

2001–2002

Federal Energy Saver Showcases

U.S. Department of Energy
Energy Efficiency and Renewable Energy
FEDERAL ENERGY MANAGEMENT PROGRAM

Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable






SHOWCASES

Content

Executive Summary

Thanks to the efforts of numerous Federal agencies, Federal facilities are becoming more efficient and less costly to operate. A variety of agencies have implemented significant energy and water efficiency improvement projects. These projects, which employ a wide variety of technologies and products, represent savings in both dollars and environmental impact.

Since 1996, Federal agencies have had the opportunity to share their methods for improving energy and water efficiency through the Federal Energy Saver Showcase program. To date, more than 100 new or existing buildings have been designated Federal Energy Saver Showcases. In Fiscal Years 2001 and 2002, 37 more sites from a number of regions across the country have been added to the list. Combined, these projects are expected to save more than 83 Gigawatt hours of energy and almost 100 million gallons of water, each year. And annual cost savings resulting from these projects are estimated at $4 million.

Successful projects such as these are implemented through partnerships with private sector energy companies, utility providers, and the U.S. Department of Energy's (DOE's) national laboratories and the Federal Energy Management Program (FEMP). Assistance may take the form of rebates and creative financing options that encourage the use of energy-efficient products and renewable energy technologies, as well as design and technical assistance and low- or no-cost energy audits.

Federal agencies are charged with identifying showcase facilities in accordance with Executive Order 13123, Section 406(e). Showcases are selected based on the extent of Executive Order requirements the project meets, as well as the overall energy savings and effectiveness of the project. In addition, showcase selection considers the historical significance of the building, the high number of non-Federal visitors it receives, the opportunities that exist to teach visitors about energy improvements, leveraging of private sector and Federal funds for project implementation, and the ease with which a project's features can be replicated.

In short, Energy Saver Showcases represent Federal facilities operating at their peak efficiency by using energy and water resources wisely. FEMP commends the efforts of its Federal agency partners in saving taxpayer dollars and preventing pollution.

2001

FEDERAL ENERGY SAVER SHOWCASES

Aircraft Support Facility, Building 1623

Dryden Flight Research Center
National Aeronautics and Space Administration
Edwards, California

A new "solar wall" and new heating, ventilating, and air-conditioning (HVAC) equipment might not be as exciting to some people as supersonic aircraft. But they're doing a good job saving energy and money at the NASA Dryden Flight Research Center, Edwards Air Force Base (EAFB), California.

EAFB is home of the nation's X-plane program and the place where an intrepid jet pilot first broke the sound barrier. It also continues to be a primary backup landing site for space shuttles. Each year, NASA Dryden hosts tours for approximately 12,000 non-Federal visitors who are interested in NASA and the history of high-performance flight.

The Airborne Science Operations and Support Facility, Building 1623, is one of several EAFB buildings leased to NASA for research purposes. It houses offices and high-bay hangar space. Modified several times over the years, the building ultimately did not meet the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 62 standards for ventilation. NASA Dryden staff wanted to install an appropriate renewable energy application while improving the ventilation system. So, they contacted staff at the National Renewable Energy Laboratory (NREL) for assistance. FEMP staff from NREL determined that installing a solar ventilation-air preheating system (also called a "transpired solar collector" or solar wall) and replacing an over-sized boiler would save a significant amount of energy and money. With support from EAFB, a project to renovate the building's ventilation system was approved and then completed in 2001.

The facility now has a 2500-ft^2 transpired solar collector that preheats ventilation air on its south-facing facade, with new modular condensing natural gas-fired boilers in the mechanical room. These help to create a highly efficient, low-emissions heating system. The new boilers no longer require special air emission permits to operate, which reduces operation and maintenance (O&M) needs, as well as costs. The system is expected to save 1,420 million Btu annually, a 55% reduction in energy use. Annual cost savings total approximately $16,300.

John Torres/PIX12144

Alex Martinez/PIX12145

Albuquerque Public Health Service Indian Hospital

Department of Health and Human Services
Albuquerque, New Mexico

A new ground-source heat pump (GSHP) system at the Albuquerque Public Health Service Indian Hospital in New Mexico is saving energy and reducing the hospital's utility bills. And that's not all. It also seems to provide a more comfortable environment for staff, visitors, and patients alike.

In the early 1990s, staff in the U.S. Department of Health and Human Services found that they needed to replace the main components of the HVAC system at this hospital. The components —obviously nearing the end of their useful lives—had been requiring extensive maintenance work and repairs to keep them running properly. A value engineering study indicated that replacing the old HVAC system with a GSHP system would be the most economical solution to the problem, primarily because GSHP systems are reliable, flexible, and relatively easy to maintain.

The new GSHP system at the Indian Hospital replaces the original boiler, chiller, and air-handler configuration, so the hospital can run on it completely. The system makes use of 210 closed-loop wells beneath the hospital's parking lot, and it is augmented by heat-pump units, an optimized control system, and night-setback strategies.

The project began in 1995 and was completed in phases to correspond with the schedule of a major architectural renovation. The original design specified small units for individual rooms. But as the project progressed, the design was modified to include larger units ducted to different heating and cooling zones. Although the GSHP system itself is energy efficient, using variable-speed pumps and direct digital controls makes it even more so.

Anchorage Processing & Distribution Center

Air Mail Facility
United States Postal Service
Anchorage, Alaska

At the Anchorage Mail Processing Center in Alaska, the U.S. Postal Service (USPS) and the Chugach Electric Association worked together on one of the largest fuel cell projects in the world. In this project, five 200-kilowatt (kW) phosphoric acid fuel cells were installed along with a unique software control package to run the units.

This grid-independent/grid-parallel generation system can provide power for the entire facility. The waste heat produced as a by-product also meets most of the facility's thermal requirements. Energy cost savings resulting from this project are more than $350,000 per year.

The Anchorage Mail Processing Center fuel cell system includes five ONSI (now UTC Fuel Cell) PC 25 C fuel cells. A high-speed switching system allows the fuel cell power plant to supply power to the building when grid power is unavailable. The switching system allows electric power to come from either the Chugach grid or the fuel cell power plant seamlessly—that is, without a noticeable interruption in power to the building. Currently, the fuel cell power plant provides more electrical power than the general mail facility can use, so excess power flows to the Chugach grid.

Water heated by the fuel cells is pumped electrically to the building's heating system. And the fuel cells can be isolated for individual maintenance.

Robert Ward/PIX12143

Robert King/PIX12128

Animal Research Building

Wildlife Services — National Wildlife Research Center
Animal and Plant Health Inspection Service
Department of Agriculture
Fort Collins, Colorado

Nearly 500 researchers and students visit the National Wildlife Research Center's Animal Research Building in Fort Collins, Colorado, each year. And to make this research building more energy and water efficient, the center has made effective use of off-the-shelf conservation technologies. For example, a new building control system, electrical duty timers, and boiler combustion analysis are reducing energy consumption by almost 35% from previous levels. And new water-pressure pumps and setback timers on high-pressure steam boilers save more than 400,000 gallons of water every year.

