now consider energy implications as part of their purchasing decisions. An increasingly popular approach to improving energy efficiency and reducing costs is the energy performance contract, which is developed with a specialized energy services contractor. The collaborative venture with private industry enables facilities to reduce energy-related operating costs without incurring up-front costs to the State or building owner. Revolving loan programs are another example of creative financing that use a limited amount of funds while providing maximum benefits for energy conservation and efficiency.

"The projects have reduced our consumption of natural gas and electricity, as well as improving the living environment for our patients. This program is a win-win situation."

– David Lyon, Business Manager, Independence Mental Health Institute, Iowa

Revolving Loan Programs "Recycle" Loan Dollars

To effectively use limited funds and to provide maximum benefits for energy conservation and efficiency, many States have developed revolving loan programs. These programs "recycle" loan dollars by consistently replenishing the original funds with interest payments. They are highly successful mechanisms for offering low-cost monies for energy efficiency measures. **Idaho** was the first state to utilize petroleum violation escrow (PVE) funds to begin a revolving loan program. Since the inception of Idaho's loan program in 1987, 1,542 loans have been granted with total project costs of almost $11 million and annual energy savings valued at $3.6 million. The success of such early programs spurred the rapid proliferation of revolving loan programs. **Wyoming** also used PVE funds to commence its revolving loan program, which provides funds to members of the Wyoming Association of Municipalities and the Wyoming County Commissioners Association to install energy conservation retrofits.

The range of revolving loan programs continues to expand and States have branched out in several directions, providing opportunities tailored to meet the needs of each community. Through a partnership with PowerSouth and the U.S. Department of Agriculture Rural Development, **Alabama** has established a revolving loan program to help small, rural governments in upgrading equipment and buildings to energy-efficient levels. In **Tennessee**, the Local Government Energy Loan Program offers low-interest loans to municipal and county governments for energy efficiency projects in existing public schools and government-owned buildings.

Tennessee has also developed a Small Business Energy Loan Program to help private companies increase energy efficiency, retrofit existing buildings, and improve operations. **Maine** has shown innovation in establishing a revolving loan program in conjunction with its small business energy audit program to aid small businesses to increase their energy efficiency.

Significant gains in energy efficiency can often be achieved by improving operations at large industrial complexes. To promote increased efficiency in the industrial sector, **Indiana** created an Industrial Energy Efficiency Fund that provides zero-interest loans to manufacturers to finance the purchase of energy-efficient equipment. The revolving loan program also reaches into the residential market.

Louisiana's $13 million revolving loan program provides low-interest mortgages for new, highly energy-efficient homes and low-interest loans to homeowners for energy improvements in existing homes. The calculated savings per program participant are estimated at $300-$600, with a reduction in emissions equal to 7,300 pounds of carbon dioxide annually and annual savings of the equivalent of 51,000 cubic feet of natural gas. In the **Virgin Islands**, a subsidized energy loan program enables homeowners, renters, businesses, and non-profit organizations to implement several energy-efficient measures, including installation of photovoltaic systems, lighting retrofits, and upgrading air conditioning.

Promotional poster for Virgin Islands subsidized energy loan.

Schools and Hospitals Benefit from Revolving Loan Programs

Many States have developed loan programs to improve energy efficiency in schools and hospitals. The **Alabama** STAR (Savings Through Analyses and Retrofits) Program provides financial assistance to schools and hospitals for installation of energy efficiency improvements. Through the Community Energy Loan Program (CELP), **Maryland** provides low-interest loans to assist in energy-efficient upgrades with the goal that the energy savings will ultimately pay for the upgrades. In tandem with the State's effort to improve education, the CELP allocates funds for a number of school projects to improve energy efficiency. For the schools of Prague, **Oklahoma**, an interest-free SEP loan financed the installation of energy-efficient lighting, high efficiency heating, ventilation and air conditioning units, and a centralized computer system to monitor the heating and cooling needs in all the buildings. The loan will be repaid through energy savings within an estimated five years and future energy savings will finance the operational and educational needs of the schools.

The Energy Bank Partnership in **South Carolina** also maximizes energy efficiency in school districts, as well as State agencies, and public and non-profit facilities by providing energy audits, financing options, monitoring, and training. **Iowa**'s Energy Bank was developed to provide a financing mechanism for the installation of energy management improvements in schools, hospitals, and local governmental buildings. Since its inception, the Iowa Energy Bank Program has installed more than $114 million in energy improvements, directly benefiting 515 participants, and saving taxpayers $16.5 million annually.

Breadth of Nebraska's Loan Program Ensures Long-Range Benefits

Nebraska's Dollar and Energy Saving Loan Program seeks to advance energy efficiency with an eye to long-term sustainability. The program, created in 1990 under the SECP and continued under SEP, draws from a loan pool of $19.9 million of oil overcharge funds. The scope of Nebraska's program is unique in its breadth: it provides low-cost energy loans to residential, small business, commercial, nonprofit, industrial, agriculture, and government energy consumers. Because the funds are continually reused, the original capital has been preserved, yielding a greater number of beneficiaries.

The Nebraska State Energy Office created a statewide information and low-cost financing network and works with 325 financial institutions to promote the program. The low-interest loans finance home, building, transportation, and system improvements. Popular home improvements include, upgrading furnaces, air conditioning, windows, and insulation. Agricultural loans generally focus on improving irrigation systems. The Dollar and Energy Saving Loan Program has generated positive results by tailoring a self-sustaining program that is consumer- and lender-friendly.

