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...and more!

President Issues New Executive Order

On January 24, 2007, President Bush issued a new Executive Order, "Strengthening Federal Environmental, Energy, and Transportation Management," that strengthens key goals for the federal government. As the nation's single largest energy user, the federal government has an obligation to lead by example to meet the President's aggressive agenda to reduce dependence on foreign oil and conserve resources.

The new Executive Order raises the bar for federal leadership and performance in several areas. The Executive Order requires agencies to reduce greenhouse gases through a reduction in energy intensity of 3 percent a year, or 30 percent by the end of fiscal year 2015 compared to the base year 2003. (This increases the challenge of the 2 percent per year and 20 percent overall from EAct 2005). Federal agencies must also ensure that at least half of renewable energy comes from new renewable sources (EAct 2005 was silent on the issue of "new" resources).

Under the new Executive Order, agencies must reduce water consumption by 2 percent annually through fiscal year 2015 (an explicit water goal was not part of EAct). Water efficiency and energy

efficiency are closely linked, as water requires a significant energy input for treatment, pumping, heating and process uses.

Agencies must also ensure new construction/major renovation comply with the 2006 Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding (MOU), which was signed at the White House Summit on Federal Sustainable Buildings (see article on page 2 and the full text of the MOU at <http://www.wbdg.org/sustainablemou/mou.php>).

With the new Executive Order, agencies must ensure fleet petroleum reduction of 2 percent annually, increased use of alternative fuels of 10 percent annually, and use of plug-in hybrids.

As the lead agency for coordinating the implementation of the energy and water goals, FEMP offers a variety of resources to assist federal agencies in achieving those goals. The full text of the Executive Order and guidance will be available in an upcoming Special Issue of *FEMP Focus*. Until then, FEMP staff can help you navigate the new requirements set forth in the Executive Order.

For more information, please visit http://www.eere.energy.gov/femp/about/eo_fedmgmt.html, and see page 19 for staff contact information.



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Cover Magnifying Glass Photo:

Wind turbine at NREL's National
Wind Technology Center.

Photo credit: Warren Gretz

Leading by example, saving energy and
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Federal Agencies Sign Historic Green Building Agreement

Last year the U.S. Department of Energy joined 15 other federal agencies and the Council on Environmental Quality (CEQ) at the White House Summit on Federal Sustainable Buildings in a joint commitment to design and construct sustainable buildings that achieve high energy performance.

The agencies signed a first-of-its kind Memorandum of Understanding (MOU) saying they would strive to adopt a standard set of guiding principles for sustainable buildings that include employing integrated design principles, optimizing energy performance, protecting and conserving water, enhancing indoor environmental quality, and reducing the environmental impact of the building materials. The agencies will aim to achieve ENERGY STAR® targets and energy targets of 30 percent below ASHRAE for new construction and renovation, and will also employ daylighting and incorporate bio-based materials into their buildings.

The agreement will accelerate implementation of common strategies for planning, acquiring, siting, designing, building, operating, and maintaining high performance and sustainable buildings. The MOU also provides guidance and assurance that these goals are implemented in the context of practical, economic, and appropriate timeframes and methods, in line with the agencies' respective missions.

The federal government owns about 500,000 buildings with total floor space of more than 3.0 billion square feet, in addition to leasing an additional 57,000 buildings comprising 374 million square feet of floor space. The signing agencies manage 95 percent of these federal buildings. In discussing the agreement at the

Summit, Bryan Hannegan, Chief of Staff for CEQ, said, "Buildings in the United States consume over 37 percent of the nation's primary energy and 68 percent of all electricity. The federal government's size and buying power uniquely positions federal agencies to drive the design and acceptance of environmentally sustainable and energy efficient building components."

At FEMP's Interagency Sustainable Working Group (ISWG) meeting, Ed Pinero, the Federal Environmental Executive, recognized the hard work of the ISWG and thanked them for their commitment and their work over the last two years in developing the MOU. He said the MOU sets measurable goals, makes commitment transparent, and establishes accountability and responsibility. He said another success at the summit was the introduction of the Office of Management and Budget's new draft Executive Management Scorecards for environment, energy, and transportation. The environmental scorecard now includes sustainable design for buildings.

For more information on the Summit proceedings, please visit <http://www.fedcenter.gov/calendar/conferences/summit2006/>. For information on FEMP's Sustainable Design program, please visit <http://www.eere.energy.gov/femp/sustainable/index.html> or contact Matt Gray at matthew.gray@ee.doe.gov or 202-586-0067.

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Energy Policy Act of 2005 Set New Renewable Energy Goals for the Federal Sector

The federal mandate for renewable energy has been growing over the last 10 years. In 1994, Executive Order (E.O.) 12902 recommended that federal agencies develop plans to use renewable energy. This was followed in 1999 with E.O. 13123, which required that the Secretary of Energy set a goal for federal renewable energy use. Now the Energy Policy Act of 2005 (Public Law 109-58) puts the force of law into the federal renewable energy goal.

Section 203 of the Energy Policy Act of 2005 (EPACT 2005) defines the renewable energy goals for the federal sector:

“The President, acting through the Secretary, shall seek to ensure that, to the extent economically feasible and technically practicable, of the total amount of electric energy the federal government consumes during any fiscal year, the following amounts shall be renewable energy:

- (1) Not less than 3 percent in fiscal years 2007 through 2009.
- (2) Not less than 5 percent in fiscal years 2010 through 2012.
- (3) Not less than 7.5 percent in fiscal year 2013 and each fiscal year thereafter.”

EPACT 2005 defines renewable energy as “electrical energy” generated from various resources of renewable energy. It expands the renewable energy definition to include new hydroelectric and ocean power options such as tidal, wave, current, and thermal resources. New hydro generation capacity is defined as that occurring due to increased efficiency or additions of new capacity at an existing hydroelectric project. EPACT 2005 continues to include the renewable energy resources biomass, geothermal, solar, and wind defined in E.O. 13123. The Executive Order guidance issued by the Secretary of Energy defined the goal as “the equivalent of 2.5 percent of

federal electricity use.” This was done in order to allow agencies to count all forms of renewable energy (thermal, electric, mechanical) toward the E.O. 13123 goal.

Section 204 is another applicable section of EPACT 2005 in terms of renewable energy. It authorizes the Administrator of the General Services Administration to establish a photovoltaics commercialization program to accelerate the growth of a commercially viable photovoltaics industry to attain the goal of installing solar energy systems in 20,000 federal building solar roofs by 2010.

The Federal Energy Management Program developed new renewable goal guidance through the Renewable Energy Working Group (RWG). The guidance includes items such as what counts towards the goal, the definition of “new” for renewable power/renewable energy certificate (REC) purchases in particular, and what types of on-site projects will get double credit (Section 203 (C)). For example, what if a site sells off the RECs associated with their on-site project?

Some of these issues were also addressed in the original E.O. 13123 renewable goal guidance. The guidance process for EPACT 2005 included reviewing the E.O. 13123 guidance and adapting it under the new legislation. The E.O. 13123 guidance and the draft guidance can be found at <http://www.eere.energy.gov/femp/pdfs/eoguidancedoc.pdf> and http://www.eere.energy.gov/femp/technologies/renewable_workinggroup.cfm. Comments were received on the draft guidance, and FEMP plans to issue revised guidance for comment soon.

For more information, please contact Anne Crawley of FEMP at anne.crawley@ee.doe.gov or 202-586-1505.

Federal Government Surpasses Renewable Energy Goal

The federal government exceeded the Executive Order 13123 goal of obtaining the equivalent of 1,395 gigawatt-hours (GWh)—equal to 2.5 percent of electricity consumption in federal facilities—from renewable energy sources by 2005. Federal agencies are leading by example by installing on-site renewable projects and purchasing renewable power that together total at least 2,599 GWh—enough to power 242,900 homes, or a city the size of Little Rock, Arkansas, for a year.

Every agency played a role in meeting the goal, and every renewable energy technology is represented in the goal. Eighteen out of 24 agencies have photovoltaic systems. Seven agencies have on-site wind projects. Thousands of geothermal ground source heat pumps have been installed across the federal government. The Department of Defense, the largest energy consumer in the United States, accomplished one-half of the total amount and the General Services Administration (GSA), the government landlord, accomplished about 20 percent of the goal. One of the smallest federal energy consumers, the Environmental Protection Agency (EPA), dedicated the highest proportion of its own internal electric energy use (about 76 percent) to renewable energy, contributing more than 230 GWh toward the goal. The National Aeronautics and Space Administration (NASA) developed a groundbreaking purchase of landfill gas to contribute another 108 GWh. The Department of Justice developed the largest solar water heating facility in the federal government.