To achieve these significant savings, project members have replaced two old, inefficient reciprocating chillers and chilled water pumps with a new scroll chiller and chilled water pump. Direct and indirect evaporative cooling pads are used to temper incoming outside air during summer months and further reduce energy consumption, because of the decreased load on chillers to cool supply air. To use less natural gas and water, they retubed the steam boiler and installed a setback timer so steam pressures drop from 80 to 25 psi, or pounds per square inch, when the building isn't occupied.

Johnson Controls Metasys® direct digital controls are used to shut down an air handler for 12 hours of unoccupied time each day. This reduces the energy used by boilers and chillers and the electricity needed to run a 40-horsepower (hp) supply fan and a 20-hp exhaust fan. All of this is done while maintaining positive pressure in the operating rooms and negative pressure in the animal rooms, as required by good laboratory practices.

Financed by a maintenance fund by the Animal and Plant Health Inspection Service, these improvements are estimated to save about $60,000 per year, based on current utility costs.

Bureau of Engraving and Printing, Main Building

Department of the Treasury
Washington, D.C.

More than 500,000 non-Federal visitors tour the Main Building of the Bureau of Engraving and Printing (BEP) in Washington, DC, every year to learn about the history of U.S. currency and how it's produced. This site operates on the basis of the authority conferred upon the Secretary of the Treasury to engrave and print currency and other security documents. Currency has been produced at the Main Building since 1914.

The BEP recently integrated two energy-efficient, environmentally preferable technologies into the Main Building to significantly reduce its energy consumption and costs: a carbon fluidized-bed concentrator/thermal oxidizer, and new chillers and cooling towers.

The carbon fluidized-bed concentrator/thermal oxidizer was acquired to control emissions of volatile organic compounds (VOCs) from the currency printing presses. Compared with a traditional thermal oxidation control process, this technology reduces natural gas usage by 53,000 therms annually. This represents an annual cost savings of approximately $45,000. In addition, nitrogen oxides, by-products from the combustion-destruction process, are being reduced by as much as 96%, or approximately 6 tons per year. This technology brings the BEP into compliance with the District of Columbia's clean air standards.

The BEP also installed four new chiller units and associated cooling towers in 2000. They replaced several outdated and inefficient units dating from the 1960s. The new, high-efficiency chillers operate on approximately 64% of the power that the older units required. In addition, two 60-hp fan motors for the new cooling towers are equipped with variable-frequency-drive (VFD) motors that substantially reduce energy consumption during startup and low-load periods. The annual reduction in energy use for the entire system is expected to be 4.2 million kilowatt-hour (kWh). That translates into a cost savings of $210,000 per year, based on an average cost of $0.05 per kWh.

The initial project cost of $6.2 million is expected to be recovered over the life of the equipment. The system was acquired through an area-wide contract from the Washington Gas & Light Company.

Department of Treasury/PIX12122

William Buchanan/PIX12148

Cusano Environmental Education Center

John Heinz National Wildlife Refuge at Tinicum
Department of the Interior, Fish and Wildlife Service
Philadelphia, Pennsylvania

The Cusano Environmental Center in Pennsylvania "walks the talk"—by obtaining heating and cooling from the Earth and wastewater treatment from natural plants. These methods reflect the center's mission, which is to demonstrate the importance of the natural world to our quality of life and to inspire visitors to become responsible stewards of the environment.

Residing at the John Heinz National Wildlife Refuge in Tinicum, this new center is generating interest in protection and restoration of the largest remaining freshwater tidal marshland in Pennsylvania. Nearly 100,000 people visit the wildlife refuge every year to learn more about nature and conservation.

The center, which cost $5.6 million to build in the first construction phase, reflects the principles of sustainable design by minimizing energy use, making efficient use of resources, and being sensitive to the site. Its energy-conserving features include a well-insulated building envelope, extensive use of natural daylighting, energy-efficient electric lighting, a geothermal heating system, many recycled construction materials, and a "Marsh Machine" that treats the center's wastewater.

The geothermal heating and cooling system consists of a series of wells 500 feet deep; they are connected to the building's HVAC system with underground piping. Making use of the relatively steady temperatures underground, the geothermal system provides heat in the winter and cool air in the summer, while using much less energy than more traditional furnaces or air-conditioning (AC) units.

The "Marsh Machine" treats a portion of the center's wastewater in a natural way, by using plants and various microorganisms that live in a "constructed wetland" in the greenhouse. The treated water can be used again, making recycling another Earth-friendly feature of the center.

Fermi National Accelerator Laboratory

Department of Energy
Batavia, Illinois

Fermi Visual Media Services/PIX12131

Working in partnership with Commonwealth Edison and Nicor, its electric and gas utilities, the Fermi National Accelerator Laboratory has made its buildings considerably more energy efficient.

Built in the 1960s, most of the equipment at the Fermi National Accelerator Laboratory—also known as Fermilab—had not been replaced or upgraded for many years since its installation. So, in the early 1990s, Fermilab began working to make its buildings, and even laboratory process systems, considerably more energy efficient. In 2000, the Laboratory launched its utility-based, alternatively financed, campus-wide energy efficiency program in partnership with both utility companies. Energy-efficient lighting systems, occupancy sensors, and direct digital controls have been installed and transformers, motors, and cooling towers have been replaced as part of this program.

Fermilab also upgraded the centralized cooling system and separated the system into two segments—a comfort system to cool office space for employees and a "process system" for equipment and accelerators. Backup cooling capacity is also provided, and cooling can be shifted between the process and comfort systems as needed. The new, 4500-ton chiller plant is expected to use 40% less energy than the previous system. And it does so without using ozone-depleting chlorofluorocarbons (CFCs). In all, the energy efficiency measures installed through the utility-based campus-wide energy program resulted in 20 million kWh energy savings each year, or about $900,000.

But Fermilab didn't stop at building efficiency. The laboratory looked next at its scientific and experimental equipment and processes to see where additional energy savings could be found. As part of its scientific mission, Fermilab implemented a retrofit of the world's largest stand-alone cryogenic helium plant (the Central Helium Liquefier), which supports the world's most powerful superconducting accelerator, Fermilab's Tevatron. The plant's compressors can liquefy 6,200 liters of helium per hour for scientific operations. Through cooling tower replacement and reconfiguration of the plant's 2500-hp compressors, additional energy and operational efficiencies have resulted in 30% savings, or about 6 million kWh, plus 0.6 million gallons of liquid nitrogen per year.

Great Lakes Naval Training Center

MCPON Plackett Manor
Department of Defense, Navy
Great Lakes, Illinois

Functional, low-maintenance, environmentally friendly new buildings are the result of a premiere project completed at the Great Lakes Naval Training Center's Bachelor Enlisted Quarters in Great Lakes, Illinois. Constructed in a two-phase building project that began in 1997, the project was completed on time and with virtually no increase in cost over the initial budget.

