

REPORT TO CONGRESS

on

**DoD Renewable Energy
Assessment**

Status Report Update



**Office of the Deputy Under Secretary
(Installations and Environment)**

March 2006

Update on Initiatives Launched to Implement the Military's Renewable Energy Vision

In March 2005, the Department of Defense (DoD) submitted the DoD Renewable Energy Assessment Report to Congress, along with the DoD Renewable Energy Assessment Implementation Plan. This report responds to the Senate Appropriations Committee Report on HR 2528 (109-105), Military Quality of Life and Veterans Affairs Appropriations Act, 2006. The section on page 23 of the report supports the findings of the DoD Renewable Energy Assessment and calls for the Secretary of Defense to pursue the Implementation Plan included in the Assessment and to report no later than March 31, 2006, on steps DoD has taken to execute the Plan.

This report highlights some of the on-site renewable energy generation projects that are in the planning, design, or construction phases as well as large renewable energy purchase opportunities that DoD has pursued or is in the process of evaluating. Life-cycle cost analyses have been conducted for each of the project opportunities now being pursued as a result of the comprehensive assessment. Since the focus of this report is an update on the renewable energy implementation plan, it will not cover the history or fundamentals of the various renewable energy technologies but rather the actual ongoing resource development efforts currently in the planning or execution stages. This follow-up report will also describe DoD's efforts to integrate hydrogen fuel cell technology applications as solutions to facility energy requirements. Hydrogen fuel cell technologies are quickly emerging from the research and development stages and are starting to present life-cycle cost effective opportunities that DoD plans to take advantage of.

In just two short years, the Department has significantly increased the amount of renewable energy purchased and generated by a factor of about 2.5, from 3.2 Billion British Thermal Units (BBtu) in FY 2003 to over 8.3 BBtus in FY 2005. Renewable energy now accounts for 8.3 percent of all facility electricity consumption.

Solar Initiatives

The Army, Navy, Air Force, and Marine Corps have several projects involving various forms of solar energy technology that are either under planning and development or are in the acquisition phase.

The Navy currently completed two Fiscal Year 2005 (FY 05) solar projects: 70 Kilowatt (KW) photovoltaic (PV) in San Diego, CA, and 60KW PV in Hawaii. One FY 06 project will install a 160 KW thin film PV parking shade structure at Armitage Airfield at Naval Air Weapons Station, China Lake, CA. The projected cost is \$1.3M. A second FY06 project will install a 200 KW thin film PV rooftop system at Naval Base Ventura County, Port Hueneme, CA. The projected cost is \$1M. Each of these projects was, or will be, funded from the Energy Conservation Investment Program (ECIP) account of the Military Construction (MILCON) appropriation.

The Marine Corps has three FY06 ECIP projects (total funding \$3.1M) at Marine Corps Base Camp Pendleton, CA, which will replace existing solar thermal systems by providing new solar collectors, associated piping, and supports to heat a 540,000 gallon swimming pool. A PV system will be installed on a parking structure to reduce electricity demand to the grid and will include a charging station for electric vehicles.

The Army completed two FY05 ECIP projects. One installed a 125 KW PV system at Fort Sam Houston, TX, at cost of \$1.3M and a second installed Transpired Solar Walls at Fort Drum, NY, at cost of \$3M. The Army is implementing several renewable energy solar projects under ECIP. A FY07 ECIP project is programmed to implement a 200 kilowatt photovoltaic system sized to supply electricity for chillers in two training classroom buildings for the Army Medical Center and School, Fort Sam Houston, TX. A FY05 project at Fort Drum, NY, is implementing transpired solar panels on 34 vehicle maintenance shops to pre-heat ventilation air in the winter and another project at Fort Sam Houston is implementing 180 KW photovoltaic systems serving a barracks facility chiller system. A 35 KW photovoltaic system was installed on Legan Island, Kwajalein Atoll, to supplement the existing diesel powered generator plant and reduce maintenance and refueling trips.

The Air Force has an FY05 Energy Savings Performance Contract (ESPC) project that is installing a 122 KW PV system at Luke Air Force Base, AZ. There are two ECIP projects (Phase 1 in FY05 & Phase 2 in FY06) that will install 300 KW and 100 KW respectively at March Air Reserve Base, CA. There are two ECIP projects (Phase 1 FY06 & Phase 2 FY07) that will install 170 KW and 365 KW respectively at Fresno Yosemite Air National Guard Base, CA. Three other PV projects, two ECIP and a ESPC, are pending. The capacity of each of these projects has yet to be determined.

Smaller solar energy projects are also included in the scope of broader ESPCs, which is a form of alternative financing.