Results:

Nearly 12,000 projects have been financed since the inception of the program, spanning most areas of Nebraska's economy. These loans benefit 97% of Nebraska's counties.

The breadth and diversity of Nebraska's loan program ensure a statewide progression toward greater energy efficiency.

States Buying and Contracting Practices Incorporate Energy Efficiency

State buying practices have been influenced by the mandatory requirement for States to incorporate cost-effective, energy-efficient purchases into their procurement standards. These purchases include, building materials, office supplies and equipment, and fleet vehicles. States now routinely consider energy implications as part of purchasing decisions and have incorporated performance contracting practices.

The use of performance contracting is another innovative approach to financing energy efficiency improvements. An energy performance contract, developed with a specialized energy services contractor (ESCO), enables the reduction of energy-related operating costs without any up-front costs to the State. **New York** uses performance contracting to improve energy efficiency in the State's school system. In less than three years, New York provided assistance to 89 school districts, with an estimated annual energy cost savings of $10.8 million.

...New York provided assistance to 89 school districts, with an estimated annual energy cost savings of $10.8 million.

Illinois Successfully Implements Pilot Energy Performance Contracting Program

Faced with the need to replace aging, inefficient building stock and growing pressure to reduce operating budgets, **Illinois** developed a pilot energy performance contracting program. Under the program, energy performance contracts were implemented at seven State facilities, including two mental health facilities, two college campuses, one correctional facility, a school, and an administration building. Energy conservation methods for the pilot program included optimization/control strategies and capital improvements, such as lighting, boilers, chillers, energy management systems, and variable air volume systems. The investment in these improvements totaled more than $20 million and was funded through private, tax-exempt financing.

Results:

The ESCOs guaranteed energy savings of more than 27% of the facilities' utility expenditures for the base year.

The success of the pilot program has encouraged expansion of performance contracting in Illinois.

North Dakota Rebate Program Helps Keep Disaster Victims Warm

While States generally develop their plans in the context of long-term goals, they are often required to be flexible and respond to rapidly-changing conditions. The **North Dakota** State Energy Program (NDSEP) demonstrated this fast response following record flooding along the Red River, concentrated at Grand Forks, and considered the worst disaster in State history. Through a PVE-funded Energy Efficient Rebate Project, the NDSEP extended $250 rebates to homeowners required to replace submerged heating systems, if they installed furnaces with efficiency ratings of 90% or greater.

Results:

The NDSEP project granted 3,800 vouchers for replacement heating systems to residents.

The rebates provided much needed financial assistance to the disaster victims while also ensuring lower energy costs and greater energy efficiency in the future for those beneficiaries.

Appliance Rebate Program in Virgin Islands Initiated in Wake of Hurricane Hugo

The destruction wrought on the **Virgin Islands** by Hurricane Hugo in 1989 spurred the need for residents to replace many appliances. The Virgin Islands Energy Office seized the opportunity to encourage the purchase of energy-efficient appliances and created the Pay$ Rebate Program. Previously, use of energy-efficient appliances was rare and these items were in short supply in the Virgin Islands. This program provides financial assistance to consumers of energy-efficient appliances and lighting and water conservation products. It also gives retailers an incentive to increase stocks of energy-efficient appliances through increased sales. The rebate program has had a significant effect in lowering energy consumption in the Virgin Islands and reducing residential energy bills.

Results:

The energy office has issued more than 8,500 rebate checks to date.

The energy savings of one rebate cycle is estimated at 8,534 barrels of oil, or 49.5 billion BTUs, per day.

Utilities

Progressive Solutions

Diversify Electricity Sources

OVERVIEW

Electricity accounts for approximately one-third of the nation's total energy consumption and is an essential fuel for U.S. residents, industry, and transportation. However, the prohibitive cost of electricity distribution to many areas of the nation has encouraged energy suppliers to turn to renewable technologies. Renewable energy sources—such as the sun, wind, biomass, geothermal energy, and hydropower—comprise a unique component of the nation's energy portfolio because they offer customers a clean, environmentally-friendly alternative to conventional electricity sources. Renewable technologies reduce the nation's dependence on foreign energy and increase the number of domestic jobs. Renewable energy currently comprises nearly 10% of total U.S. energy production and is forecast to displace more than one quad of primary energy by 2010.

SEP supports the development of alternative electricity sources and renewable technologies. States use SEP funds to develop reliable and cost-effective renewable technologies. By establishing the credibility and cost-effectiveness of these technologies, States have made alternative electricity sources a realistic option for many consumers. The State-led drive to expand the use of renewable resources has spurred utilities to integrate renewable sources into their energy portfolios. States are joining forces with Federal and utility partners in using renewable energy technologies such as photovoltaics to meet off-grid power needs in sensitive environmental areas. SEP also increases consumer knowledge of electricity supply alternatives. As a result, consumers are increasingly receptive to "green pricing"—paying a premium for renewable energy.

Utilities Partner with Ratepayers to Bring Renewables to the Grid

...many consumers have agreed to pay a premium for "green" power.