This project was one of the first best-value, two-phase, design-build acquisitions to use the specifications of the Clinger-Cohen Act of 1996. Under these guidelines, the contractor offering the best overall value, not necessarily the lowest price, could be selected. As a result, a $60,000,000 design-build contract was awarded to McHugh Construction for work on 450,000 ft^2 of space. The work included construction of nine new residential dormitory buildings to house about 2,240 sailors. Also included were two separate developments: the Naval Training Center and the Naval Hospital.

One of the challenging aspects of this pilot project in green building design was the need to satisfy a number of objectives, while using new development criteria. Users needed functional, durable, low-maintenance facilities. And the Navy wanted to provide the sailors with higher quality residences having greater energy efficiency and lower life-cycle costs. The design and construction agent, Naval Facilities Engineering Command Southern Division, wanted this to be a project that would meet the certification standards of the U.S. Green Building Council (USGBC) and demonstrate the practice of sustainable development.

Ultimately, this project was recognized as achieving the standards for USGBC LEED™ (Leadership in Energy and Environmental Design) certification. The comprehensive LEED Green Building Rating System provides direction and definition for sustainable design and construction.

PIX12150

John Porter/PIX12127

Guam Weather Forecast Office

National Oceanic and Atmospheric Administration
Department of Commerce
Barrigada, Guam

As Guam's first and only building to make use of sustainable design principles, Guam's Weather Forecast Office is hoping to foster the development of other "green" buildings on Guam and nearby islands.

This project faced some formidable and unusual design challenges. For example, as the hub of the National Weather Service in a region the size of the continental United States, the Guam facility is required to operate 24 hours a day, 365 days a year. In addition, the Weather Forecast Office houses sensitive electronic systems and complex communication equipment, which are required to fulfill its mission of providing valuable weather data for the region. The facility also needs to be self-sufficient, which is evident in its 7,000-gallon potable water tank and twin diesel electric generators.

Guam is located in "typhoon alley" and has suffered much damage from these Pacific hurricanes. To provide critical weather reports even under the most severe conditions the facility is designed to withstand 194-mph winds, as well as flying debris. The building's design and materials also had to address highly humid and salt-laden air.

To meet all these needs and integrate sustainable design principles into the building, NOAA staff partnered with architects Design Partners, Inc., in Honolulu and staff from the Pacific Division Naval Facilities Engineering Command. And DOE FEMP obtained the design assistance of Steven Winters, Associates, to accomplish energy modeling and make recommendations for appropriate energy efficiency strategies during the pre-design phase.

The result is a new building that rates high in efficiency and low in maintenance requirements. Its design maximizes daylighting and reduces lighting loads, makes use of passive solar design strategies and incorporates recycled materials. Paints, sealants, and adhesives with low or no VOCs were used in the construction, to improve indoor air quality. And the building incorporates renewable energy: a solar thermal collector system is used to heat water.

This project is estimated to result in operating costs approximately 30% lower than the cost of operating a conventional ASHRAE-compliant building—that is, one that meets the standards for energy use established by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

Leo W. O'Brien Federal Building

General Services Administration
Albany, New York

In Syracuse, New York, more than 75,000 non-Federal people enter the Leo W. O'Brien Federal Building every year to conduct business with the Internal Revenue Service, the Social Security Administration, and other Federal agencies. What they find when they go there now is a building that is more energy efficient and environmentally benign than ever before.

Built in 1974, this building contained HVAC, lighting, and envelope systems that were in need of much improvement by the late 1990s. To reduce the building's energy consumption and associated costs, facility engineers decided to install a variety of newer, more efficient technologies. The new technologies include a building automation system, HVAC retrofits, energy-efficient lighting, building envelope upgrades, and replacements for several direct expansion cooling units. The direct expansion AC units provide cooling to computer rooms and other spaces that require year-round cooling. The project replaced the direct expansion coils with chilled water coils that are served by an existing glycol loop system.

Electric-to-natural gas conversions also improved the building's efficiency. The staff replaced electric resistance heating coils with hot water heating coils in two air-handling units that are used to heat the entire building. Six new modular hot water boilers were installed. For domestic hot water, the staff installed an additional hot water boiler, replacing an old electric hot water heater.

This project is one of two pilots in support of contractor awards for the DOE Northeast Super ESPC. In addition to being a pilot project for that regional energy savings performance contract, the project also made use of a rebate from the New York State Energy Research and Development Authority (also known as NYSERDA). The $66,000 rebate was received for the removal of abandoned heat recovery wheels and replacement of a direct expansion air handler.

Implementing all these improvements is saving the agency more than 1,951,500 kWh per year. This represents a savings of nearly 27% in comparison to previous energy usage. In addition, the improvements are preventing nearly 3,000 lb. of nitrogen oxides from being released into the environment.

M. Blake Degen/PIX12134

United State Postal Service/PIX12140

New Hampshire District

United States Postal Service

Because lighting accounts for as much as 30% of a facility's total energy use, the savings generated by energy-efficient lighting can be significant. Knowing that, the New Hampshire District of the USPS carried out an energy conservation program from 1998 to 2000 to reduce lighting costs at all 111 USPS facilities in the state.

The USPS New Hampshire District project has reduced lighting costs by replacing existing T-12 magnetic ballasts and incandescent fixtures with low-wattage T-8 lamps and electronic ballasts. Also used are mini-fluorescent bulbs and efficient LED exit lights.

The post offices with the most significant savings were located in Center Ossipee, Center Sandwich, and Gilsum, New Hampshire. After the installation of the new, more efficient lighting and exit signs, the Center Ossipee and Gilsum Post Offices achieved 40% energy savings per square foot. The Center Sandwich Post Office uses 43% less energy per square foot.

Other energy-saving projects have been planned for the future in the district. In these projects, USPS plans to install setback thermostats, water heater timers, and point-of-use water heaters, among other measures. These are expected to result in district-wide energy savings of 684,000 kWh per year.

Oakland Park Facility

Florida Regional Center
Department of State
Ft. Lauderdale, Florida

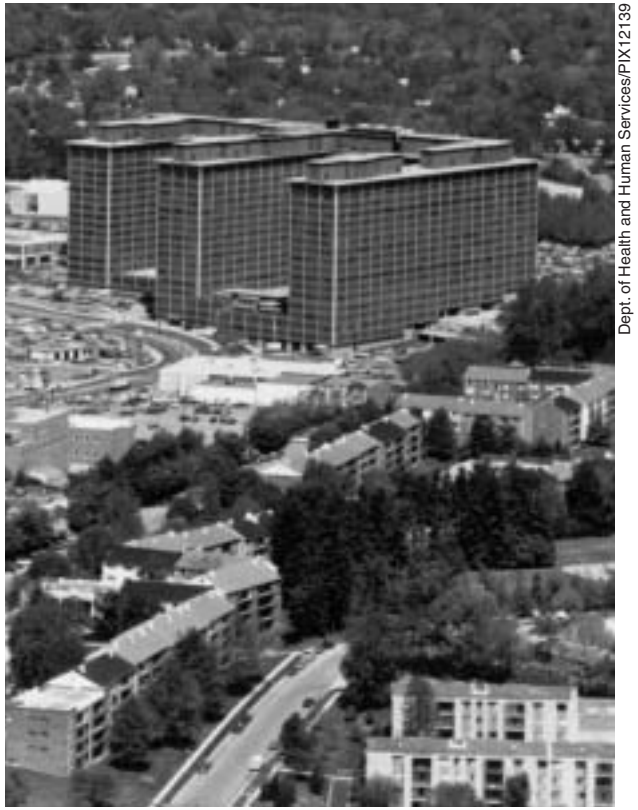
The U.S. Department of State's Florida Regional Center is making the most of a variety of solar energy technologies to reduce its energy use and associated costs.