Wind Initiatives

Wind initiatives are being pursued by each of the Military Departments. The on base wind power projects are described in three categories: installed, in development, and under study.

Installed wind generation projects (FY05) include a Navy 3.8 Megawatt (MW) wind generator at Guantanamo Bay, Cuba, which provides 30% of the base's power requirement, and an Air Force 1.32 MW wind generator at F.E. Warren Air Force Base, WY.

The Air Force has under development a 250 KW wind generator at the Tin City, AK, site. Additionally, the National Defense Authorization Act for FY 2006 directed a wind generation security and reliability demonstration project that will include installation of a wind generator. Planning and development for this demonstration project has been initiated.

In 2005, the Air Force generated on-base power from renewable wind energy at the following locations: Ascension Island, 5,361 Megawatt Hours (MWhrs) and FE Warren Air Force Base, 252 MWhrs.

Wind power projects under study by the Army include Fort Irwin, CA; Fort Bliss, TX; Fort Richardson, AK; and the Army Garrison, HI. Air Force wind projects under study include 3 Megawatts at Anderson Air Force Base, Guam; 3 Megawatts at Vandenberg Air Force Base, CA; and a wind generator at Air National Guard Cheyenne, WY.

Wind generation projects are typically funded either through the ECIP program or with alternative financing through an ESPC.

Geothermal Initiatives

The Navy has several geothermal projects in operation or under development, including the Coso Geothermal Project, Naval Air Station Fallon, Hawthorne Army Ammunition Depot, and Naval Air Field, El Centro.

Coso Geothermal Project - At the present time, the Geothermal Program Office (GPO) has four power operating geothermal power plants at the Naval Air Weapons Station, China Lake, CA, under its jurisdiction. The current output for those facilities is approximately 250MW.

Naval Air Station Fallon - A Public-Private Venture capital contract for development of a new facility at Naval Air Station Fallon, NV, was awarded in late December 2005 for construction, operation, and maintenance of a minimum 30 MW facility. This project has expansion capability up to 160 MW. The project is currently in the permitting stage with expected first power within the next 2-3 years.

Hawthorne Army Ammunition Depot (HWAD) - A full 3D reflection seismic data set has been acquired over the area of interest at HWAD, and is currently in the early stages of being interpreted. The outcome of that interpretation will be selection of one primary and one alternate drilling site where a 7,000 foot deep exploration hole will be drilled to evaluate the resource. Drilling is anticipated to begin in the summer of 2006 and be completed by beginning of the third quarter of calendar year 2006.

Naval Air Field El Centro (NAFEC) - A 3D magnetotelluric survey will be conducted this fiscal year to further delineate a geophysical anomaly located on the Shade Tree range of NAFEC. This particular location is the site of a temperature anomaly defined by shallow drilling by industry in the 1970's. Results of the survey will be integrated with previous geophysical and geological surveys to produce a geological synthesis of the area of interest. The GPO is working with the Bureau of Land Management to fund a joint Environmental Impact Statement (EIS) in anticipation of future drilling and resource development.

Biomass Initiatives

The Marine Corps is studying the potential for a new biomass plant at Marine Corps Base Camp Lejeune that will have the capacity to produce 80,000 pounds per hour of steam at 150-160 pounds per square inch gauge (psig) to be distributed to the existing steam headers. The plant will use on-site waste sources and off-site wood waste sources to displace the majority of the load currently supplied by four boilers. The new plant will allow Camp Lejeune to make use of

on-site waste streams, to purchase lower cost steam, and to receive a monthly credit on the electrical utility bills. The biomass boiler will displace a significant portion of the current load on four of the existing boilers. Camp Lejuene is currently evaluating the merits of this project and the economics associated with it. The Marine Corps is collaborating with the Department of Interior on this project.

The Air Force has completed an ESPC project for a 1.4 MW generator at Hill Air Force Base, UT and an additional generator is under consideration. This project is fueled by landfill gas from a nearby site. A 3 MW ESPC waste to energy generation plant is under construction at Dyess Air Force Base, TX. The Air Force is also developing an opportunity to purchase electric power from an offsite project fueled by poultry waste and considering other onsite landfill gas generation projects. In 2005, the Air Force generated on-base power in the amount of 5,318 MWhrs at Hill Air Force Base, UT from biomass energy.

The Navy is evaluating a landfill biomass purchase opportunity at Pacific Missile Range Facility, Barking Sands, HA.