Utility customers across the nation are increasingly supporting the development of "green" power supplies and many consumers have agreed to pay a premium for "green" power. In **Michigan**, ratepayers of Traverse City Power & Light agree to pay a green rate premium of 1.58 cents/kWh (roughly $7.58 per month for an average residential household) to support the wind turbine supplying their homes with electricity. The turbine is the first utility-scale wind generator in Michigan. The 600 kW generator turbine uses a variable blade pitch mechanism to take maximum advantage of the winds blowing off Lake Michigan. The turbine produces 1.1 to 1.2 million kWh annually and powers approximately 200 average Traverse City homes. Without the premium rate, the $650,000 project would have been out of reach for the utility, which also used a $50,000 SEP grant to partially fund the generator. The green rate premium plus a 1.5 cents/kWh Federal renewable energy production incentive makes the wind generator's 5.5 cents/kWh amortized operating cost competitive with electricity available from the municipal power pool.

Results:

Each Traverse City "green rate" customer helps avoid burning three tons of coal every year.

The consequent reduction in air-polluting emissions amounts to 10,000 pounds of carbon dioxide, 60 pounds of sulfur dioxide, and 40 pounds of nitrogen oxides annually.

States Support Testing and Application of Renewable Energy

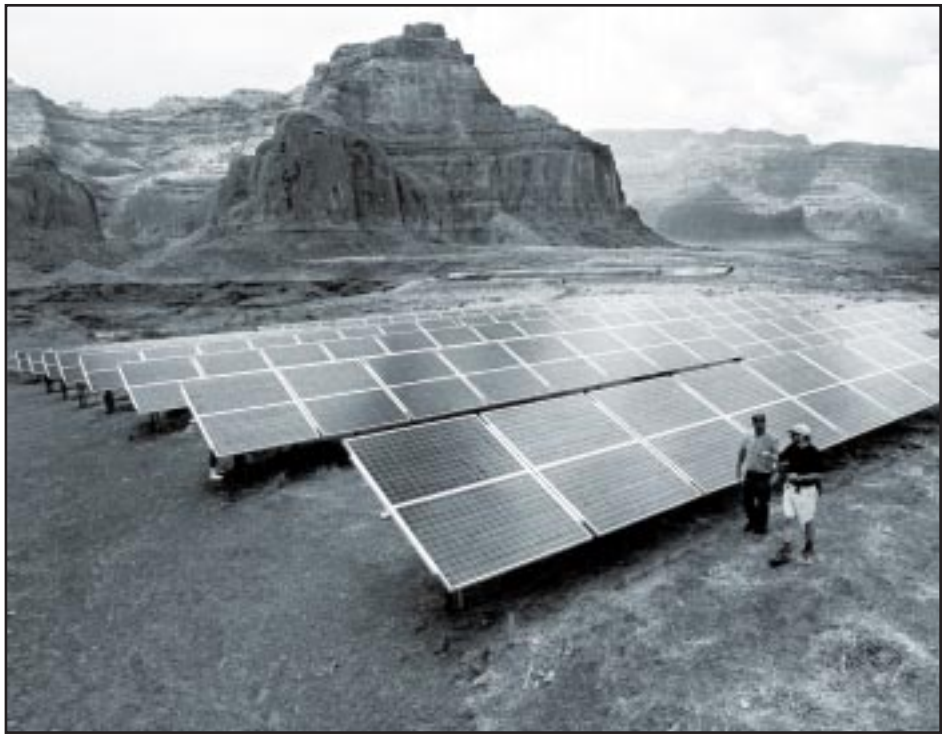
State Energy Offices are teaming with Federal and utility partners to test promising energy supply alternatives in high-value situations. The demonstrations resolve market barriers and technological bugs. The **Wyoming** Energy Office is testing several small grid-connected photovoltaic arrays at sites on the University of Wyoming campus, using nearly $1 million in funds and the expertise from the University and partners, Pacificorp and Advanced Photovoltaic Systems. In Beverly, **Massachusetts**, a 15-year-old 100-kW photovoltaic system is now the site of the Solar Now Project. Since 1995, many Massachusetts teachers and students have attended renewable energy education seminars at the site, sponsored by Solar Now. Educators and utilities want to expand opportunities for high-value solar applications during utility restructuring.

Texas is the largest energy user in the United States and the sixth largest energy consumer in the world. When the State discovered to its shock that it had become a net energy importer by the late 1980's, it began testing several renewable technologies, first with public utility and State and Federal funds and now with private utility partnerships. The Lower Colorado River Authority and Texas General Land Office developed a 35-MW wind farm in the Delaware Mountains of west Texas that supplies more than 12,000 homes in central Texas with power, plus funnels additional revenues to the State's school fund. Many small solar arrays serve irrigation or cattle watering pumps across the State, while the city of Houston has installed more than 1,000 solar-powered school zone warning lights. Additional supplies from Texas' abundant solar and biomass resources could easily meet the State's energy needs in the future, and utilities and the State Energy Office continue to explore that robust potential.

According to the Union of Concerned Scientists, if the majority of Texas' wind power potential were captured it could supply most homes in the United States with electricity.

Virginia passed ground-breaking legislation in 1993 offering one of the most far reaching incentive programs for manufacturing photovoltaic panels. The incentive is performance based and provides up to $0.75 per watt for photovoltaic panels manufactured in Virginia and sold through December 31, 2001. The program, administered by the Virginia Department of Mines, Minerals, and Energy, has been instrumental in bringing high technology companies including Solarex and Solar Building Systems to Virginia. To date, these companies have made approximately $32 million of capital investment in Virginia and employ 80 people.