For example, a 30-gallon solar water-heating collector has been installed on the center's roof to provide heated domestic water for hand washing and other uses at the facility.

And a solar electric array consisting of 16 photovoltaic (PV) panels is now mounted on the building's roof to produce added electricity for the building from the sun, along with batteries for storing any excess power, beyond the building's needs, that is generated by the PV system. Two additional wall-mounted solar electric panels (one tilted and one swivel-mounted to track the sun's progress in the sky) were also installed, along with batteries for energy storage.

The Florida Regional Center is also using solar electricity to power parking lot and security lights. The energy savings resulting from the use of these solar energy systems are estimated to be 1,671 kWh per year.

James Jones/PIX09572



Dept. of Health and Human Services/PIX12139

Parklawn Building

Program Support Center
Department of Health and Human Services
Rockville, Maryland

The Parklawn Building in Rockville, Maryland, has completed an alternative financing contract with a local utility company that has yielded impressive energy and water savings. The building, a 1.4-million-ft^2 leased facility, houses approximately 5,000 employees of the U.S. Department of Health and Human Services.

The project's energy management team replaced magnetic ballasts and standard fluorescent lamps with electronic ballasts and energy-saving lamps. In addition, they retrofitted bathroom fixtures with water-conserving models. This project has resulted in an annual savings of 7,455 million Btu, nearly $211,000, and 6.3 million gallons of water.

Ralph H. Metcalfe Federal Building

General Services Administration
Chicago, Illinois

Driving a car that gets 20 miles per gallon about 20 miles a day results in roughly 22 pounds of carbon dioxide emissions daily, according to an ABC News calculator. Imagine the amount of carbon dioxide that would result from driving that car 25,117 miles, or once around the world. That's approximately the amount of CO_2 that's been avoided—in other words, not emitted—each year since a solar energy system was installed on the roof of the Metcalfe Federal Building in downtown Chicago. Consisting of 84 adjustable photovoltaic (solar electric) panels, the solar system supplements the building's electric power and complements its energy efficiency.

Designated an ENERGY STAR® building for its energy efficiency, the Metcalfe Building also participates in Commonwealth Edison's Energy Curtailable Service Cooperative, a program that allows the utility company to curtail electricity use during times of high demand. For their help in managing demand, participating customers receive a credit on their electric bills.

To enhance the building's energy efficiency, compact fluorescent lamps are used instead of incandescent bulbs. LED exit signs, occupancy sensors, and devices that control the operation of vending machines are also in place. An energy management system controls both ventilation and lighting. And high-efficiency motors and VFDs are installed on domestic water pumps and cooling tower fans.

Several government agencies were involved in this project, including the Environmental Protection Agency (EPA), the General Services Administration (GSA), and the DOE. GSA's Energy Center of Expertise provided most of the direct construction funds, and EPA funded the balance of the construction costs. DOE FEMP funded an initial study of a solar thermal system and provided sample contract specifications and technical support. FEMP also provided funds for an educational public information kiosk in the lobby.

General Services Administration/PIX12133

General Services Administration/PIX12125

Richard B. Russell Federal Building

General Services Administration
Atlanta, Georgia

How do you improve the energy efficiency and infrastructure of a building while reducing maintenance and repair costs? GSA personnel at the Richard B. Russell Federal Building in Atlanta, Georgia, have answered that question by making use of a DOE FEMP ESPC to obtain much-needed upgrades in lighting and cooling systems. As a result, the facility has reduced its energy use and costs significantly.

Through the ESPC, the building's lighting was renovated to improved lighting quality while reducing energy consumption by more than 65%, in comparison to former usage levels. Inefficient lights have been replaced with T-8 electronic ballast fixtures. In all, 9,000 fixtures have been replaced with energy-efficient lights and controls. And, in places where lower light levels are permissible, some fixtures have been de-lamped.

This reduced lighting load not only saves lighting energy, it also lowers the amount of energy needed to cool the building. So, the air-distribution systems have been resized to match the new, lower air-conditioning loads.

In addition, the entire facility has undergone a comprehensive "energy tune-up." Variable-speed drives have been installed on 22 air handlers. And GSA personnel have been able to replace refrigerant-based chillers that were more than 20 years old with new, high-efficiency, fully automated systems. The central plant capacity was reduced by 500 tons, and three new chillers were installed.

Altogether, the project is saving more than 3,209,219 kWh per year. In addition to being named an Energy Saver Showcase, this facility has been designated an ENERGY STAR building. Throughout, DOE FEMP provided technical assistance as well as help with the ESPC.

Salt Lake City Health Care System

Department of Veterans Affairs
Salt Lake City, Utah

The Veterans Affairs (VA) Medical Center in Salt Lake City, Utah, has made improvements through an energy savings program that are saving taxpayers half a million dollars every year. These improvements also enable this Federal facility to meet its goal of becoming more energy efficient without incurring up-front costs. A privately financed, $4.8 million energy efficiency project is reducing the 30-building facility's annual energy consumption by an impressive 30%. And these savings allow the VA to pay back the investment in these improvements over the term of the contract.

With the help of Johnson Controls, Inc., which provides facility management services to the center, and financing through a DOE FEMP Energy Savings Performance Contract, or ESPC, the center is enhancing its operational and maintenance efficiency, reducing energy used for waste management, and improving indoor air quality.

The facility's new energy efficiency features include new, energy-efficient lighting; improvements to the chiller plant and to HVAC equipment; modifications to the chilled water system; and a new electric substation.

This energy savings project also incorporates elements beneficial to the environment. The facility's solar hot water system has been updated to function more efficiently, and a medical waste incinerator has been replaced. These measures reduce harmful atmospheric emissions while decreasing facility energy costs. These improvements have transformed the Salt Lake City VA Medical Center into an ENERGY STAR-rated building.

VASLCHCS/PIX12112

2002

FEDERAL ENERGY SAVER SHOWCASES

750-kW Photovoltaic System

Naval Base Coronado
Department of Defense, Navy
San Diego, California

The Naval Air Station North Island has an unusual carport—a structure covered with approximately 81,470 ft^2 of PV. The newly constructed 750-kW photovoltaic array and support structure provides cover and shade for the parking garage as well as more than 1 million kWh of energy each year. The system, which may be the largest PV installation of its kind, is being partially financed through an ESPC.