The goal was established in 1999 as a result of Executive Order 13123 and includes renewable energy from biomass, geothermal, solar, and wind projects. At that time, most renewable energy used in the federal government was from older projects. New renewable energy from projects built after 1990 was a tiny fraction of overall federal renewable energy use (173 GWh). Renewable energy certificates (RECs) and green power

were fledgling ideas that were just starting to enter the market. The goal for 2005 was a serious challenge.

Remarkably, six years later, the federal government exceeded the goal ahead of the September 30, 2005 deadline. Though few would have bet on it in 1999, purchases of RECs and power by agencies grew to become the majority of federal renewable energy consumption – 2,245 GWh.

Recent federal REC purchases include: the Air Force (829 GWh), The Department of Veteran Affairs (87 GWh), and the Department of Homeland Security (20 GWh). Federal agencies have reported even more renewable energy usage on their FY 2006 Federal Energy Management Scorecards, so the current federal renewable energy count is conservative.

The increased use of renewable energy has diversified federal energy supplies and reduced emissions. Federal energy managers are more familiar with renewable energy technologies and how to take advantage of GSA Federal Supply Schedules for solar and other renewable energy technology. GSA and the Defense Energy Support Center have played important roles in helping the federal sector meet their renewable energy goal by pioneering new approaches to purchasing renewable power such as RECs.

The Energy Policy Act of 2005, Section 203, establishes new, statutory renewable energy goals for the federal government that will help renewable energy continue to expand its role in the federal energy supply to 7.5 percent by 2013 and beyond. Thanks to Executive Order 13123 the federal government has a healthy start toward meeting the new goal on time – or maybe ahead of schedule.

For more information, please contact Anne Crawley of FEMP at anne.crawley@ee.doe.gov or 202-586-1505.

The President's Solar America Initiative to Advance Market-Ready PV

The Department of Energy's Solar Energy Technologies Program has launched the Solar America Initiative (SAI) to help advance research and development (R&D) for the rapid commercialization of clean solar energy technologies, including photovoltaics (PV) and concentrating solar power systems, and to decrease the cost of solar energy to be competitive with existing sources of electricity in 10 years. The SAI is a Presidential initiative designed to encourage solar industry competition and foster technology innovation.

To achieve the goals of the SAI, the Solar Program will focus primarily on two areas: first on research and development on PV component and system designs including low-cost approaches for manufacturing, and second on activities that address marketplace barriers and offer the opportunity for market expansion. The SAI aims to provide 5 to 10 gigawatts of new electric capacity by 2015, enough electricity to power 1 to 2 million homes. While changing the way we power our homes and businesses, the President's initiative promotes domestic

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Federal Agencies Receive Awards for Privately Financed Renewable Energy Projects

In October 2006, FEMP presented Federal Energy and Water Management Awards to 11 agencies for exemplary energy and water-saving projects implemented in FY 2005. Six of the 17 winning projects highlighted renewable energy and green power purchases, and all of these projects were funded using either an energy savings performance contract (ESPC) or a utility energy services contract (UESC).

Using an ESPC with NORESKO LLC, the Federal Bureau of Prisons at Federal Correctional Institution (FCI) Victorville installed a 750-kilowatt wind turbine, a photovoltaic (PV) covered parking solar array, and several cost-efficient upgrades to the heating, ventilation, and air conditioning (HVAC) system. The wind turbine produces 30 percent of the peak electric demand for FCI Victorville and saves more than 9 percent of annual electricity consumption. The PV carport array is rated to produce 74.5 kilowatts at full capacity, and provides shade for vehicles during the extremely hot summers. The renewable projects, along with integrating HVAC controls and adding variable frequency drives, saved more than \$212,000 and 3.8 billion Btu in FY 2005 during the final construction phase. At the time the nomination was submitted, it was estimated that savings of almost \$470,000 and 9.6 billion Btu would be attained in FY 2006.

The Social Security Administration (SSA) used a UESC with Commonwealth Edison to complete the installation of a 100-

kilowatt solar electric system at the Harold Washington Social Security Center. This 8,000 square foot building-integrated array is the largest in Chicago. It is made up of 528 rooftop solar panels, and generates enough electricity each day to power 100 homes. The array reduced SSA's electrical load by more than 98.5 million Btu in FY 2005, helping to offset peak power costs statewide. SSA estimates that the



Larry Smith with 100 kW photovoltaic array on roof of Harold Washington Social Security Center

solar system will displace more than 4 million pounds of greenhouse gases over the next 30 years. This is equivalent to the carbon dioxide absorbed by 20 acres of trees or avoiding driving 4.8 million miles on the roadways of Chicago. Larry Smith of SSA's Chicago office was recognized for this project with a Federal Energy and



750 kilowatt wind turbine at FCI Victorville

Water Management Award. The project was also recognized with a Presidential Award for Leadership in Energy Management, along with the larger SSA Energy Initiatives Team's nationwide efforts.

Other projects receiving Renewable Energy awards in 2006 included:

- Hill Air Force Base, for constructing a 2-mile landfill gas pipeline and 1.2-megawatt on-site power generation facility using an ESPC through FEMP's Biomass and Alternative Methane Fuels (BAMF) program. The base also re-negotiated a five year contract with the local utility to purchase steam produced from refuse incineration.
- U.S. Army Fort Knox, for using a UESC to replace 70 percent of the 40 year-old heating and cooling systems at their Disney Barracks Area with geothermal heat pumps.
- The Department of the Navy, for using an ESPC to construct a \$12 million wind turbine project at Guantanamo Bay, Cuba with a total capacity of 3.8 megawatts.
- Marine Corps Base Camp Pendleton, for using an ESPC to install two large solar photovoltaic rooftop arrays and seven additional solar projects underway—totaling 236 kW of PV solar generating capacity. The ESPC value was \$6.5 million.

To find out more about these award winning projects, please visit http://www1.eere.energy.gov/femp/services/awards_fewm2006.html. For more information on FEMP's Federal Energy and Water Management Awards, please contact Nellie Tibbs-Greer at 202-586-7875.

Department of Defense Completes Renewable Energy Assessment

The Department of Defense (DOD) has a long history of pursuing renewable energy, and currently has a diverse energy portfolio that includes several non-fossil sources including wind, solar, geothermal, hydrogen, and biomass generated power. In 2002 and 2004, Congress appropriated funds for DOD to assess wind, solar, and geothermal energy resources at domestic military installations and to identify opportunities to increase the use of power from renewable sources. Completed in 2005 this assessment provides the first truly comprehensive evaluation of renewable energy use by installations, and considers resource availability, electricity purchasing, mission compatibility, energy security, and short- and long- term perspectives. It also provides a technical and economic foundation for DOD to pursue onsite electricity generation from renewable energy to reduce market and infrastructure vulnerabilities. The information produced through the assessment provides the foundation for a new, aggressive renewable energy strategy, and has spurred the development of many projects.

DOD's renewable energy strategy is two-fold. First, based on the results of the study, DOD is increasing generation capability over the next several years on its military installations. For example, the Navy recently completed a 20-kilowatt photovoltaic system at Naval Air Facility El Centro, California; the Air Force recently completed a 1.5 megawatt biomass gas plant at Hill Air Force Base, Utah; the Army is installing a 35-kilowatt photoelectric renewable power system at Kwajalein Atoll; and the Marine Corps recently finished the construction of an on-installation bike path illuminated with solar energy at Marine Corps Air Station Yuma, Arizona. Second, DOD is working with industry and commercial sector partners to pursue several large promising renewable energy opportunities, including the purchase of renewable power and the development of new geothermal and ocean thermal energy conversion projects. The combination of these two approaches will enhance energy flexibility as well as help decrease reliance on fossil fuel energy.

Wind Energy

The assessment concluded that more than 200 sites have some on-site wind development potential. The economics of wind power generation has led to the conclusion that while several small turbine projects should be pursued on a case by case basis, the most advantageous approach is to pursue large purchases through commercial development. Depending on market prices for power, only a few sites are suitable for utility-scale development by private partners. The remaining sites may only be economical to develop if long-term power prices continue to escalate. The assessment also identified a number of barriers to development of viable projects, such as mission conflicts,

environmental and flight path restrictions, and radar interference. Understanding and contending with these identified barriers is imperative to successful development.

Solar Energy

The solar assessment identified several specific solar technologies expected to be widely applicable to the energy uses and building types on military installations. Each technology was evaluated against utility costs using available solar information and representative technology performance and cost data. Some solar projects are potentially cost-effective at almost all DOD sites, assuming utility rates remain high and appropriate buildings and energy uses exist for specific solar technologies (i.e., swimming pools heated with solar pool heaters). Solar thermal technologies fared best in the assessment, especially daylighting and transpired solar collectors to pre-heat inlet air in hangars with forced air heating. Solar photovoltaics are only economic in areas with high electricity prices and high state and utility incentives for solar power. The results of this assessment are currently being used in a joint effort with the Department of Energy's Federal Energy Management Program (FEMP) to pilot a new acquisition approach through energy savings performance contracts (ESPC) that will attempt to mass replicate a selected few of these economically viable solar applications at military installations throughout an entire geographical region.