This home employs integrated solar roof panels.

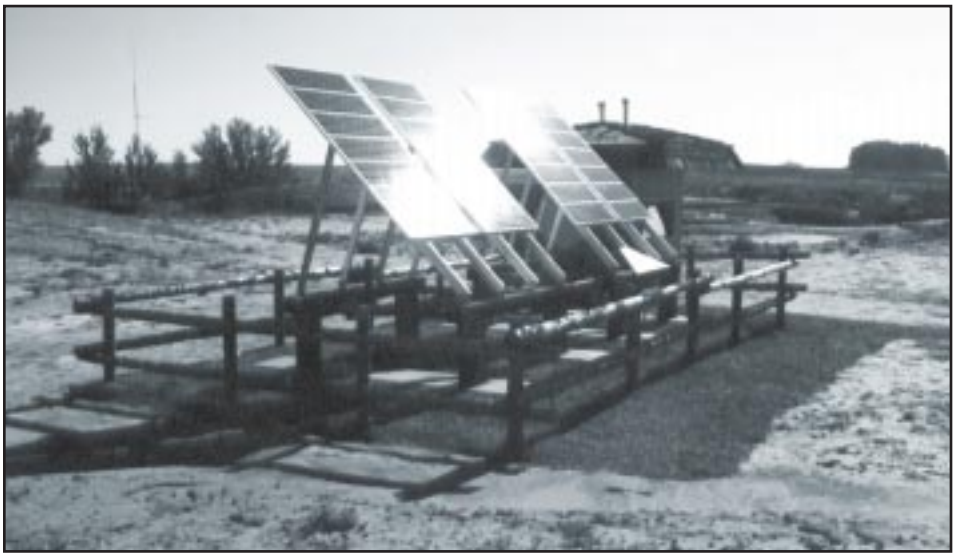


This 115 kW PV system in Utah s Glen Canyon Recreation Area powers Dangling Rope Marina on Lake Powell.

Remote Solar, Off-Grid Electricity Supplies Provide Alternatives in Isolated Areas

To promote self-sufficiency and prevent expensive distribution costs, State Energy Offices are developing off-grid power supplies for remote communities. In the **Republic of Palau**, energy officials have installed more than 200 photovoltaic home lighting systems across the island nation, sometimes providing the families first light, or replacing kerosene lamps. States are also pioneering projects designed to provide power within the National Park system. These remote applications power services in peak visitor periods, but can be idled in the off-season without prohibitive base-load juggling or long-term investment in distribution systems. These off-grid tests provide valuable information on how alternative power supplies function in real-world conditions. This information benefits community planners who want a more sustainable energy system and helps planners in developing countries find solutions for off-grid needs.

Several State parks in **Utah** will benefit from the installation of solar and solar/propane hybrid energy supply systems. At Yuba Lake State Park, the U.S. Department of Energy's Office of Energy and Resources Planning (OERP) has been working with the Utah Division of Parks and Recreation to install a series of small photovoltaic systems to power 18 cabana shelters. The same team will design and install a photovoltaic system at Red Fleet State Park that will free the park from the grid. At Goblin Valley State Park, a batch type solar thermal collector will be installed that will supplement current water heating for showers. In Canyonlands National Park, the OERP leveraged funds from the Federal government, the State of Utah, and the private sector to develop a photovoltaic/gas microturbine hybrid electricity supply system to serve the Needles District Visitors Center. In each case, solar power will replace expensive, noisy, and polluting fossil fuels.



Goblin Valley State Park in Utah s Red Rock County utilizes solar collectors to heat water.

Results:

The system at Yuba Lake will displace 205 gallons of diesel fuel.

Red Fleet's photovoltaic system will offset the burning of 3,800 pounds of coal each year and avoid $6,356 in end-of-the-line fees.

Goblin Valley's solar system will eliminate the need to burn 246 gallons of propane annually.

The hybrid system at Canyonland's National Park will reduce operating costs and eliminate the burning of approximately 20,600 gallons of diesel fuel per year.

These projects will give Park and State personnel enough experience with the technology to allow them to build it into the planned cross country and biathlon venue at Utah's Soldier Hollow for the Winter Olympics in 2002.

Geothermal Technologies Produce Myriad of Benefits

Geothermal energy technologies capture the earth's heat to warm and cool buildings, heat water, and generate electricity. Similar to solar applications, geothermal technologies are particularly useful in remote locations. The four communities comprising the Hamlin School District in **South Dakota** are small and remote, making them excellent candidates for geothermal. The State of South Dakota supported the installation of a ground source heat pump in the Hamlin School District to reduce electricity consumption and operating costs. Geothermal heat pumps use electricity to move heat, not to generate it, and utilizing geothermal energy can reduce electricity consumption up to 75%. Though the initial cost of the geothermal system was slightly higher than the conventional system, the long term energy savings are significant.

Results:

The annual operating costs of the heat pump system are nearly 60% lower than the conventional system.

Installation of the ground source heat pump has resulted in annual energy savings of nearly $24,000 for the school district.

Geothermal energy displaces traditional sources of electricity generation and reduces related emissions.

"...utilizing geothermal energy can reduce electricity consumption up to 75%."

Installation of a geothermal heat pump requires drilling two boreholes which are 4 inches in diameter and range from 125 to 450 feet deep.