Project coordinators felt that the parking structure was an optimal location—open space that can accommodate a large array in a single installation. Because of limited parking, the PV system was mounted on the carport to preserve the parking spaces below it. Covered parking is ideal in San Diego's hot, sunny climate. The garage's proximity to an electrical substation was also promising. The system provides PV power to the 12-kV distribution grid at the facility. Because the system is tied to the existing power grid, battery storage is not required.

This renewable energy source reduces greenhouse gases by 700 metric tons of CO_2, 460 lb. of NO_x, and 37 lb. of SO_2 each year, and it helps the Navy meet its "green energy" goals. It also reduces utility power purchases by more than $225,000 annually.

The Navy Region Southwest and the Navy Public Works Center, San Diego, undertook this project as part of their electrical demand reduction efforts. The Navy Region Southwest's ESPC contractor designed and developed the project.

PowerLight Corporation/PIX12373

Thomas Waller/PIX12355

Aircraft Hangars 450, 452, 454, and 456

Columbus Air Force Base
Department of Defense, Air Force
Columbus AFB, Mississippi

An Energy Savings Performance Contract (ESPC) helped to provide lighting retrofits and heating improvements in four aircraft hangars and more than 74,000 ft^2 of space at Columbus Air Force Base.

Insufficient lighting levels and a combination of shadow and color rendition problems had produced an unsafe and unproductive working environment in four major aircraft maintenance hangars. Therefore, an outdated medley of lighting—which included incandescent, mercury vapor, and sodium lamps—was replaced with energy-efficient metal halide lighting. The lighting conversion saves more than 40% of the energy consumed by the former hodge-podge of lighting in the hangars.

In addition, repetitive service calls on the antiquated hot-air and hydronic-heating systems, combined with extremes in winter temperatures and wasted energy, prompted the conversion to infrared heating. Ceiling-suspended infrared heaters were installed, replacing the aging, maintenance-intensive hot-air furnaces and hot water boiler hydronic heating and greatly reducing hangar heat recovery time for roll-in/roll-out of the aircraft.

The energy-efficient lighting retrofits and new, energy-efficient, infrared heaters improve occupant safety, productivity, and comfort while reducing energy use. The energy savings from the lighting and heating conversion amount to 715,870 kWh annually.

Arizona Army National Guard EcoBuilding

Department of Defense, Army
Phoenix, Arizona

This unique facility is a true showcase of sustainable design and an example of how the Federal sector can lead by example. The 5200-ft^2, environmentally sustainable, energy-efficient office building incorporates natural daylighting, passive solar design strategies, and recycled materials, among other technologies.

The structure is independent of conventional utilities, such as electricity, sewer, and municipal water; systems with these functions are located within the building's footprint. These systems include a 12-kW solar array for electricity production, a roof designed for harvesting rainwater and containing water storage cisterns, a closed-loop wastewater treatment system, cooling tubes that use geothermal technologies for cooling, and a radiant barrier under the roof to mitigate heat transfer. And on overcast days, 1200 watts (W) of power from small wind turbines supplement the PV. These three little turbines (400W each) have kept the batteries charged enough to keep the facility from transferring over to utility power on "marginal," or partly cloudy days. This wind-solar partnership exemplifies the staff's belief that wind and solar are a natural combination.

Many energy-efficient materials and products have been deployed in this adobe-style building. The primary building material is used tires compacted with earth. As a result, the building uses substantially less wood than conventional structures, while applying energy-saving thermal mass principles. High-efficiency lighting—including LED, compact fluorescents, and T-8 lamps with electronic ballasts—have also been installed. With all of these features and 100% energy savings, the facility lives up to its name, the EcoBuilding.

Not only does this project meet the requirements of the Million Solar Roofs Initiative, it also reduces greenhouse gas (GHG) emissions by the following amounts: 48,500 lb. of CO_2, 1175 lb. of SO_2, and 160 lb. of NO_x. The EcoBuilding and its project team have been recognized with several Federal and state awards, including the Governor's Pride in Arizona 2000 Environmental Leadership Award.

Jeff Seaton/PIX12358

William Peintenger/PIX12375

Bechtel Hanford

Richland Corporate Center
Department of Energy
Richland, Washington

Off-the-shelf energy efficiency technologies and improved system operations have reduced energy consumption by almost 15%—and water use by 5%—at this showcase facility.

Project coordinators targeted interior as well as exterior lighting for energy-efficiency upgrades. Inside the building, lighting sensors were installed in all offices and conference rooms. Outside, timers were added to lighting fixtures so they could be set to turn on and off at different times, depending on the season of the year.

Energy savings were also achieved through the use of new heating and cooling measures. Installing shades on all exterior windows helped to regulate heating and cooling losses. Also, HVAC operation time was reduced from 16 to 8 hours each day! In addition, the HVAC system was turned off on weekends, when it was not needed.

Center staff reduced water consumption by adjusting sprinklers and installing low-flow plumbing fixtures.

Building 46A—Engineering Division Offices

Lawrence Berkeley National Laboratory
Department of Energy
Berkeley, California

A variety of energy efficiency improvements have been completed at the Lawrence Berkeley National Laboratory (LBNL) over the past several years, including direct digital control (DDC) systems, efficient HVAC systems, and installation of variable speed drives. Altogether, these technologies have helped LBNL meet its Executive Order energy reduction goal to reduce energy consumption by 35% per square foot (compared to 1985 levels) 7 years early. But the facility continues to look for innovative methods of further reducing its energy consumption.

For example, a new table lamp—the "Berkeley Lamp"—delivers both illumination and energy savings. This lamp, developed by scientists at Lawrence Berkeley National Laboratory, has demonstrated energy savings of 40%–70%, when compared to previous lighting usage. In some cases the lamp replaced both the overhead and task lighting because the lamp is capable of indirect "up" lighting as well as "down" lighting. The newly developed lamp uses two fully dimmable and independently controlled 55-W compact fluorescent light bulbs. At full power, the lamp's luminous output is equivalent to that of a 300-W halogen torchiere and a 150-W incandescent table lamp combined, yet the lamp consumes only 25% as much power.

Although an estimated 400 lamps are now used in offices all around the laboratory site, Building 46A's office manager has been particularly aggressive in deploying Berkeley Lamps in that building. Berkeley Lamps, which can be found in every office and the main reception area of Building 46A, have replaced most of the overhead lighting in this building. Some staff members have reported that their eyestrain and headaches have disappeared since they began using a Berkeley Lamp for office lighting instead of overhead lights.

Energy savings from this effort are averaging about 66% of the energy formerly used for lighting in the building. This lighting effort coupled with the numerous other energy efficiency improvements, have netted 37 energy efficiency awards for the energy management program at the Lawrence Berkeley National Laboratory.

Department of Energy/PIX12160

Susan Spitalny/PIX12362

Cleland Multipurpose Sports Complex

Department of Defense, Army
Fort Bragg, North Carolina

Staff and visitors at the Cleland Multipurpose Sports Complex are skating in comfort, thanks to this ESPC project. In addition to a makeover (new paint, sound system, and ceiling), this sports complex underwent significant energy conservation measures. While these measures reduce energy costs, they also improve the arena's temperature and humidification control, lighting in the skating area, and control of the ice temperature.