Geothermal Energy

Two types of geothermal evaluations were conducted: 1) the potential for utility-scale electric power production and 2) direct use of geothermal resources for building heating and cooling systems. The greatest potential for geothermal development is in sparsely populated areas of the western United States. Most military facilities in these areas are used for training exercises that require lots of land, but have little demand for electricity and heating. These facilities are typically far from the utility grid and, as a result, geothermal resources on military lands are generally less attractive for private development.

Biomass Energy

While not specifically studied in the renewable energy assessment, DOD is extremely interested in pursuing renewable energy from biomass sources. The most economic opportunities appear to be viable through ESPCs for on-site development and long-term commodity purchases for off-site commercial development. Of interest is that many installations possess, or

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Oklahoma Gas & Electric's Green Pricing Program

The Energy Policy Act of 2005 requires renewable electricity consumption by the federal government to be not less than 3 percent in FY 2007-FY 2009, 5 percent in FY 2010-FY 2012, and 7.5 percent in 2013 and thereafter. To meet these goals, FEMP encourages federal agencies to develop on-site renewable projects and to purchase renewable electricity.

One of the ways Federal agencies can purchase renewable electricity is to participate in a utility "green pricing" program. These programs typically charge a premium over the normal tariff to provide renewable electricity. However, a few programs offer a provision that can effectively reduce or even eliminate the premium for green power. These programs offer an exemption from the fuel adjustment clause that is part of many utility tariffs. Since the fuel adjustment clause causes the tariff to fluctuate according to natural gas prices, exemption from this provision means that the green power price may be less than the normal tariff when natural gas prices are high.

Oklahoma Gas & Electric's (OG&E) green pricing program is a shining example of this approach. OG&E has offered wind power as a renewable energy option since September 2003. OG&E's wind power program, with 50 megawatts of power produced by 34 wind turbines at the Oklahoma Wind Energy Center, is one of the largest in the country.

When natural gas prices are high, wind power costs less than standard OG&E electricity. As of January 2006, the premium for wind (in addition to OG&E's standard charge for electricity) was significantly decreased from \$2 per block of 100 kilowatt-hours (kWh) to 10 cents per block of 100 kWh. Since participants in

the wind power program are exempt from the fuel adjustment charge, their standard (or base) charge is lower than for customers not in the program when natural gas prices increase. With a premium of only 10 cents per block of 100 kWh, and with gas prices at levels of early 2006, customers with 100 percent wind power were saving as much as 10 percent on their monthly electric bills. Depending upon how natural gas prices change, the cost of wind power may be higher or lower than OG&E's standard electricity in the future.

Due to overwhelming response to its wind power program, OG&E is currently sold out of wind power and has reached capacity on the waiting list. By early 2007, however, it will add 120 megawatts of electricity generated by wind to its system. OG&E plans to target the green pricing program to large power customers, which may include federal facilities in Oklahoma.

Gary Marchbanks, OG&E's manager for Government Accounts, noted that "OG&E is a strong supporter of wind power as well as other renewable technologies. We welcome the participation of our Federal customers in our wind program and we look forward to Federal Aviation Administration Monroney Center and Tinker Air Force Base joining us in our newest wind offering. OG&E actively encourages our federal customers to investigate and participate in renewable projects at their facilities. We are ready to assist all our federal customers in the evaluation of potential projects."

For more information, please contact Rich Brown of Lawrence Berkeley National Laboratory at REBrown@lbl.gov or 510-486-5896.

THE PRESIDENT'S SOLAR AMERICA INITIATIVE TO ADVANCE MARKET-READY PV (continued from page 4)

production of PV technologies, diversifies the nation's electricity portfolio, enhances grid reliability, and provides significant environmental benefits.

This major R&D effort will accelerate the progress of several public-private sector solar research partnerships, including the Thin Film Partnership and the Crystalline Silicon Initiative. These initiatives seek to reduce costs, increase system efficiency, and improve the manufacturing of solar power.

The SAI's emphasis on achieving cost-competitiveness and broad commercialization of solar energy technologies represents a

shift in the Solar Program's approach to advance the role that PV can play in United States energy supplies.

FEMP is partnering with SAI to assist in technical transfer of solar technology and to assist in accelerating the widespread commercialization of clean solar energy technologies. The SAI is interested in partnering with the federal government to expand the marketplace and address market barriers. The SAI is looking for high profile, preferably large, federal projects to collaborate on. Generally they can provide significant technical assistance. This aspect of the program is still developing, so look for more information in the future.

For more information, please see http://www1.eere.energy.gov/solar/solar_america/index.html or contact Anne Crawley of FEMP at anne.crawley@ee.doe.gov or 202-586-1505.

Success in Exploring Expanded Development of Wind Energy on BLM Public Lands

The National Energy Policy Report (May 2001) included a recommendation to increase the use of renewable and alternative energy on the Department of the Interior's Bureau of Land Management (BLM) public lands. In response to the directive, BLM developed a Renewable Energy Action Plan, and in January 2002 requested the partnership and technical support of the Department of Energy's Office Energy Efficiency and Renewable Energy and the National Renewable Energy Laboratory (NREL) to conduct a renewable energy resource assessment of BLM federal lands in the Western U.S. The 11 states included in the study were Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming, encompassing more than 160 million acres.

The assessment used geographic information system (GIS) analysis techniques to identify BLM lands with high potential for development of wind, solar, and biomass energy production systems. NREL and BLM staff met initially to establish GIS-based land exclusion criteria as overlays of the databases of renewable resources and BLM lands. BLM staff, NREL technology experts, and Denver area renewable industry developers mutually identified and prioritized criteria that would be used to evaluate the technical and economic feasibility of renewable energy production facilities.

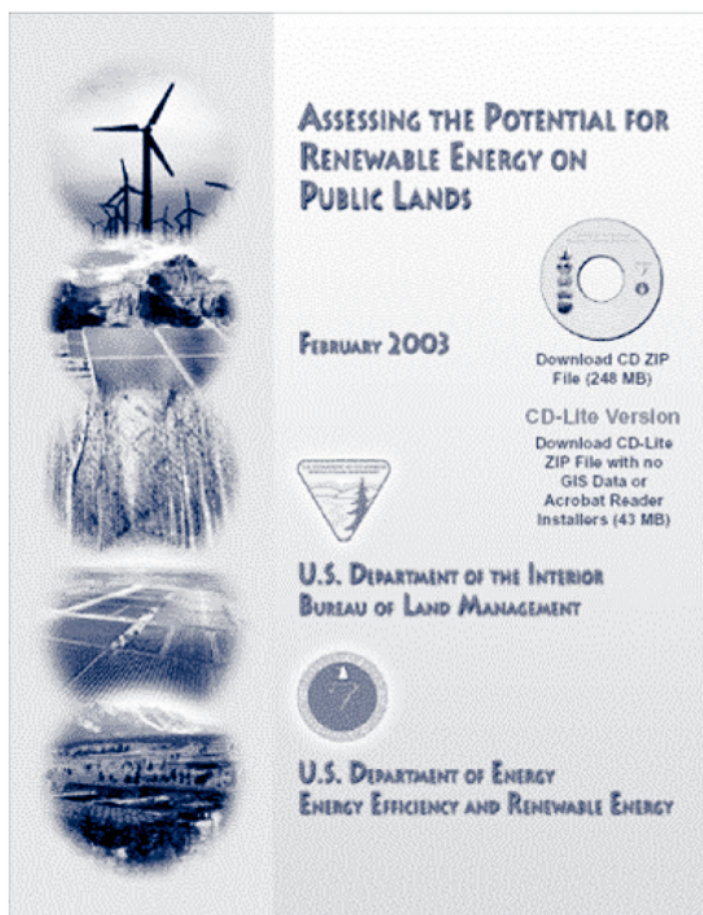
A draft of the study, funded by the Federal Energy Management Program, was produced in May 2002, and was posted on the BLM Web site for a 60-day public comment period. During that comment period, BLM received a dozen wind industry land use permit applications for wind energy resource monitoring and potential wind energy facility development. This was a surprising indicator that wind project development on federal lands was a real opportunity, after years of low industry interest due to the bureaucratic and costly delays associated with public versus private land development.

As stewards of public land use management, BLM reacted responsively, developing policies to guide the processing of wind industry applications, since wind energy was not part of current BLM Land Use or Resource Management Plans. Within five months, BLM used existing right-of-way (ROW) statutes and regulations to develop a draft policy, which was provided for review and comment to industry professionals, wind trade association representatives, and national environmental organizations. In October 2002, the BLM Interim Wind Energy Development Policy was issued as Instruction Memorandum No. 2003-020, which can be found on the BLM Web site at <http://www.blm.gov/nhp/efoia/wo/fy03/im2003-020.htm>. Issuance of this policy was the first major step to proactively address

renewable industry access limitations for development on federal lands.