Sustainability and Disaster Relief

Integrated Approaches for Comprehensive Development

OVERVIEW

Sustainable development is defined as "development that meets the needs and aspirations of the present without compromising the ability of future generations to meet their own needs" (Brundtland Report, 1987). By applying sustainable practices to planning, communities maximize resources, create efficient infrastructures, and protect and increase their energy independence. An additional unique opportunity to apply sustainable practices is manifested in a community's response to natural disasters: communities can rebuild or even relocate in a manner that increases energy and resource efficiency and enhances their ability to more effectively cope with calamities.

Flexibility and leveraging characterize SEP's support of sustainable practices in the States. As part of the formula grant, States are required to develop emergency plans to deal with energy supply interruptions, focusing on reducing energy use and encouraging the use of energy efficiency and renewable energy technologies. In recent years the scope of SEP has expanded to accommodate the varied needs of States, including adoption of integrated energy plans and incorporation of energy efficiency in economic designs. SEP sustainability projects often involve innovative partnerships among Federal, State, and local entities. The following examples provide a sampling of many successful SEP-driven partnerships.

Growth Through Integrating Sustainable Energy Policies

Many States develop guidelines or regulations that help planners at the city, county, and State level plan communities for more sustainable resource use. Montgomery County, **Maryland**, and the **Arkansas** Energy Office are two entities that use sustainability as the watchword for future growth. In Montgomery County, officials used new county energy guidelines to approve a window redesign in the county government building and a complete energy saving plan for the large new county swim center. These measures resulted in energy savings of $750,000 in 1990, and officials expect increased energy savings of $150,000 each year. Arkansas' Energy Office has encouraged State planners to use its annual "Energy Data Profile" as an information tool, enabling businesses, State officials, and institutional planners to compare current energy supplies with historic consumption data and future projections. The detailed information helps officials plan using sustainable development principles.

Individual facilities or practices in **Kansas** and **Colorado** demonstrate that sustainable planning has arrived, and is flexible enough to embrace a variety of energy-efficient practices and renewable energy resources. Kansas provided a different model of synergistic systems with its Ecohouse and Energy from Space exhibits in the Wonderscope Children's Museum in Shawnee. The Ecohouse is a dome-shaped, energy-efficient structure constructed only of recycled materials and using solar and wind power. In the Energy from Space exhibit, children enter a simulated underground facility and use computers to control solar-powered satellites and operate motors from "space." Colorado's Office of Energy Conservation has pioneered the use of Smart Places computer software to allow developers, builders, utilities, and State or county officials to project energy use, traffic patterns, and other resource needs of communities while they are in the planning stages. The program builds general data into a powerful "looking glass," enabling participants to see the results of developments under various assumptions.

Children learn about energy efficiency, solar, and wind power at the Ecohouse—a dome-shaped building made entirely of recycled materials.

A promotional mailer for the Ecohouse and Energy from Space exhibits in the *Wonderscope Children's Museum* in Shawnee, Kansas.

Swains Island Residents Demonstrate Energy Independence

Many places in the world remain without electricity, due to their remote locations, poverty, or lack of electrical infrastructure or utility provider. Small, stand-alone systems, such as solar arrays, small-head hydro, wind generators, or ocean wave action generators, could power the most critical needs, such as irrigation pumps or communication devices, for the most isolated communities. The 27 residents of Swains Island, **American Samoa**, were among those without electricity, cut off from the main American Samoan Island of Tutulia by 200 miles of South Pacific seas. Government supply boats visit only three to four times each year, so Swains residents must be self-sufficient. They are proud of their reliance on locally grown foods such as taro, breadfruit, coconuts, bananas, mangos, papayas, and guava, supplemented by fish from the reef surrounding their tiny 2-square-mile coral atoll. They collect drinking water through rainwater catchment systems.

In 1995, the Territorial Energy Office installed a 120-amp-hour photovoltaic system to supply lighting to the one-room school and medical clinic, and power a radio transmitter and vaccine refrigerator. Island dwellings remain without power. The Energy Office maintains the photovoltaic system, and is considering expanding it in 1999 or 2000.

Results:

Swains Island uses reliable solar photovoltaics to serve educational and medical needs of its remote location.

The project is replicable and cost-effective for remote locations or developing countries without a utility infrastructure.

Natural Disasters Catalyze a Move to Sustainability

Many States have used **disasters as an opportunity,** choosing to implement sustainable energy policies during rebuilding.

Sustainable planning and practices not only can help meet the needs of isolated communities, but soften the blow when disaster strikes. Many States have used disasters as an opportunity, choosing to implement sustainable energy policies during rebuilding. In redesigning their communities, States, counties, and cities have applied sustainable principles to increase their energy efficiency and self-sufficiency. Several States also employ sustainable planning regulations as a way to ward off natural disasters.

After suffering huge economic losses in Hurricane Andrew in 1992, **Florida** officials teamed up with the Federal Emergency Management Agency to develop a variety of strategies governing new development, redevelopment following disasters such as hurricanes, and building code modifications to existing structures. Under the guidelines, Floridians can apply tactics such as relocation, stronger building codes and enforcement, retrofitting, economic diversification, education, and planning. These strategies favor sustainable practices and renewable energy sources.