A number of technologies were used to achieve these improvements. They include high-efficiency metal halide lighting, a new desiccant dehumidification air-handling unit, VFD pumps, a reflective ceiling system, and a new energy management control system. Energy savings of more than 40% have been achieved, reducing energy use by more than 1 million kWh each year.

Improved comfort at this recreation facility helps scores of soldiers relax with their families. The facility sits on one of the largest military post in the United States and entertains more than 60,000 patrons each year, usually family members and friends visiting soldiers away from home.

David C. Wynecoop Memorial Clinic

Department of Health and Human Services
Indian Health Service
Wellpinit, Washington

The David C. Wynecoop Memorial Clinic is the primary source of modern health care for members of the Spokane and Kalispel Native Americans Tribes in northeastern Washington. In addition to providing health care, the clinic's buildings management staff is dedicated to improving the facility's environment for their employees and patients. With limited personnel and operational resources, the staff has pursued and implemented numerous energy-efficient, cost savings strategies and technologies.

These projects included improving and expanding the HVAC zoning to optimize operational control, comfort, and efficiency; replacing old, inefficient heat pumps with new, high-efficiency models; installing energy-efficient lighting such as T-8 lamps, electronic ballasts, CFLs, and occupancy sensors; and transitioning to 3-phase electrical power to better serve the major mechanical systems. In addition, insulation was increased in exterior walls and ceilings, exterior doors were replaced with energy-efficient models with thermal breaks, and energy-efficient windows with low-emissivity (low-e) glazing were installed. Also, the clinic implemented water conservation measures with retrofits of plumbing fixtures with low-flow models. To keep energy and water conservation issues in the forefront of management priorities, the topics have been incorporated into the monthly staff meetings.

The installation of the projects described above have resulted in energy savings of more than 68% per gross square foot when compared to the fiscal year 1990 base year. The clinic has also reduced its GHG emissions by 12% in the last 11 years, while almost tripling in size to the current capacity of 28,100 ft^2. These are commendable achievements, even more so when one considers that this clinic now uses two to three times less energy than the national average for buildings similar in type and function.

Heidi Feigenbaum/PIX12157

DISA / Defense Enterprise Computing Center

Hill Air Force Base
Department of Defense, Air Force
Ogden, Utah

Kent Normura/PIX12356

Whether in peace or wartime, the Department of Defense depends on the Defense Information Systems Agency (DISA) to provide information systems support to facilitate planning, communications, and intelligence. The Defense Enterprise Computing Center Ogden, a DISA facility, dedicates more than 38,000 ft^2 to computing and 107,200 ft^2 to administration. Energy-efficient improvements at this computer operations facility increased capacity and improved dependability, while saving more than 1.5 million kWh each year.

Energy-efficient improvements included replacing several old, inefficient chillers with newer, high-efficiency units. With the new units, the energy use of the chillers dropped from as high as 1 kW per ton to 0.54 kW per ton. Also, the hazardous R-11 refrigerant in the chillers was replaced with more benign R-123 coolant. Variable frequency drive (VFD)-controlled pumps and a new Computer Monitoring and Control System were installed as well. Efficiency improvements to the HVAC system also included a new economizer cycle, to offer "free cooling" to the facility when outdoor temperatures permit.

The center also installed a computer-controlled lighting system that remains the largest system of its kind in the world. The system enhances lighting quality while it reduces power consumption by an estimated 10% annually. The system vastly improves work areas. Individual occupancy sensors located in each fixture turn on lights only when needed, and workers can change lighting levels (from their desk PCs) by using "on-screen" dimming switches. An ESPC/DSM contract provided funding for this intelligent lighting, which is called the Ledalite/Ergolight system.

The Ogden facility also undertook water conservation measures. A new chemical feed system allows 50% of the cooling water to be reused. This "recycling" effort saves approximately 8,000 gallons of water each day.

The success of this project is shared with 800 non-Federal visitors each year and may be replicated by the Headquarters Defense Information Support Agency (at other DISA centers). Headquarters supports the installation of high-efficiency chillers and equipment, and the incorporation of VFDs and other new and energy-efficient technologies.

Envelope Systems Research Apparatus

Buildings Technology Center
Oak Ridge National Laboratory
Department of Energy
Oak Ridge, Tennessee

Already designated an ENERGY STAR Building, this showcase facility also generates its own power. A new, distributed energy resource (DER) system installed at the Buildings Technology Center (BTC) consists of 8.5 kW of photovoltaic power and a 30-kW microturbine. The PV DER supplies almost 35% of the building's total electricity needs.

The BTC—in partnership with the Tennessee Valley Authority (TVA), BP Solar, the Power Electronics Applications Center, FEMP, the ORNL State Partnership Program, and the State Energy Office of Tennessee—established a PV-DER demonstration and experimental field study on its campus. The PV-DER field tests will provide utilities, state and Federal agencies, the solar industry, and the public with metrics documenting the benefits of integrating PV into commercial buildings. The demonstration will also provide data on net metering and the benefit of ancillary shading.

The BTC also collaborates with roughly 80% of the roofing industry by field-testing each participant's best roofing products on an outdoor test facility, the Envelope Systems Research Apparatus. The PV-DER demonstration and field study support DOE's Million Solar Roofs initiative, as well as TVA's Green Power Switch Program, a program that offers consumers electrical energy generated by renewable resources.

This project received $50,000 from the 2001 DER Call for Projects issued by FEMP to support a cost-effective Federal project using DER. Resulting annual savings amount to approximately 64,050 kWh/year. The BTC and the TVA plan to expand the PV DER into a micro-grid consisting of a synchronous generator, ultra capacitor-based uninterruptible power supply, and an additional 60-kW microturbine.

ORNL/PIX12364

EPA New England Regional Laboratory

Environmental Protection Agency
General Services Administration
North Chelmsford, Massachusetts

Erland Construction, Inc./PIX12363

Thanks to a collaborative effort between GSA and EPA, this showcase is a prototype for future EPA labs and a potential Gold-rated LEED facility. The Chelmsford laboratory hosts Federal visitors as well as private-sector architects who are eager to show clients a superior example of sustainability.

Ten years ago, this facility began implementing LEED-specific requirements and other green building initiatives. With some ESPC training and a LEED consultant, the staff transformed the laboratory into a "green" building. The laboratory incorporated energy- and water-efficient features such as increased glazing for natural daylighting, low-flow toilets, a highly efficient water-cooled HVAC system with variable-air-volume fans, recycled and reused materials, variable-speed-drive (VSD) pumps, and modular boilers.

But that's not all. The laboratory incorporated a building-integrated photovoltaic (BIPV) sunshade that provides shading as well as power for the building. This wall, located in the building's lobby, also serves as an educational display for visitors. In addition, the building is electrified with 100% green power from wind sources in Vermont, it hosts an alternative fuel vehicle refueling station, and the grounds are xeriscaped.