BLM continued to receive numerous wind industry ROW applications for wind resource monitoring to install meteorological towers on BLM lands (1,000 to 10,000 acre parcels) to confirm wind resources as the first of two phases of wind development in the BLM Wind Development Policy. Meanwhile, NREL and BLM published the final report, *Assessing the Potential for Renewable Energy on Public Lands* in February 2003, which can be accessed at <http://www.nrel.gov/docs/fy03osti/33530.pdf>. The study identified the top 25 BLM planning units with the highest potential for wind, solar, and biomass energy development. Results provided BLM with information to prioritize planning, budgeting, and funding for Land Use and Resource Management Plan amendments or revisions that incorporate renewable energy development on public lands.

By mid-2003, BLM had received more than 60 wind industry ROW applications for wind resource testing. BLM had also begun the next step of reviewing the first few ROW applications



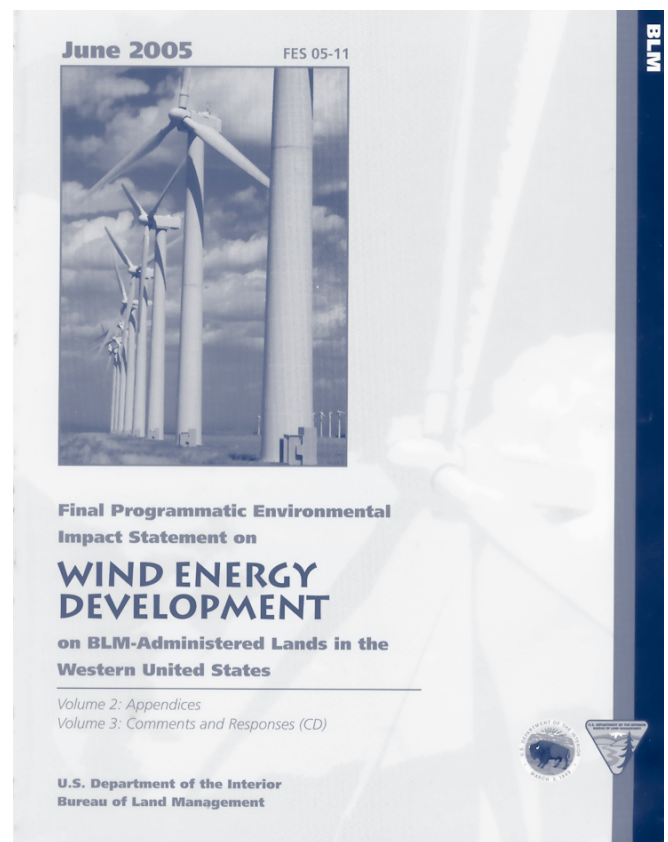
that had already attained wind resource data confirming wind energy economic feasibility for wind energy power production development. A key deterrent for wind development on federal lands is the cost of complying with the National Environmental Policy Act (NEPA). For wind farm development involving significant land disturbance during construction, NEPA requires the preparation of an Environmental Impact Study (EIS), subject to federal agency approval, before federal notice to proceed. Preparation, public hearings, and approval of an EIS can cost between \$1.5 and \$2 million and can take 1.5 to 2 years, primarily at the expense of the wind project developer. Additionally, when BLM proposes land use or resource plan amendments for new land use, they are required to develop a Programmatic EIS to communicate the general (not site-specific) environmental impacts.

To address both of these wind energy development issues, BLM initiated the development of a Wind Programmatic EIS (PEIS) in the fall of 2003 for BLM lands in the 11 Western states included in the renewable resource assessment. To develop the Wind PEIS, BLM partnered with and funded the expertise of Argonne National Lab to help with the EIS process and documentation development, and NREL to provide wind technology expertise and development scenario analysis. The draft PEIS used NREL GIS mapping and wind development system modeling to identify economically-feasible land wind development projects for the period of 2005 to 2025. GIS maps of all BLM lands indicating high potential areas were incorporated to communicate the proximity of potential wind development opportunities.

The final Wind PEIS, issued in June 2005, conservatively projected that more than 3,200 megawatts (MW) could be developed on BLM lands by 2025. A principal outcome of the Wind PEIS was the development of best management practices, which address wind energy siting, construction, and operations mitigation activities to reduce adverse environmental impacts. These best management practices are being incorporated into the BLM Wind Energy Development Policy as additional guidance for BLM field office for NEPA actions in wind development ROW applications. The final Wind PEIS can be found at <http://windeis.anl.gov>.

In advance of the final Wind PEIS, BLM conducted a pilot project to demonstrate the benefit of using the Wind PEIS as part of a Resource Management Plan (RMP) revision for the Ukiah, California planning unit. BLM tasked and funded NREL to conduct analysis to identify the wind energy development potential (in terms of MW production) for BLM California State and Ukiah field office selected land parcels. The wind energy projections and Wind PEIS were incorporated into the BLM Ukiah RMP. BLM is now seeking public comments on changes in current land uses, including wind energy development.

BLM has demonstrated leadership in addressing the National Energy Policy objective to evaluate renewable industry access



limitations, helping to increase the wind industry interest and commitment toward wind energy development on federal lands. After successfully incorporating wind energy as a land use option in RMPs and the Wind PEIS best management practices into BLM's Wind Energy Development Policy, it is anticipated that ROW grant applications for wind energy development on BLM public lands are more streamlined, and likely will require only Environmental Assessment (EA) approval before notice to proceed with development. An EA is significantly less costly to developers (estimated at \$200,000 and approval within 6 months) and reduces the burden on BLM field offices resources for processing and approving wind energy development project applications. BLM is now positioned to incorporate wind energy land use in more than 50 BLM RMP amendments planned in the next few years.

BLM has also processed and approved a few wind energy development ROW applications. With the Energy Policy Act of 2005 reinstating the Production Tax Credit for wind projects, wind farm development will proceed with nearly 1,000 MW of wind energy on BLM public lands in the next two years.

For more information please contact Doug Dahle of the National Renewable Energy Laboratory at douglas_dahle@nrel.gov or 303-384-7513 or Ray Brady of the Bureau of Land Management at ray_brady@blm.gov or 202-452-7773.

FEMP Explores Renewable Energy Trends Impacting the Federal Sector

Navigant Consulting was retained by the National Renewable Energy Laboratory (NREL) to support the Federal Energy Management Program as it worked to meet federal sector renewable energy (RE) consumption targets established under Executive Order 13123. Navigant was asked to provide an outside perspective on key renewable energy technologies and market issues for electric power, as well as trends relevant to the federal sector.

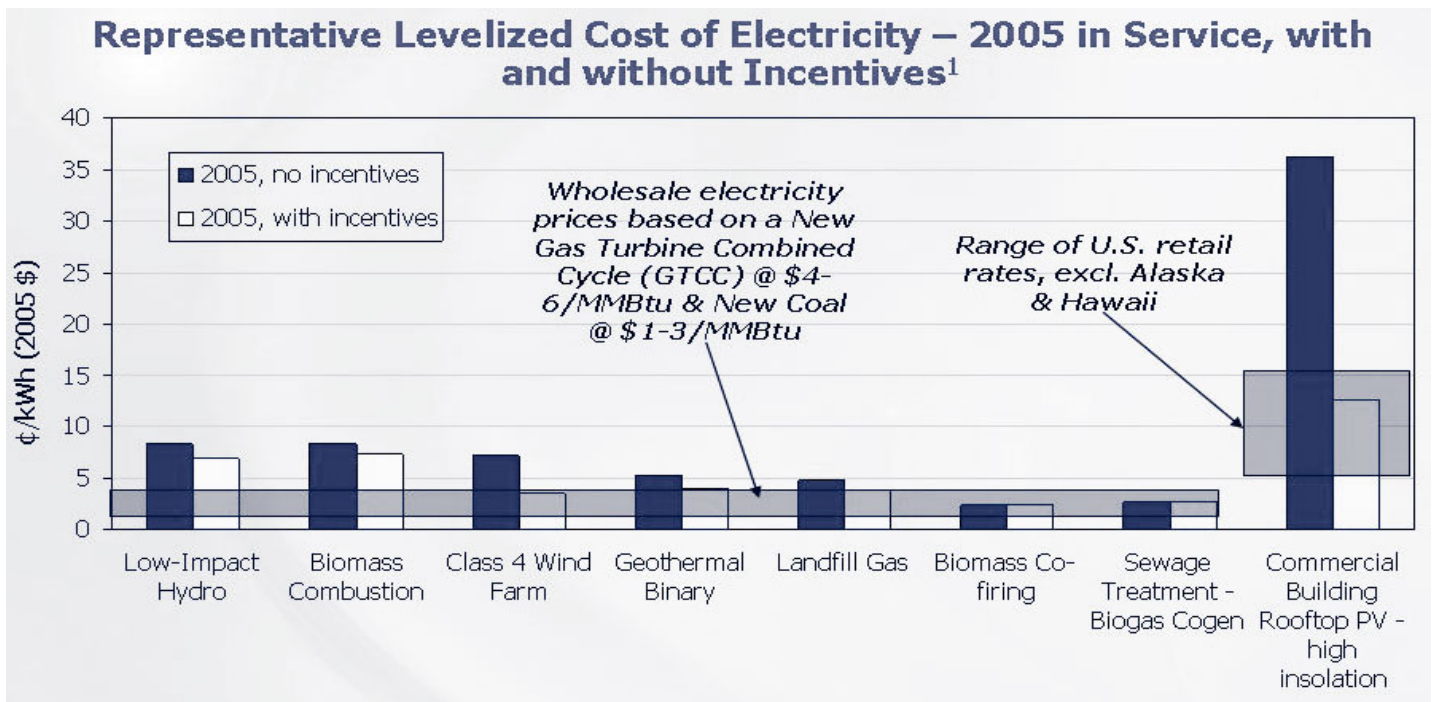
RE Technologies: Entering the Mainstream