Following a devastating ice storm that resulted in State and Federal disaster declarations in Northeastern **New York**, the State energy office labored to ensure stable and adequate fuel supply lines. Working with State, Federal, and local emergency officials and private vendors, the energy office supplied gasoline, heating oil, and propane to tens of thousands of farmers, residents, and businesses.

The community of Pattonsburg, **Missouri**, had to decide whether to remain in the same location or switch to a new site after being flooded out in 1993. Choosing to plan for the future, the small town used a $12 million Federal grant to move to a more secure location and rebuild itself along energy-efficient lines. The city added a new lifetime learning center, a more efficient telecommunications facility, and designed the layout of the town to place residential areas no more than a 5-minute walk from stores and shopping malls. The community incorporated solar power and biomass energy for its needs, and re-engineered an old hat factory to operate using waste heat from an adjoining grain mill.

Environment Takes Center Stage in Sustainable Planning

Cutting pollution and saving energy often go hand in hand—modifying processes or practices often result in better efficiency and an improved environment. That was the experience in **Pennsylvania**, where Governor Tom Ridge recognized 45 organizations in 1997 with the Governor's Award for Environmental Excellence. The businesses, institutions, municipalities, and environmental groups recognized in 1997 collectively saved $79 million in costs, returned 22 to 73% on their investments, and enjoyed an average payback period of 2.1 years on their environmental or energy process investments. In addition, they prevented 27.5 million gallons of liquid waste, 15.1 million tons of solid waste, and 18.8 million tons of air emissions from entering the environment.

The financial benefits of good environmental stewardship were clear—10 of the businesses recognized in 1997 embrace a "zero emission" goal simply to make themselves more competitive.

Residents of the **Virgin Islands** make use of Federal grants coordinated by the Virgin Islands Energy Office to upgrade their solar-powered reverse osmosis water purification system. Fresh water is at a premium on the islands; using renewable energy to rid their water of impurities improves both their health and environment, while saving precious energy dollars.

Recycling Industrial By-Products Saves Energy and Money

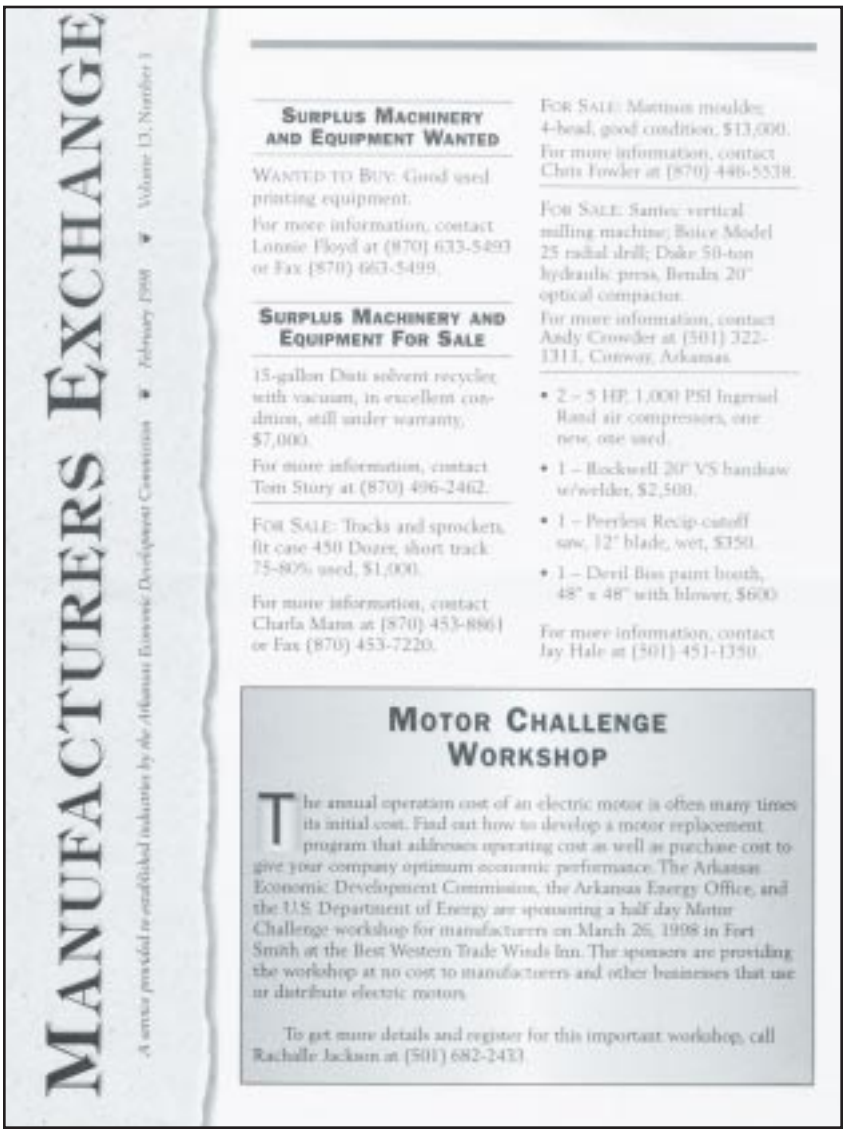
Modifying processes saves energy, and so does recycling the material at hand. In **Tennessee**, the State's Energy Division coordinated a recent conversion by Panoply Corporation of Lexington. The company installed new equipment that captures and reuses the wood dust by-product of its custom plywood manufacturing process. The wood dust is burned to produce steam for other on-site uses.