This showcase even applied sustainable practices during the building process, reusing site materials for construction. For example, soil and gravel from the site were later used as fill and loam. This reuse prevented 785 dump truck loads of material from having to be removed from the site. An aggressive construction waste management practice was also employed, recycling construction materials and diverting more than 50% of the waste stream from landfills.

Computer modeling for this building projects energy savings at 53% or $70,000 each year. Its sustainable strategies will also eliminate the emission of 2 tons of CO_2, 43,200 lb. of SO_2, and 18,900 lb. of NO_x.

This facility has embraced energy efficiency, environmental stewardship, and recycling, and has been rewarded for its efforts. It received the GSA Environmental Award, the GSA Demolition Derby Award, the White House Closing the Circle Award, and the Boston FEB Excellence in Government Award for Creativity and Innovation.

Ft. Lauderdale/Hollywood Air Traffic Control Tower

Department of Transportation
Federal Aviation Administration
Fort Lauderdale, Florida

Although air traffic control towers tend to be high-energy-consuming facilities, the FAA still found opportunities for substantial annual energy savings. Extensive energy efficiency improvements, including the installation of new HVAC equipment, a reflective roof coating, and ENERGY STAR appliances, produced energy savings of more than 30%.

This comprehensive refurbishment project involved a number of HVAC improvements. The facility replaced an old, diesel-powered generator with a newer, more efficient unit. New air conditioning units and air handlers were also installed. A new, state-of-the-art electronic system that monitors and controls all the building zones replaced the pneumatic control system.

ENERGY STAR units replaced the water fountains, water heaters, and refrigerators. The sprinkler system was repaired and placed on control timers, saving water.

Outside lighting and parking lot lights were set on timers to maximize the use of daylight. Highly efficient T-8 lamps, electronic ballasts, and LED units replaced the old lighting and exit signs.

Even the roof and ceiling were targeted for improvements. A coating that reflects heat replaced the old roof coating. With new ceiling tiles, the building could maintain a sealed, cooler environment. Also, ceiling fans were installed to maintain a neutral temperature within each room.

These projects were identified and installed as the result of a comprehensive energy audit provided through FEMP's SAVEnergy Audit program, and completed by Global Energy Partners, LLC.

Although visits to the control tower are limited because of post-September 11 security concerns, the project is highly replicable. Currently, there are plans to replicate the project at the Miami Air Traffic Control Tower.

Odel Torres/PIX12367

Belton Tisdale/PIX12374

Laurel Bay and Pine Grove II Housing

Marine Corps Air Station Beaufort
Department of Defense, Marine Corps
Beaufort, South Carolina

Relying on the relative warmth or coolness of the Earth, geothermal heat pumps can produce heating and cooling—even hot water—for buildings.

Geothermal heat pump technology is the energy-saving centerpiece of this showcase facility. Energy-efficient geothermal heat pumps replaced 2,500 tons of existing HVAC systems and hot water heaters. These heat pumps provide space heating, cooling, and domestic hot water for 1,235 family housing units at the Beaufort Marine Corps installation. The new geothermal technology has reduced energy consumption by 30% from fiscal year 2001 to fiscal year 2002 and decreased associated CO_2 emissions by approximately 11 tons per year. This facility is currently 50% below its fiscal year 1985 baseline consumption.

Currently, about 2,500 non-Federal guests visit the housing facility each year. Plans to replicate this project are already under way. A similar project will be carried out in industrial facilities through a geothermal Super ESPC. It will provide geothermal technology and other energy conservation measures for 33 buildings located at the air station in Beaufort.

An excellent example of leveraging Federal funding with private sector resources, this project was funded through a utility energy services contract (UESC) with South Carolina Electric & Gas. Design and construction services were provided by the Co-Energy Group.

Main Injector 8 GeV Beamline

Fermi National Accelerator Laboratory
Department of Energy
Batavia, Illinois

Radical new concepts in accelerator design have completely eliminated the use of non-renewable energy at the Fermi National Accelerator Laboratory Main Injector 8 GeV Beamline. Permanent magnet electromagnetic displacement has dramatically reduced energy and water use as well as maintenance requirements there.

The innovative technology applied at the Fermi National Accelerator Laboratory—also known as Fermilab—involves the use of permanent magnets instead of conventional electromagnets for beam focusing and bending. Conventional electromagnets require substantial power input and water for cooling, as well as additional maintenance for support systems, controls, and calibration. The permanent magnets perform like renewable energy technologies, transforming energy without support from non-renewable sources and displacing electric power. When permanent magnets are used instead of electromagnets, the energy and water savings are 100%, comparatively speaking.

There are additional benefits of this innovation; it's extremely cost effective on a life-cycle-cost basis because of both its modest construction costs and its reduced maintenance requirements. The new approach is also more sustainable. The use of permanent magnet technology eliminates the generation of radioactive mixed waste from regeneration of deionizer beds used in electromagnetic technology. And water conservation through reductions in industrial cooling water evaporative losses saves 300,000 gallons of water each year.

The technologies applied at Fermilab are breaking new ground in the field of accelerator design. Such designs can be applied to both the research and the medical fields. And according to the environmental disclosure information from the local electric utility, this project reduces CO_2 emissions by more than 116 metric tons annually.

Fermilab/PIX12368

PowerLight Corporation/PIX12377

Marina Processing and Distribution Center

United States Postal Service
Inglewood, California

A 127-kW rooftop PV system—the largest roof–integrated Federal system in the nation—now generates electricity directly from the sun for the Marina Processing and Distribution Center. This PV system is expected to save almost 300,000 kWh per year, shave up to 10% off the facility's 1.2 MW peak power demand, and save approximately $25,000 per year in utility costs.

In recent years, California has experienced energy supply and delivery problems. By incorporating PV, this Inglewood facility improves the reliability of its electricity supply. PV can also provide supplemental electric power at times of peak demand (peak shaving).

In addition to the PV system, this showcase facility has also installed a state-of the-art, Web-based energy management control system (EMCS), which is tied to the PV system. The EMCS includes chiller controls as part of a demand response system. The ability to instantly reduce chiller demand as the PV production drops will significantly decrease the facility's energy consumption and costs.

The facility used a creative financing approach to fund a variety of innovative technologies. It received a $680,000 rebate from Los Angeles Department of Water and Power, as well as $125,000 in DER equipment funds awarded under FEMP's FY01 DER Call for Projects program.

With 1,000 Federal and 2,600 non-Federal visitors each year, the center hopes to build support to replicate this type of project at many other USPS sites. The PV manufacturer, PowerLight®, has provided an interactive display kiosk for the site that educates visitors about PV technology and its benefits.

Military Family Housing

Charleston Air Force Base
Department of Defense, Air Force
Charleston, South Carolina

Charleston Air Force Base replaced 885 conventional air conditioners and gas furnaces with geothermal heat pumps in their military family housing units. The alternatively financed project eliminates the need for natural gas for heating, resulting in demand reductions of 42% and overall energy savings totaling 30%.