Many RE technologies are undergoing rapid change and becoming competitive with conventional power options. In addition to significant technology improvements, a range of state and federal incentives are also leading to accelerated deployment.

Among the commercially available options, wind power and photovoltaics (PV) are expected to experience significant cost reductions over the next 10 to 15 years. Onshore wind power could become competitive with conventional options on a levelized cost of energy basis (without incentives) by 2010, and is competitive today with incentives such as the Production Tax Credit. Offshore wind power development will depend on the

technical success of ongoing efforts in Europe and if early projects in the United States can be successfully developed. PV will remain more expensive than retail power in many areas of the country until beyond 2015, but a number of states offer incentives that dramatically improve PV economics. Biomass direct combustion, landfill gas/biogas, geothermal power and low-impact hydropower are all relatively mature, and are not expected to change much over the next 10 to 15 years. Biomass co-firing is also relatively mature, but could experience relatively rapid deployment due to Renewable Portfolio Standards eligibility in some states. Biomass gasification combined-cycle technology is still being demonstrated and the timing of progress towards commercial status is uncertain. Marine energy is still largely in the research, development, and deployment stage, and future costs remain highly uncertain, but the technical potential is large.

Overall, RE “build” options (onsite RE at federal facilities) are expected to be relatively expensive and therefore fulfill a fraction of total federal RE use. As such, the federal sector should have a clear picture of the best opportunities and a strategy to maximize return on investment.



¹ Incentives applied are the applicable Federal incentives in 2005 and representative state incentives that may not be available in all states.

FEMP EXPLORES RENEWABLE ENERGY TRENDS IMPACTING THE FEDERAL SECTOR (continued from page 10)

RE Markets: Benefits and Challenges to the Federal Sector

Renewable Portfolio Standards (RPS), in place in 21 states as of September 2005, are resulting in significant demand for RE; they are expected to support approximately 30,000 megawatts of new additions by 2015, plus support approximately 8,000 megawatts of existing capacity. Overall, RPS are expected to have mixed impacts on the federal sector—on the one hand driving the development of the RE marketplace, but on the other, creating competition for RE resources. Although smaller than RPS markets, voluntary green power markets are also adding to RE demand. They give consumers and other entities, like the federal government, the opportunity to purchase renewable energy through green pricing, green power marketing, and green certificate or renewable energy credit (REC) products. These RE

“buy” options represent one of the simplest ways for the federal sector to meet its RE obligations.

There are also significant financial incentives in place at the federal, state, and local levels. For example, state “system benefits charge” funds are currently providing more than \$300 million per year in support of renewable energy. The federal sector can benefit directly by using the incentives for which it is eligible, and indirectly by procuring RE products and services from private sector entities that can take advantage of the incentives for which the federal sector is not eligible. Several other factors, namely high natural gas prices, increasing reliance on liquefied natural gas imports, and mounting concerns over climate change and security all favor RE development.

The complete Navigant Consulting report is available for download at http://www.eere.energy.gov/femp/pdfs/rewg_navigant.pdf. For more information, please contact Lisa Frantzis at lfrantzis@navigantconsulting.com or 781-564-9614.

Kennedy Space Center Pilots Solar Thermal Project at Film Storage Building

A solar thermal pilot project was conducted at the film storage building at Kennedy Space Center (KSC), Florida, funded by a grant from the Department of Energy’s (DOE) Federal Energy Management Program (FEMP). The project demonstrated that sunlight is a viable source of heat for the regeneration process of a desiccant dehumidification system.

The desiccant dehumidification system used in this project is part of the film storage building’s heating, ventilation, and air conditioning (HVAC) system. This building was constructed to provide cold storage for the Visual Records Control office, which maintains the original engineering drawings for the Space Shuttle Program flight hardware, historical films, photographic records, and other computer media associated with Shuttle and historic Apollo Moon missions. About 80 percent of the building’s total electrical load is used by the HVAC system for cooling and dehumidification of conditioned storage space. Due to the unique temperature and relative humidity requirements for records preservation, the building uses more energy than other buildings of similar size.

Climate control is maintained in the cold storage compartment by two redundant seven-ton Direct Expansion (DX) air conditioning units. Each HVAC system includes a desiccant dehumidification package unit. The DX units provide for the cooling, while the desiccant dehumidification units control the relative humidity of the conditioned space. The units are configured to operate in a lead/lag scenario, providing a reliable system.



Solar heating system at Kennedy Space Center’s film storage building.

The desiccant rotates into the air stream to remove moisture and then rotates out for regeneration. Heat is required in the regeneration process to evaporate the moisture from the desiccant. The unit uses a two-stage 19 kilowatt electrical heating element to create 275°F regeneration air that in turn is blown over the moist desiccant, causing the moisture to be evaporated and then exhausted to the outside air. The focus of the project was to offset the electrical consumption of the existing 19 kilowatt heating elements with solar energy. Because of the high temperatures required for the regeneration air, high efficiency evacuated tube solar collectors (Thermomax Mazdon 20) were chosen for this project.

The solar heating system includes 10 evacuated tube collectors mounted on a ground-level stand, a heat exchanger, and a circulation pump. The circulation pump provides heated water

continued on page 19

FEMP Conducts Solar Technology Screening at Job Corps Centers

With funding from the Federal Energy Management Program, the National Renewable Energy Laboratory (NREL) in 2005 performed an initial assessment of solar energy opportunities at 88 Job Corps Centers across the United States and Puerto Rico. The screening considered solar water heating, solar ventilation air preheat, and photovoltaic technologies. The Job Corps program, consisting of vocational education facilities for young adults, has centers comprised of dormitories, education buildings, vocation workshops, medical facilities, gymnasiums, cafeterias, and administrative buildings, with each center ranging from 45,000 to 1 million square feet. The agency plans to install a renewable energy system at one center that will be capable of supplying 5 percent of its electricity; this assessment was the first step in identifying the most appropriate site.

The assessment examined solar resource, site-specific factors, and applicable incentives or rebates to determine which centers were most promising for a specific technology installation. Job Corps staff provided detailed site information for each of the centers for analysis, including center name; address; longitude and latitude; number of students and residents; square footage of buildings; and utility use and cost data for each fuel. The longitude and latitude data was used to extract solar resource information for each center from NREL's geographic information system database.

Combining the solar resource and site-specific data, the system size and cost were calculated for each technology. Cost effectiveness was evaluated on a per-kilowatt (kW) or per-square-foot basis, but the maximum system size was also calculated to provide information to Job Corps staff on the largest potential opportunities.

Incentives and rebates offered for renewable technologies greatly impact the cost-effectiveness of various projects, and so these financial benefits need to be included in the early stages of the screening process. The relevant incentives and rebates for each center were taken from the Database for State Incentives for Renewable Energy (<http://www.dsireusa.org>) and approximated as either a percent reduction in initial system cost, a dollar-per-watt or dollar-per-square-meter reduction in initial system cost, a dollar-per-kilowatt-hour production incentive, or a combination of the three. In this way, the initial cost estimate or the annual cost savings estimate was actually modified to reflect the applicable financial benefits for a particular site, as compared to the calculations without such benefits.

These values were then used to calculate the savings-to-investment ratio (SIR) and payback period. SIR is the life-cycle

savings divided by the life-cycle cost. However, please note that this assessment did not consider the benefits or possible income to be earned from net metering; that is, the sale of excess electricity to the utility or from selling renewable energy certificates, both of which are complex to predict but would likely help the economics of using these technologies at most of the sites.