Results:

This recycling effort is saving the company an estimated $42,000 annually in energy costs, and an additional $5,000 annually in waste hauling and disposal fees.

Payback will take slightly more than two years.

In **Arkansas**, the "swap meet" concept has risen to new environmental heights. The State Economic Development Commission publishes a handbook called "Manufacturers Exchange." The publication helps industries to learn of each other's wastes, by-products, excess capacity, surplus materials, and equipment for possible exchange. Industrial participants profit through lower energy and waste costs and the environmental benefits are multifold.



MANUFACTURERS EXCHANGE

A service provided to established industries by the Arkansas Economic Development Commission • February 1998 • Volume 13, Number 1

SURPLUS MACHINERY AND EQUIPMENT WANTED

WANTED TO BUY: Good used printing equipment.

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SURPLUS MACHINERY AND EQUIPMENT FOR SALE

15-gallon Dutt solvent recycler, with vacuum, in excellent condition, still under warranty, $7,000.

For more information, contact Tom Story at (870) 496-2462.

FOR SALE: Tracks and sprockets, fit case 450 Dozer, short track 75-80% used, $1,000.

For more information, contact Charla Mann at (870) 453-8861 or Fax (870) 453-7220.

FOR SALE: Mattson moulder, 4-head, good condition, $13,000.

For more information, contact Chris Fowler at (870) 446-5538.

FOR SALE: Sante vertical milling machine; Boice Model 25 radial drill; Duke 50-ton hydraulic press, Bendix 20" optical comparator.

For more information, contact Andy Crowder at (501) 722-1311, Conway, Arkansas.

- 2 – 5 HP, 1,000 PSI Ingersol Rand air compressors, one new, one used.
- 1 – Rockwell 20" VS bandsaw w/welder, $2,500.
- 1 – Peerless Recip cutoff saw, 12" blade, wet, $350.
- 1 – Devil Biss paint booth, 48" x 48" with blower, $600.

For more information, contact Jay Hale at (501) 451-1350.

MOTOR CHALLENGE WORKSHOP

The annual operation cost of an electric motor is often many times its initial cost. Find out how to develop a motor replacement program that addresses operating cost as well as purchase cost to give your company optimum economic performance. The Arkansas Economic Development Commission, the Arkansas Energy Office, and the U.S. Department of Energy are sponsoring a half day Motor Challenge workshop for manufacturers on March 26, 1998 in Fort Smith at the Best Western Trade Winds Inn. The sponsors are providing the workshop at no cost to manufacturers and other businesses that use or distribute electric motors.

To get more details and register for this important workshop, call Rachelle Jackson at (501) 682-2433.

Looking Ahead

Twenty years of State energy grant programs have produced significant, tangible results. The cornerstones of program success are highly leveraged Federal grants (typically $4 or more of other funding is leveraged for every of $1 of DOE funding) through partnerships with State agencies, communities, and private entities. Program flexibility has allowed the program to adapt to changing State energy needs, the availability of new energy efficiency and renewable energy technologies, and to economic, environmental, and national security concerns. Success can also be attributed to sound management practices that emphasize performance and results, streamlined administrative operations, effective communication channels, and a history of collaborative problem-solving. As the new millennium approaches, the State Energy Program will continue to capitalize on these strengths to meet both State and national energy objectives.

Our near term goal ... will result in saving .71 quads of primary energy and **$510 billion in energy costs** and will **reduce carbon emissions by 1.515 million metric tons**.

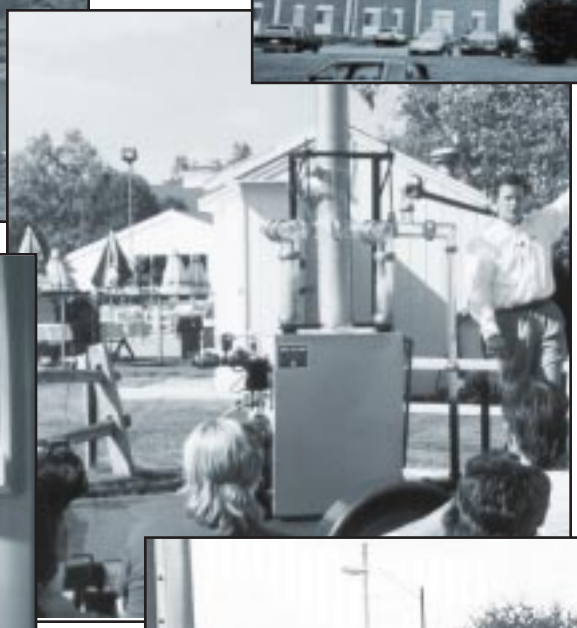
Imagine an America in which every home is energy efficient, every car runs on clean fuel, every community is a sustainable community, and businesses and industries are competitive in international markets. Picture a future when controlling energy costs and recycling waste byproducts into energy is routine and when reliable, diverse energy sources promote our national security by reducing dependence on foreign suppliers. This SEP vision is closely tied to the nation s well-being.

