

Greening the DoD

**WITH THOUGHTS TO THE LONG TERM, DoD
IS TRYING TO BECOME A MORE EFFICIENT
CONSUMER OF ENERGY.**

**By HEATHER BALDWIN
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From radar development during World War II to computer science and the creation of the Internet, DoD has always been at the cutting edge of technology research. Now, it is engaged in a massive energy innovation effort that already is promising revolutionary changes in the ways Americans will think about and consume energy in the years to come.

This push to go “green” is far more than a nod to a Democratic White House. As Secretary of the Navy Ray Mabus said last year, “Energy reform will make us better fighters. In the end, it is a matter of energy independence and it is a matter of national security.”

It is also a matter of fiscal prudence. DoD is the single largest energy consumer in the U.S., accounting for about 90 percent of the federal government’s energy use. Its fiscal year 2010 energy bill was \$15 billion. Of that, \$11 billion was for operations (fuel used to power ships, aircraft, ground vehicles and generators at forward operating bases). The remaining \$4 billion was for electricity to power the 300,000 buildings and fuel to operate the 200,000 non-tactical vehicles on DoD installations.

DoD is tackling energy reform on three fronts: reducing its demand for traditional energy from commercial sources, expanding its supply of renewable and alternative energy, and boosting energy security. Projects under each of these categories run the gamut from solar panels, wind farms and building retrofits to vegetative roofing and dining facility oil re-use. All are aimed at helping DoD meet various energy goals, including one to produce or procure 25 percent of its total facility energy use from renewable sources by 2025 and another to reduce energy intensity 30 percent by the end of FY15 (compared to an FY03 baseline).

“The goals of the military’s green initiatives, and the associated initial efforts of many talented and dedicated individuals across the ranks, all point in a very positive direction,” observed Tom Lewis, group vice president of U.S. operations at The Louis Berger Group Inc. (LBG). “This has created positive buzz and interest within the green technology industry, as well as a diversity of pilots and small projects within DoD to get things started.”

LBG, a leader in green engineering and construction solutions for more than 50 years, has more recently become active as a technology evaluation, alternatives and impacts analysis, and solutions integration contractor for waste management, green power and energy efficiency. Among its many projects, LBG has lately led or supported feasibility of energy crops grown on U.S. Army lands at six U.S. sites; completed a net zero water, waste and energy environmental impact statement at Fort Bliss, Texas; provided advisory materials on advancements in different waste-to-energy technologies to the Air Force Civil Engineer Support Agency and others; and done a pilot study in Iraq for forward operating base fuel use reduction through the re-use of dining facility waste oils.

Lewis called DoD a “progressive client [that is] greatly reducing the amount of waste they generate, water resources they consume and grid-produced energy they use—while at the same time increasing the use of renewable resources and green designs and technologies.”

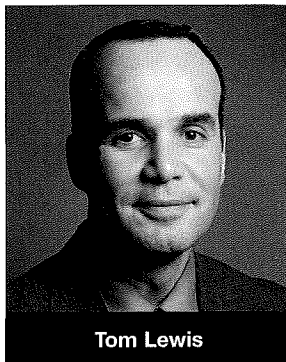
To meet its aggressive targets, DoD is working not only with private companies like LBG but also with other federal agencies—in particular, the Department of Energy (DoE) and Environmental Protection Agency (EPA). Most recently, the DoD and EPA signed a February 2012 memorandum of understanding (MOU) formalizing a partnership between the two organizations to develop and implement technologies that will help create sustainable American military bases worldwide. Under the MOU, the research of EPA and DoD scientists and engineers will be used to develop and demonstrate tools and technologies that will aid DoD in achieving sustainability as well as use military bases as test beds for innovative technologies that can then be shared more broadly.

In a sense, the agreement extends the work of the Environmental Security Technology Certification Program (ESTCP), a program established in 1995 to promote the transfer of innovative technologies that have successfully established proof of concept to field or production use. It identifies the most promising technologies by annually soliciting for relevant project proposals, then putting selected projects through rigorous demonstrations and evaluations.

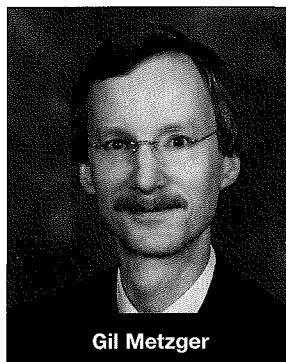
In late 2011, ESTCP gave the green light to 27 projects—selected from 575 proposals—to demonstrate emerging energy technologies on military installations in FY12. One of the selected projects is for a smart microgrid at Fort Bliss. Smart microgrids allow a user to “intelligently control a diverse set of energy generation sources and a diverse set of loads and optimize it for efficient, reliable and secure power,” explained Gil Metzger, intelligent microgrid solutions director for Lockheed Martin Corp., the company driving the Fort Bliss project. “You are creating an energy cocoon around an end-user’s facility.”

The microgrid concept is gaining traction, as it makes a lot of sense from both a power and security standpoint. The current power grid includes minimal or no renewable energy and energy storage, no intelligent distribution and uncontrolled load demands. Microgrids enable those capabilities and, when necessary, can disconnect from the national grid network and function in ‘island mode,’ enabling critical military functions to continue during commercial power disruptions.

Lockheed Martin’s ESTCP microgrid is slated for a brigade combat team (BCT). Metzger said the microgrid should be fully operational by



Tom Lewis



Gil Metzger

early summer and his team will collect data for six months to a year. Altogether, the project will run roughly 18 months.