The SIR was calculated and used as the primary indicator of cost-effectiveness for the three technologies at each site. As defined according to regulation Title 10, Code of Federal Regulations, Part 436, a SIR of greater than 1.0 indicates that a project is cost effective. The higher the SIR, the better the project. According to the analysis, cost effective opportunities for solar water heating projects exist at 13 sites, for solar ventilation preheating opportunities at 18 sites, and for PV opportunities at four sites (see Figure 1 for site locations).

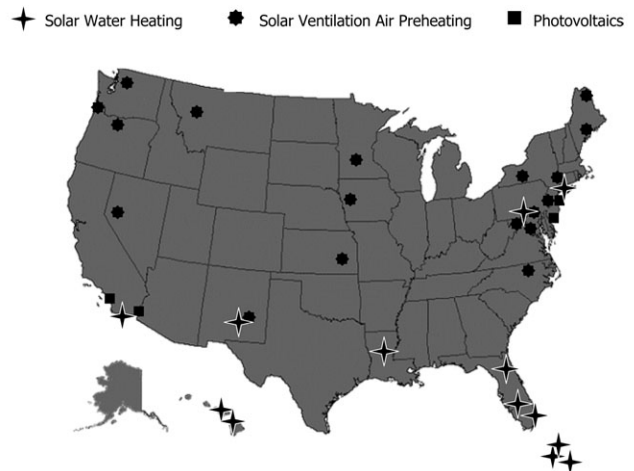


Figure 1: Job Corps Sites with SIR > 1, by Technology

The Job Corps staff stated that this screening has helped to develop “the foundation for the renewable technology building program” for their agency. It is likely that a project will be implemented for at least one of these promising sites with a SIR of greater than 1.0. Supporting that statement, the staff added, “After funding is approved, we will begin the engineering study and plans to complete these projects.”

For more information, please contact Andy Walker of the National Renewable Energy Laboratory at andy_walker@nrel.gov or 303-384-7531.

FEMP Working Group Views Sustainable Design Features at Federal Facilities

FEMP's Interagency Sustainability Working Group (ISWG) is composed of representatives from 20 federal agencies who promote the collaboration and exchange of information among federal agencies to advance the use of sustainable design in federal facilities nationwide. The ISWG occasionally conducts tours of federal facilities to learn about new sustainable features and practices.

Last year, ISWG members visited the U.S. Department of Agriculture's headquarters office building to view the agency's 150-square foot green roof pilot system. Designed by GreenTech, the system is useful for terraced commercial roofs, and provides flexibility to re-arrange the landscape designs. Benefits include innovative storm water management, increased building energy performance, improved urban air quality, and preservation of ecology. The project is part of a much larger effort to incorporate sustainable practices at the USDA Headquarters Complex.

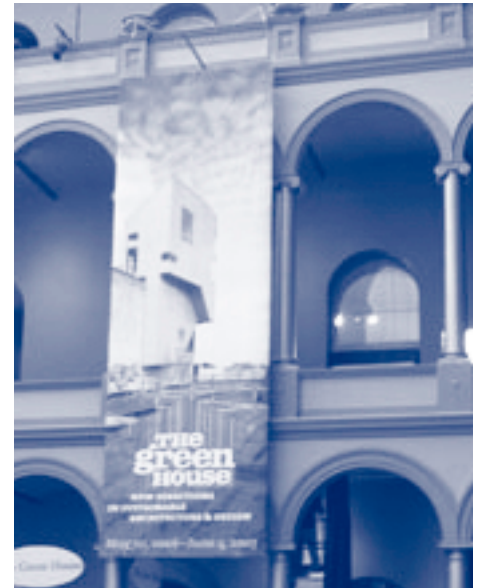
The ISWG also visited the U.S. Fish and Wildlife Service's (FWS) National Conservation Training Center (NCTC) in Shepherdstown, West Virginia. The 538-acre campus was one of the first FWS facilities to receive Federal Energy Saver Showcase designation. The buildings were built to fit surrounding rural structures, and interior finishes were selected to reduce volatile organic compounds. Other features include daylighting and solar exposure through the buildings' orientation along an east-west axis; fitted sunscreen windows; and extended rooflines. The buildings' HVAC system uses high-efficiency chillers and boilers, primary and secondary pump loops, and air and water energy recovery systems. Energy-efficient lighting has been installed in the building through the use of electronic ballasts, ambient and task lighting, and occupancy sensors.

Most recently, the group toured the National Building Museum's (NBM) new exhibit, *The Green House, New Directions in Sustainable Architecture and Design*. The green house, known as



USDA's pilot green roof technology, Washington, D.C.

the Glidehouse™, is a modular house designed by northern California architect Michelle Kauffmann of MKD Designs. Ms. Kauffmann designed the first modular green house in 2004, and has since designed 10 Glidehouses, which include one to four bedrooms with square footage of about 700 to 2,000 square feet. The average price begins at \$132 per square foot and includes design, materials, and construction costs, but does not include solar panels or other renewable energy systems.



The Green House exhibit at the National Building Museum.

The design is based on basic sustainable and green features, and includes:

- gliding glass walls and opposite operable clerestory windows for daylighting and increased ventilation;
- solar panels, geothermal systems, and wind generator systems for reduced utility bills;
- building materials for exterior walls such as Cor-Ten steel, Galvalume, Hardi panels, and cedar planks to reduce maintenance costs;
- bamboo flooring, slate bathroom flooring, recycled glass, birch, and maple to optimize the use of recycled materials;
- and storage bars to maximize space efficiency.

For information on the Interagency Sustainability Working Group, please visit www.eere.energy.gov/femp/sustainable/sustainable_workinggroup.html. To learn about USDA's green roof, please contact Ed Murtagh at Ed.Murtagh@usda.gov. For more information on NCTC, please visit <http://training.fws.gov>. To learn about the National Green Building Museum's (NBM) greenhouse tour, contact Jamie Van Mourik at jvanmourik@nbm.org. Information on the NBM is available at: www.nbm.org/.

FEMP Provides Technical Assistance to National Park Service for Sustainable Visitors Center

The National Park Service (NPS) recently completed a 7,270-squarefoot Contact Station at Jamaica Bay Wildlife Refuge in Queens, New York that showcases energy efficiency and renewable energy to millions of visitors each year. The project partially re-uses an existing structure, with limited expansion to minimize the overall footprint. Technologies include solar water heating, photovoltaics, and ground source heat pump systems, as well as passive solar and daylighting features. These design considerations are projected to result in annual energy savings of 378 million Btu—savings of 45 percent over a standard building—and annual cost savings of \$6,900. The project has been recognized with five awards: Department of the Interior Environmental Achievement Award “Honorable Mention”; the National Park Service’s Environmental Achievement Award; NER Superintendent’s Conference Exemplary Recognition; the National Park Foundation Award for Sustainable Grants Program; and GSA Recognition for Sustainable Design.

Jamaica Bay Wildlife Refuge, a unit of Gateway National Recreation Area, is an important urban wildlife refuge with more than 2.7 million visitors annually. Encompassing 9,155 acres, it is comprised of diverse habitats including salt marsh, upland field and woods, several fresh and brackish water ponds, and an open expanse of bay and islands—all located within New York City limits. The facility reinforces and supports Gateway’s core program for resource stewardship, environmental education, and recreation.

The project was completed in 2006. The NPS strives for the building to be Leadership in Energy and Environmental Design (LEED™) “Gold” certified. The Gold certification is pending.

The project involved a broad partnership between NPS and Denver Service Center, the Federal Energy Management Program, and the New York State Energy Research and Development Authority (NYSERDA) to solve technical and financial challenges. FEMP staff provided technical assistance through the National Renewable Energy Laboratory (NREL), contributing to initial goal setting, value analysis, HVAC criteria, and review of energy-related equipment, products, and submittals during the construction and commissioning process. FEMP staff also helped assure building conformance to specified energy goals and LEED™ requirements. NYSERDA cost shared with FEMP for energy modeling, LEED™ specifications, and commissioning services by Steven Winter Associates. The financing for solar water heating, photovoltaics, and energy efficiency measures for the building came from several sources. The Energy10 computer program was used to set initial energy goals and the DOE2 program was used for subsequent energy modeling.

Jodie Petersen of the National Park Service noted that NREL’s assistance was invaluable, stating, “FEMP is a key team member, and without their expert input the project would not be as successful.”

For more information, please contact Andy Walker of the National Renewable Energy Laboratory at andy_walker@nrel.gov or 303-384-7531.

DEPARTMENT OF DEFENSE COMPLETES RENEWABLE ENERGY ASSESSMENT *(continued from page 6)*

are located close to, many ideal sources of biomass energy including landfills, anaerobic digesters, and agricultural waste.