The use of geothermal technology not only eliminates the need for natural gas for heating, it also eliminates the potential carbon monoxide hazard associated with gas furnaces. In addition to this technology, the Charleston showcase implemented electric load-shedding devices for reducing peak-kilowatt demand. The energy savings resulting from implementing this project are approximately 2.2 million kWh each year.

This project was funded through an ESPC. The Air Force plans to replicate this project within the agency. Geothermal heat pumps will be included in the current military family housing renovations and possibly implemented in future renovations of industrial facilities.

Warren Gretz/PIX06540

William Martin/PIX12360

Natural Gas-Driven Air Compressor at Building 110

Department of Defense, Army
Watervliet Arsenal, New York

The Watervliet Arsenal, a large gun manufacturer, relies heavily on the use of compressed air in its shops. In a site assessment, the compressed air system appeared to provide a good opportunity to improve efficiency and save energy. So, the Arsenal replaced conventional electric-motor-driven units serving the industrial facilities with an efficient new air compressor driven by a natural gas engine.

Compressed air at this facility is supplied to several large buildings housing the shops for machining, plating, painting, sandblasting, and packaging, among others. Compressed air is used for pneumatic tools, painting guns, sandblasting, equipment cleaning, cooling, drying, and agitation. Since the natural gas-engine-driven air compressor replaced the electric-motor-driven units, significant energy savings have been realized. In fact, the replacement of the electric-driven motor by a natural gas-engine-driven motor yielded annual net electricity savings of about 1,382 MWh. Overall, energy consumption for the compressed air functions is reduced by 90% per year. Cost savings are estimated at $31,500 each year, or 24%. Considering the additional maintenance requirements for the gas-driven units, the overall cost savings are reduced by about 50% per year, at $15,750. Adding demand-side management and repairing leaks reduced annual compressed air usage from 2174 cfm to 1100 cfm.

This unique and straightforward project demonstrates that energy-efficient technologies can be successfully applied in any facility. It has been so successful that it has already been replicated at the Picatinny Arsenal in New Jersey.

Naval Medical Center San Diego

Bureau of Medicine
Department of Defense, Navy
San Diego, California

The 79-acre Naval Medical Center San Diego, hailed as "The Pride of Navy Medicine," is the most technologically advanced and largest military health care complex in the world. It advances medicine through education, training, and research, while sometimes serving more than 4,000 patients in a day!

In addition to patients, nearly 780,000 non-Federal guests visit this center, an ENERGY STAR-rated building, each year. Visitors can now benefit from a host of energy-efficient technologies—including renewable energy—that are yielding significant annual energy and water savings at this Naval medical center. These technologies, financed through a UESC, have reduced the facility's utility consumption by 20% and allowed those costs to be redirected toward the real mission: medicine.

To obtain these energy savings, the center converted more exit signs to LED exit signs. Energy efficient T-8 fluorescent lamps with electronic ballasts and special reflectors were also installed. Reflectors further increase the efficiency of each lighting unit by reflecting additional light into the workspace.

A new high-efficiency HVAC system is used in conjunction with a new digital energy management and control system. Adjustable-speed drives for fans and pumps further reduce the building's energy consumption. Low-temperature dishwashing equipment reduces the hot water load. And solar collectors on the roof heat water for the swimming pool, keeping it at just the right temperature. Combined, these features result in annual energy savings of more than 9 million kWh and reduce carbon emissions by nearly 681,000 tons.

This medical facility is also achieving a significant amount of water savings. Numerous low-flow plumbing fixtures, from toilets to showerheads, are saving nearly 87.6 million gallons annually.

Currently, the medical center is replacing three inefficient cogeneration turbines with a new high efficiency cogeneration turbine and heat exchanger to reduce fuel consumption, generate steam for the new absorption chillers, and further reduce emissions.

Photo Geodetic Corporation/PIX12370

NOAA/Ferrard Choi and Associates, LTD/PIX12369

NOAA Fisheries

Honolulu Laboratory
Department of Commerce
National Oceanic and Atmospheric Administration
Honolulu, Hawaii

The redesign of an existing research laboratory, this project makes use of low-energy building design strategies, efficient technologies, and renewable energy. The project team at this fisheries and marine mammal/turtle research laboratory has been working to attain a Gold LEED rating and ENERGY STAR certification. LEED, a building rating system developed by the U.S. Green Building Council, stands for Leadership in Energy and Environmental Design; ENERGY STAR is a DOE/EPA certification program for energy efficiency. If the laboratory attains a Gold LEED™ rating, it will be the first for the state of Hawaii, as well as for a Federal laboratory.

In order to reach these goals, the project team adopted a Whole Building Design approach and applied strategies such as natural daylighting, solar water heating, liquid desiccant dehumidification, occupancy sensors, and a new building management system. Solar-heated water will regenerate the liquid desiccant system. This project also incorporated water conservation into its strategy—rainwater will be collected from the roof to irrigate the site's landscaping. Collecting rainwater will save 252,000 gallons per year, or about $500.

This laboratory and its team have been recognized in several ways for their efforts. For example, in 2002, DOE FEMP and EPA welcomed the facility as a pilot partner in the Laboratories for the 21st Century program. This program recognizes facilities that voluntarily improve energy and water efficiency, use renewable energy sources, and promote environmental stewardship in U.S. laboratories. The lab's commitment to sustainable design and energy conservation is also evident in the estimated project energy savings: 504,000 kWh/year, for a 44% reduction in energy use compared to a laboratory facility built to code.

Thermal Test Facility

National Renewable Energy Laboratory
Department of Energy
Golden, Colorado

A true showcase of innovation, the facility has received several awards, including an ASHRAE Technology Award, and has been featured in several publications, such as the ASHRAE Journal and Solar Today.

When outlining plans for its Thermal Test Facility (TTF), the National Renewable Energy Laboratory (NREL) used a simple design to create a high-performance building. An integrated approach—which considers how all the building technologies work together most efficiently—was at the heart of the design process. The TTF incorporates passive solar design, high-efficiency lighting with natural daylighting, two-stage evaporative cooling, VSD23s, instantaneous water heating, low-flow plumbing fixtures, xeriscaping, and a whole-building EMCS. Not surprisingly, research in this facility focuses on the development of energy-efficient and renewable energy technologies that are cost effective and environmentally sustainable.

Researchers monitored the performance of this 11,000-square-foot building, which boasts energy savings of nearly 50%, or 58,617 kWh, and water savings of 17,000 gallons each year. The most effective savings measure was the direct use of sun for lighting—daylighting provides 75% of the actual lighting load.

In addition to the numerous energy-efficient strategies applied to this building, 10% of the electricity used at the TTF is purchased through Xcel Energy's Windsource green power program.

Fundamental goals of the project design were to create a state-of-the-art model of sustainable design and a high-performance building design that could be replicated. The basic plan of the building can be adapted to many needs, including retail, warehouse, and professional office space. Concepts from the building have been replicated in the private sector and in two new NREL facilities.

Warren Gretz/PIX04117

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