DoD ESPC Renewable Replication Pilot

The office of the Secretary of Defense (OSD) has launched an initiative to implement cost effective solar energy applications in mass throughout military installations. In a cooperative effort with the Department of Energy and their national laboratories, DoD is developing a pilot ESPC contract and anticipates award this FY. This effort is the result of significant collaboration with industry that sought to identify methods to implement renewable energy applications at military installations in a more timely and cost effective manner, and in greater volume. It will also facilitate DoD's positive response to the enactment of the Energy Policy Act of 2005 which calls for more aggressive Federal renewable energy use goals of:

“... of the total quantity of electric energy the Federal government consumes during any fiscal year the following amounts shall be renewable energy:

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

The ESPC delivery order to be awarded under this support agreement will be focused on solar energy applications. Through this initiative, utilizing the four solar technologies (daylighting, solar transpired cooling, solar pool heating, and grid connected PV) identified as most suitable for mass replication by an assembled team of technical experts, the Acquisition Team, led by the Defense Energy Support Center, intends to leverage economies of scale in order to increase the economic benefits of the applications that are marginal when individually assessed. Technical data was gathered from Navy installations and used for economic analysis. A total of \$23M of potential projects were identified at 43 sites: (15 Navy, 1 Marines, 10 Army, 17 Air Force). Site visits are planned to multiple sites in the near future to validate the data and economic analysis. The Acquisition Team is concurrently developing an acquisition strategy for this pilot project. If successful, this pilot project will serve as the template for future mass acquisitions of other replicable renewable energy applications.

Hydrogen Initiatives

DoD is proactively investigating opportunities for hydrogen and hydrogen infrastructure projects at military installations. While not technically classified as a renewable energy source, hydrogen can be produced from renewable sources of energy such as wind, photovoltaics, biomass, and bio fuels such as ethanol and is an extremely promising alternative energy source that is quickly offering life-cycle cost effective solutions to facility energy requirements. These efforts will help DoD identify viable applications of hydrogen at military installations for fuel cells, hydrogen vehicles, and potential energy storage applications. Historically, hydrogen and fuel cell demonstrations at military installations have been funded with Congressional adds; however, they have not translated to a large extent to further replication for various reasons including unfavorable economics, increased maintenance requirements, reduced operational life spans, and costly component replacement.

Some of these technologies are rapidly maturing and overcoming some of the obstacles identified through the numerous studies and demonstrations. For example, the Army through their Construction Engineering Research Laboratory in Champaign, IL, is designing an extremely viable project that takes the waste gas from the anaerobic digester of a waste water treatment plant at Fort Stewart, GA, to produce hydrogen for a fuel cell. The Marine Corps also has a hydrogen fuel cell project under design that will provide facility power at Marine Corps Air Station Miramar, CA. Both of these projects have been included for funding in the FY07 ECIP budget.

DoD Renewable Project Execution

Direct appropriations, alternative financing, and lease agreements are the most common approaches to execute renewable energy on-site generation projects.

As indicated in the initial report on this subject, DoD has significantly increased the percentage of funds from the ECIP account dedicated to life-cycle cost effective renewable energy projects. In FY 2003, DoD spent about \$5M of its ECIP budget on renewable energy generation projects. Since then, as a result of the findings of this assessment, DoD has steadily increased funding to \$13M in the FY 2005 program and \$17M in the FY 2006 and 2007 programs. For the first time ever, the FY 07 ECIP project list also highlights the inclusion of \$2.6M in life-cycle cost effective hydrogen fuel cell projects that will meet facility energy requirements.

DoD is also working very closely with the Department of Energy and its private sector partners to increase the use of alternative financing through ESPC contracts to implement more renewable energy projects at military installations.

Finally, DoD is extremely interested in facilitating renewable energy projects on its land, where compatible with mission, through lease arrangements.

Renewable Energy Purchases

Each Military Service has completed a purchase of renewable electric power either directly or through the Defense Energy Support Center (DESC). DESC is currently developing purchases from specific renewable energy projects for the Military Services. Additionally, the Western Area Power Administration and Bonneville Power Authority have provided renewable power to Air Force installations. In FY05 the Air Force purchased approximately 10% of their annual electric power use, more than 1 million megawatt hours, from wind, geothermal, and other renewable energy sources.

DoD Renewable Energy Vision

As of the end of 2005, renewable energy accounted for 8.3% of all electricity used by U.S. military installations. On November 18, 2005, the Deputy Under Secretary of Defense for Installations and Environment issued a guidance memorandum establishing a visionary longer-term goal for renewable energy of 25 percent by FY 2025. DoD's goal is to continue leading the Federal government in the pursuit of renewable energy in order to reduce its reliance on fossil fuels.