Purchasing Strategy

In most cases, renewable resources developed near but not on military lands are more economical than on-site projects. Use of long term commitments for commodity purchases is viewed as the key to encouraging commercial development of renewable energy resources near DOD installations. Additionally, DOD routinely requests price quotes for renewable energy when it solicits power supplies in competitive markets.

Implementation

The Department of Defense is firmly committed to supporting the President’s agenda on renewable energy and his stated

objective of reducing our nation’s reliance on fossil fuels. Since the Department accounts for about 78 percent of the federal government’s energy consumption, DOD’s intent is to lead by example in the areas of renewable energy, energy efficiency, and energy conservation. DOD has an aggressive program with many initiatives already underway that incorporate several different approaches including third party financing, on-site construction, and energy commodity purchases. DOD’s renewable energy portfolio will continue to increase as the performance of new technologies improves and costs are reduced. As a result of the renewable energy assessment, DOD has programmed over \$18 million worth of new renewable energy projects in the FY 2006 President’s Budget, which is a significant increase in investment over prior years.

For more information, please contact Jim Snook of the Air Force Civil Engineer Support Agency at jim.snook@tyndall.af.mil or 850-283-6295.

REC 101 – Helping Federal Agencies Meet the Renewable Energy Goal

Renewable energy certificates (RECs), also known as renewable energy credits, tradable renewable certificates, or green tags, have become an important element of the market for renewable electricity. RECs represent the environmental and other attributes of electricity generated from renewable resources. These attributes may be unbundled and sold separately from the physical electricity.

RECs (and other renewable power purchase options) enable a site to realize the benefits of renewable energy in the near-term without having to deal with the finances and time needed to install an on-site renewable energy system. On-site renewable systems require investment, but provide renewable energy to the site over their lifetime of up to 25 years. RECs are purchased for a specific period, usually one to three years, and have a specific price. RECs are available to any site and may be purchased from renewable generation sources located anywhere in the country. Thus, RECs are a viable option for any location, but are especially useful for sites located in states without a competitive electricity market and/or when the local utility does not offer a green pricing program. Federal agency purchases of RECs were a significant contributor to the Executive Order 13123 federal renewable energy goal, and are planned as one of several means to meet the Energy Policy Act of 2005 renewable energy goal.

Competitive REC prices are typically much lower than utility green pricing rates and are usually lower than renewable power purchased in competitive electricity markets. REC prices have fallen dramatically in recent years. Market prices for national federal purchases in 2005 and 2006 have typically ranged from \$1 to \$3 per megawatt-hour (0.1 to 0.3 cents per kilowatt-hour) versus \$10 per megawatt-hour or higher when the REC-type product first entered the renewable market. REC prices vary, depending on factors such as renewable resource type and location. States with renewable portfolio standard (RPS) requirements typically have higher REC prices due to increased demand.

Evolution Markets has a monthly REC price report, available at <http://www.evomarkets.com/resources/index.php>, that includes “Compliance” and “Voluntary” market prices. Compliance prices are for RECs that are purchased by utilities or energy suppliers to meet state RPS requirements. Voluntary prices are for large REC buys done on a voluntary basis by federal agencies, private companies, and other entities.

Federal agencies may purchase RECs through either the Defense Energy Support Center or the General Services Administration (GSA). Both have significant experience purchasing RECs. The Western Area Power Administration has a new federal renewable program that is primarily available to agencies in their service territory, encompassing most of the western United States.

There are several verification and certification programs for RECs and other renewable products that are helpful in providing some assurance that a supplier’s claims are accurate and that the product meets minimum standards for quality. Federal agencies are encouraged to include an annual verification audit requirement in their REC purchases (see Third Party Verification FY05 Guidance, available on the FEMP Web site at http://www.eere.energy.gov/femp/renewable_energy/renewable_workinggroup.html).

This article provides basic information about RECs. For additional information, please see the Green Power Network Web page at <http://www.eere.energy.gov/greenpower/index.shtml>. Also visit FEMP’s Web site on Renewable Purchasing at http://www.eere.energy.gov/femp/renewable_energy/renewable_purchasepower.html and download the *Guide to Purchasing Green Power*. A detailed discussion of RECs is also contained in the report, “Emerging Markets for Renewable Energy Certificates: Opportunities and Challenges,” available at <http://www.eere.energy.gov/greenpower/resources/pdfs/37388.pdf>.

If you are interested in purchasing this type of product or if you have other renewable power questions, please contact Chandra Shah of the National Renewable Energy Laboratory at chandra_shah@nrel.gov or 303-384-7557.

NASA's First LEED™-Certified Building Constructed at Marshall Space Flight Center

The National Aeronautics and Space Administration (NASA) Marshall Space Flight Center (MSFC) in Huntsville, Alabama completed construction on Building 4600, a five-story 139,000 square foot office building designed to incorporate many energy efficient and sustainable features. Building 4600 is registered with the U.S. Green Building Council, and recently became NASA's first Leadership in Energy and Environmental Design (LEED™)-certified building. This building was also recognized as an exceptional model of energy efficiency, innovation, and sustainable design by the Federal Energy Management Program, and is one of four buildings selected to receive a 2005 Federal Energy Saver Showcase award.

Building 4600's orientation along an east-west axis plays an integral role in its sustainable design, minimizing sun exposure and shielding narrow ends using horizontal sun shades and vertical fins. This orientation and cladding, combined with a white ENERGY STAR® roof membrane, reduces the building's susceptibility to heat gain and lowers its energy demand. Motion and perimeter light sensors also reduce the building's overall electricity requirements. Photovoltaic roof panels totaling 44 kilowatts of capacity collect energy that is converted to AC power and combined with the main electric grid, while excess power is stored in batteries for use at night. Additionally, use of the campus chilled water and steam system and heat recovery units help to further increase the building's energy performance.

Water discharged from the campus chilled water plant is distributed to a retention pond on the building site where it is combined with captured site water and rain water and used for landscape irrigation, saving more than 3.5 million gallons of potable water each year.

When designing the interior space, MSFC's energy team adopted the philosophy that a clean, well-lit, flexible work environment leads to increased productivity and employee satisfaction. An open office work environment was chosen to provide flexibility, encourage team interaction, and inspire creativity. Environmental and occupant health benefits include the elimination of construction waste, efficient air flow and light distribution, and greater access to daylight and views. Maximum daylight penetration is achieved by centralizing the building core and support elements. The large north and south portions of the floor plan remain open for lower height modular workstations that allow for either direct or indirect access to

daylight and views for at least 90 percent of the occupants. Where privacy is required, traditional offices can be found along the east and west ends of the building.

Indoor air quality was also a key part of the design. During construction, an indoor air quality plan included sealing all ductwork prior to operation, cleaning tops of all ductwork prior to carpet and ceiling grid installation, keeping absorptive materials covered until installation, and using low VOC paints, adhesives, carpets, and furniture.

More than 20 percent by cost of the material used for the building, such as carpet fiber insulation and access flooring panels, is made of recycled content. Related environmental benefits of the structure type were also evaluated, with a steel structure chosen for the high level of recycled material used in manufacturing, as well as the low level of construction waste. The concrete used for foundations and floor slabs was specified to contain 20 percent fly ash in the mixture, reducing the amount of this post-industrial byproduct discarded into landfills. Additionally, during construction more than 85 percent of the waste was reused or recycled; industrial sized waste bins were marked for separation by material type and periodically taken to recycling plants.

All new construction at MSFC is planned to be certified at a LEED™ "Silver" rating, and the design for Building 4600 will be used as a model for all future office space in the surrounding area.

For more information, please contact Cedreck Davis of Marshall Space Flight Center at cedreck.g.davis@nasa.gov or 256-544-3221.



George C. Marshall Space Flight Center, Office Building 4600

The FEMP Web Site Offers New Renewable Energy and Sustainable Products

A variety of new items and tools highlighting renewable technologies are now available on the FEMP Web site. A new renewable energy case study, available at http://www.eere.energy.gov/femp/renewable_energy/renewable_casestudies.html, details a renewable installation that has been monitored for system performance. The General Services Administration (GSA) included an 11.5-kW building-integrated photovoltaic system into a sustainable design and construction project at the Alfred A. Arraj Courthouse in Denver, Colorado—the first federal courthouse to build solar electricity into its structure. The system produces up to 60 kilowatt-hours of electricity daily, and is one of many measures incorporated into the building to reduce its energy use by 50 percent compared to a typical courthouse.

Also new to the FEMP Web site is the addition of the latest Web-based version of FRESA, the Federal Renewable Energy Screening Assessment program. This software can be used to do either a general or more detailed screening of numerous renewable technologies. The general screening provides the user some direction as to whether or not to consider further research and analysis into a particular technology for that site; the specific screening results in more detailed life cycle and system specification data. FRESA can be accessed online at http://www.eere.energy.gov/femp/information/download_fresa.html.