"Since this is a training facility, the power goes up quite a bit during the day and down at night," said Metzger. "When they do exercises, they will also exercise the microgrid and allow us to react to unexpected outages." Metzger said Lockheed Martin's tactical microgrid systems have achieved anywhere from 10 percent to 40 percent savings, depending on how well facilities were optimized prior to implementation. Once the Fort Bliss project proves its value, "we'll be looking to expand across the entire BCT, then across the entire base," Metzger said.

Although smart grids are still in their infancy, Judy Marks, president and CEO of Siemens Government Technologies Inc., anticipates their usage will grow quickly. "DoD is just starting to do initial implementation and testing [of smart grids]," said Marks. "The technology exists, so it's not a technology challenge; it's a matter of people being able to understand their current energy baseline, how much of that should be traditional and renewable. I think we're going to see microgrids emerge in late 2012 and they'll come up a pretty quick curve."

In August 2011, Siemens Government Technologies and Boeing announced a strategic alliance for the joint development and marketing of smart grid technologies. The alliance's first contract, awarded under the ESTCP program, was announced on February 27. Under that contract, the team will implement intelligent energy-management solutions that include integrated controls for cooling and heating systems, lighting, ventilation and plug loads at an unspecified DoD installation. The partnership said DoD will realize up to 40 percent savings in energy costs at the installation.

"When you think that the majority of power DoD uses today comes from the commercial grid, there are some reasons for this and also some reasons to function autonomously, on a microgrid, during a natural disaster or other threat," said Marks. "That's where the future lies: energy efficiency through improvements in building controls, chillers and boilers, renewables. There is much opportunity for improvement."

So much opportunity, in fact, that a handful of installations are moving toward "net zero," meaning they consume only as much energy or water as they produce and will eliminate solid waste to landfills. The net zero concept arose from a joint initiative formed between DoD and DoE in 2008 to address military energy use. Their work led them to examine the potential for net zero energy installations. Marine Corps Air Station Miramar was selected as the prototype installation for net zero energy assessment and planning. Now, the Department of the Navy aims to have 50 percent of its installations be net zero by 2020.

In April 2011, the U.S. Army identified six net zero pilot installations each for energy, water and waste. The goal for all is to achieve net zero by 2020. By 2030, the Army aims to have 25 net zero installations.

Fort Hunter Liggett (FHL), Calif., was selected as a net zero pilot in both energy and waste. FHL is the largest Army Reserve installation and the eighth largest Army installation in the nation. Colonel James Suriano, FHL garrison commander, said his post was likely selected from the more than 100 applicants because it was already moving in a net zero direction. "We are close to being net zero on water," he said. "Now we have a great opportunity to work with other professionals in the Army to reach our energy and waste goals in a more timely manner and with more support."



Todd Dirmeyer, DPW energy manager, said FHL is working closely with the National Renewable Energy Laboratory (NREL). NREL recently studied FHL energy use and is currently creating a roadmap to help guide the post to net zero by the 2020 deadline. Dirmeyer expects that roadmap to be delivered in April 2012.

In the meantime, FHL is moving ahead with multiple energy initiatives. Taking advantage of its 292 average annual days of sunshine, FHL is building three 1-megawatt (MW) solar panel grids. The first one, stretching 40 feet by 1,200 feet over an existing parking lot, will tie into the FHL energy grid in April 2012. Construction on a second, identical, solar panel grid will begin in May or June this year. A third is awaiting funding. Each grid will produce about 1.8 million kWh annually. All three together will shave about 5.4 million kWh from FHL's annual 23 million kWh of energy consumption, said Dirmeyer.

Separately, the post is getting ready to replace its high-wattage light fixtures with LEDs. "Lighting is typically 20 to 40 percent of the total energy load," said Dirmeyer, adding that the LEDs should decrease annual energy consumption by 2.4 million kWh.

In FY14, Dirmeyer expects to see a further dent in consumption with the installation of an energy management control system (EMCS), which will automate building controls for lights, HVAC and other energy consumers. In October 2012, smart meters will be installed for precision measuring of electric, gas and water usage. "At this time the installation does not have a baseline established for individual building electrical, water and propane use," said Dirmeyer. "The advanced smart meters will establish a baseline and give us the tools to measure our progress."

For instance, the smart meters will enable FHL to compare energy use at the recently overhauled legal office with unmodified identical buildings across the street. Under net zero, the legal office was fitted with adjustable-light solar tubes, a treated concrete floor (eliminating carpet cleaning energy), high-efficiency R34 siding (eliminating heating and cooling) and dual-pane high-efficiency windows. "Now, the only energy used in that building is to power the computers," said Suriano. "We don't have to light the building during the day. And even during the winter when temperatures were below zero, the building lost only one degree of heat overnight."

Ultimately, Dirmeyer envisions saving enough energy to export the excess to Pacific Gas & Electric (PG&E) for credit. And when the 1-MW export limit is reached, "we could siphon off additional energy to something else, such as a hydrogen fuel cell, and the EMCS could discharge the energy when the sun isn't shining," Dirmeyer said. "We're still working it all out. It's all new."

Still, FHL knows it is on the right track. "We are measuring the flow coming in from PG&E," Suriano said, "and we know that even though PG&E's rates are going up, we've been paying less. Our gross energy use is down even though the number of people on base is going up."

During his nearly 30 years in the Army, Suriano said, he has seen [the concept of] "green" progress from something unheard of to something exotic to "the new normal. There's great buy-in," he concluded. "In a convoy, every tank of fuel we don't have to use makes it easier to execute the mission and reduce threats to human life." *

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