Our near term goal to achieve this vision is to increase energy savings across all our customer sectors by 30 percent by the year 2010. This will result in saving .71 quads of primary energy and $510 billion in energy costs and will reduce carbon emissions by 1.515 million metric tons. This goal is achievable as States continue to deploy cost-effective and advanced energy efficiency and renewable programs and technologies through State-Federal partnerships. State Energy Offices are responding to major challenges on the horizon. States are providing reliable and impartial energy information to help consumers understand the process of utility restructuring and evaluate energy options in selecting new electricity providers. In addition, States are beginning to shape a variety of public benefit programs related to utility restructuring.

More rigorous Clean Air legislation targets pose another challenge for States. SEP support for development of advanced transportation technologies and cleaner fuels and implementation of progressive conservation methods will enable States to achieve the new emission goals.

Documenting SEP activities, almost all of which lower greenhouse gases, will help States meet their goals as well as comply with legislative requirements. States are working with the U.S. Department of Energy to apply new methods, such as the WinSAGA computer program, to improve data collection and produce comprehensive, explicit results. Improved documentation enables States to share results nationwide and speeds replication of successful projects. Many more success stories like the ones summarized in this document will emerge in the coming years to define the evolving character of the State Energy Program.

From its original focus on conservation measures 20 years ago, to increasing emphasis on deploying advanced efficiency and renewable energy technologies, the State Energy Program is looking ahead to a future defined by sustainability. State Energy Offices are the catalysts for implementation of national policy. Additional energy challenges loom ahead and States have the experience, ability, and commitment to turn future obstacles into opportunities. The State Energy Program will be there to assist States to galvanize local and regional solutions to our nation s energy challenges.



Directory of State Energy Offices and U.S. Department of Energy Offices

Alabama
Department of Economic and Community Affairs
P.O. Box 5690
Montgomery, AL 36103-5690
(334) 242-5292

Alaska
Alaska Housing Finance Corporation
P.O. Box 101020
Anchorage, AK 99510
(907) 338-6100

American Samoa
Territorial Energy Office
Office of the Governor
American Samoa Government
Pago Pago, AS 96799
011 (684) 699-1101

Arizona
Arizona Department of Commerce
3800 N Central Ave., Ste. 1200
Phoenix, AZ 85012
(602) 280-1402

Arkansas
Arkansas Energy Office
One State Capitol Mall, Ste. 4B-215
Little Rock, AR 72201
(501) 682-1370

California
California Energy Commission
1516 9th St., MS-1
Sacramento, CA 95814
(916) 654-4204

Colorado
Governor's Office of Energy Conservation
1675 Broadway, Ste. 1300
Denver, CO 80202-4613
(303) 620-4292

Connecticut
Office of Policy and Management
450 Capitol Ave., MS#52 CPD
Hartford, CT 06134-1441
(860) 418-6416

Delaware
Department of Administrative Services
410 Federal St., Ste. 2
Dover, DE 19901
(302) 739-3611

District of Columbia
DC Energy Office
2000 14th St., NW, Ste. 300 E
Washington, DC 20009
(202) 673-6700

Florida
Department of Community Affairs
Florida Energy Office
2555 Shumard Oaks Blvd.
Tallahassee, FL 32399-2100
(850) 488-2475

Georgia
Georgia Environmental Facilities Authority
Equitable Building, Ste. 2090
100 Peachtree St., NW
Atlanta, GA 30303
(404) 656-5176

Guam
Guam Energy Office
P.O. Box 2950
Agana, GU 96910
011 (671) 477-0538

Hawaii
Department of Business, Economic Development & Tourism
P.O. Box 2359
Honolulu, HI 96804
(808) 587-3807

Idaho
Idaho Department of Water Resources
1301 N Orchard
Boise, ID 83706
(208) 327-7900

Illinois
Department of Commerce and Community Affairs
325 W Adams St., Rm. 300
Springfield, IL 62704
(217) 785-7500

Indiana
Department of Commerce
Indiana Commerce Center
One N Capitol Ave., Ste. 700
Indianapolis, IN 46204-2288
(317) 232-8940

Iowa
Department of Natural Resources
Wallace State Office Building
502 E 9th St.
Des Moines, IA 50319-0034
(515) 281-6682

Kansas
Kansas Corporation Commission
1500 SW Arrowhead Rd.
Topeka, KS 66604
(785) 271-3350

Kentucky
Department of Natural Resources
663 Teton Trail
Frankfort, KY 40601
(502) 564-2184

Louisiana
Louisiana Department of Natural Resources
P.O. Box 94396
Baton Rouge, LA 70804-9396
(504) 342-4500

Maine
Department of Economic and Community Development
State House Station #59
Augusta, ME 04333-0059
(207) 287-2656

Maryland
Maryland Energy Administration
45 Calvert St., 4th Floor
Annapolis, MD 21401
(410) 260-7655

Massachusetts
Division of Energy Resources
Leverett Salstonstall Building
100 Cambridge St., Rm. 1500
Boston, MA 02202
(617) 727-4732

Michigan
Department of Consumer and Industry Services
G. Mennen Williams Building, 4th Floor
P.O. Box 30004
Lansing, MI 48909
(517) 373-7486

Minnesota
Department of Public Service
121 7th Place E, Ste. 200
St. Paul, MN 55101-2145
(612) 297-2545

Mississippi
Mississippi Department of Economic and Community Development
P.O. Box 850
Jackson, MS 39205-0850
(601) 359-6600

Missouri
Department of Natural Resources
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* American Samoa, Guam, Northern Mariana Islands, the Republic of Palau, and the Western Caroline Island are in the Seattle Region.

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