Another screening tool developed by FEMP is a collection of interactive solar resource maps, available at <http://mapserve2.nrel.gov/website/L48MarineCorp/viewer.htm>.

These maps were originally created as a collaborative effort between the FEMP and geographic information system staff at NREL as part of a Technical Assistance Marine Corps project, but provide benefits for any agency wanting to consider the feasibility of solar technologies at a particular site. The maps allow a user to see the availability of solar resources at sites across the United States, and show where PV, solar hot water, and solar ventilation preheat technologies are cost-effective today and where they will be cost-effective as the utility rates for electricity change.

FEMP's Web site also features an abundance of new sustainable design tools. For instance, four new Best Practice Guides provide information on design, construction, and operation of specific technologies that contribute to energy efficiency and sustainability in laboratories, including efficient electric lighting; exhaust and intake design; low-pressure-drop heating ventilation, and air conditioning design; and water efficiency.

Produced by *Laboratories for the 21st Century*, a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy, the guides include information from actual implementation of such technologies in various laboratory facilities, highlighting quantifiable performance goals and possible methods to achieve them. Please visit http://www.labs21century.gov/toolkit/bp_guide.htm.

Also available are three new Labs21 case studies at http://www.labs21century.gov/toolkit/case_studies.htm. The most recent case study profiles the U.S. Environmental Protection Agency's Robert S. Kerr Environmental Research Center in Ada, Oklahoma. Annual energy consumption in the laboratory was reduced by 45 percent due to an upgrade in the building's mechanical system and the incorporation of renewable energy. This retrofit, financed with an energy savings performance contract, implemented a geothermal ground source heat pump and other energy efficient systems. As a result of these upgrades and "green tag" purchases from wind power, the Ada Lab is EPA's first "zero emissions" facility.

Another case study profiles the Marian E. Koshland Integrated Natural Science Center (KINSC). Designers estimated that the KINSC system saves 52 percent in cooling and heating energy annually for the entire facility as compared to a system using 100 percent outside air, variable air volume fume hoods, and no energy recovery.

The third new case study spotlights Emory University's new eight-story Whitehead Biomedical Research Building. Completed in 2001, it has incorporated many energy- and water-efficient features including: energy recovery, condensate recovery for cooling towers, rainwater harvesting for irrigation, natural lighting, and lighting controls. The building also earned a Leadership in Energy and Environmental Design (LEED™) "Silver" rating.

Finally, the High Performance Federal Buildings Database site, available at <http://www.eere.energy.gov/femp/highperformance/>, spotlights more than thirty federal facilities that have succeeded in creating high performance buildings that save energy and reduce environmental impact. The database can be used to examine project details or to explore construction or retrofit ideas for your facility. FEMP is sponsoring this federal portal to the High Performance Buildings Database, which lists more than 75 federal and non-federal buildings.

For more information about these renewable and sustainable products, please contact Alicen Kandt of the National Renewable Energy Laboratory at alicen_kandt@nrel.gov or 303-384-7518.

An Old Tradition Showcases the Newest Lighting Technology

To the casual observer there was not anything particularly unusual about the Capitol Christmas tree this year. The 65-foot Pacific Silver Fir was as beautiful as any tree that has graced the Capitol lawn since the tradition began in 1964. But for federal employees in the know, this year's tree was a shining example of cutting-edge technology. In addition to its 3,000 handmade ornaments, the tree featured 10,000 light-emitting diode (LED) lights—lights that are up to 90 percent more efficient than their incandescent counterparts and cost just a fraction of the price to use. In fact, this year's tree cost a mere \$1 per day in energy.

Use of the LED lights signaled a federal commitment to conserving energy, according to Architect of the Capitol (AOC) Alan Hantman, who served as master of ceremonies at the tree lighting ceremony. The Congress and the Office of the AOC are committed to implementing energy-saving measures across the Capitol Hill complex and already plan to use LEDs on future trees.

In 2005, approximately one-third of the lights on the Capitol tree were LEDs, as a transition to all LEDs this year. The move to LEDs was based on the clear efficiency advantage of LEDs and the fact that LED bulbs last substantially longer before needing to be replaced. While not as bright in appearance as traditional incandescent bulbs, the intensity of the color of LEDs is greater, making this year's rich red and blue bulbs a memorable image. The strings of LED lights also proved easier to mount on the tree.

Eventual widespread use of LEDs by consumers will contribute significantly to energy conservation. The conversion of electricity into useful light is one of the least efficient energy conversion processes in buildings today. Consumers and businesses spend approximately \$58 billion each year to light their homes, offices, streets, and factories. Energy consumption for all lighting in the United States is estimated to be 8.2 quads, or about 22 percent of the total electricity generated in the U.S.

The Department of Energy's (DOE) Building Technologies Program has the mission of reducing the amount of electricity used to illuminate buildings by 50 percent by 2025. The Program is working in close collaboration with research and industry partners to develop and demonstrate energy-efficient, high-quality, long-lasting lighting technologies, including white-light LEDs.

Colored LEDs have been around since the 1960s and are commonly used in home electronics, automobile taillights, and even some traffic signals and exit signs. White LEDs, however, are just now reaching the point where they have enough luminous output and power to be viable for building applications and consumer use. For most general illumination applications, current LEDs cannot yet compete with traditional sources on performance and cost.

In terms of performance, many of the white-light LED products currently marketed as "energy efficient" have very low light output compared with conventional light sources. This makes them less desirable than their incandescent or fluorescent counterparts for reading lamps and other applications requiring bright light. They may be perfect, however, for applications where light is specifically directed, such as lighting outdoor steps or pathways. This is because LEDs emit light in a less diffuse pattern than conventional bulbs, which emit light in all directions.

LEDs are the clear winners when it comes to durability and efficiency. Being a solid-state device makes LEDs highly resistant to damage caused by vibration, and the best white LEDs have been found to have a useful life of about 35,000 hours, or four years of continuous operation. Researchers have also improved the efficiency of white-light LEDs to approximately 50 lumens per watt, almost four times more efficient than incandescent sources.

There is widespread variation among current white LEDs primarily because there are no consensus test procedures or performance standards for LEDs. DOE is working to change that through its Solid State Lighting Partnership with the Next Generation Industry Alliance, an industry group including lighting giants General Electric, Philips, Sylvania, and others. Working through this partnership and others, DOE is involved in the testing of LED fixtures, the creation of ENERGY STAR® criteria, and technology procurement programs to help bring better-quality LEDs to market.

For more information about market-available LEDs and DOE's involvement in developing better LED technology please visit <http://netl.doe.gov/ssl/faqs.htm>. You may also contact Brad Gustafson of FEMP at brad.gustafson@ee.doe.gov or 202-586-5865 or Jeanne Chircop of Technology & Management Services at jchircop@tms-hq.com or 571-225-9912.



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KENNEDY SPACE CENTER PILOTS SOLAR THERMAL PROJECT AT FILM STORAGE BUILDING
(continued from page 11)

to a water-to-air exchanger during daytime operations. To protect against freeze damage, a mixture of 20 percent glycol and 80 percent water was chosen as the operating fluid, with pressure relief valves and an expansion tank included in the system. The entire system is insulated for safety and to ensure maximum efficiency. The installation did not interfere with

the existing HVAC equipment and created a redundant heating system for the regeneration equipment during the peak sun hours of a typical day.

KSC documented savings of 26 percent in the building's overall electrical energy consumption over the project timeframe, equating to 196 million Btu saved in FY 2004.

For more information, please contact Harry Plaza, Kennedy Space Center, at Harry.Plaza@nasa.gov or 321-867-8414.

Announcing the Labs21 2007 Annual Conference Call for Presenters

Do you have in-depth knowledge and experience in the areas of sustainable laboratory design, engineering, and operation? If so, the Laboratories for the 21st Century (Labs21) program invites you to present your ideas and accomplishments at the Labs21 2007 Annual Conference, taking place October 2-4, 2007 in Charleston, South Carolina. The application deadline for the Call for Presenters is March 23, 2007.

This year's international conference will feature dozens of thought-provoking technical sessions highlighting sustainable laboratory design, engineering, and management, an interactive poster session, evening tours, and the Technology and Services Fair, which highlights the newest and most innovative laboratory products and services on the market.

You can participate in this exciting event in three ways: (1) present a technical paper, (2) display a poster, or (3) submit a project for on-site technical review and discussion during the Roll Up Your Sleeves Roundtable.

For more information, including suggested presentation topics and submission requirements, please visit <https://www.labs21century.gov/conf/>. Labs21 is a voluntary partnership program co-sponsored by the U.S. Environmental Protection Agency, the U.S. Department of Energy, and the International Institute for Sustainable Laboratories (I2SL). For more information about Labs21, please visit <https://www.labs21century.gov>.



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