

The Sun Shines on the Department of Defense

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Upon reading the December 2009 Government Accountability Office report on renewable energy generation at Department of Defense (DOD) facilities, it struck me that the Department is in a similar situation (of course on a much grander scale) to mine in 2006. I wanted to put solar panels on the roof of my house, but I wasn't sure about the economics, and I really didn't know where to start.

Fortunately, a neighbor got the ball rolling. He organized a community meeting around Thanksgiving of 2006, proposing to negotiate a bulk discount with a local solar company. About 250 people showed up at the first meeting. The company explained the economics of solar installation in detail. I benefited from the dialogue between other neighbors and the company. Relying up my neighbor's screening of the solar company, I was among the first in line to order solar panels. Mine were installed in April 2007. Over 115 households bought at the same time.



My solar panels

I think a lot of military bases are in the same boat. To be sure, some have already taken action, particularly in areas with lots of sunshine and/or high electrical rates, such as Hawai'i. In fact, the first large solar array I ever saw was on the canopy of a parking lot at Naval Base Coronado, which I visited in January 2003. The Marines have already decided to require all new construction, beginning fiscal year 2012, to incorporate some type of rooftop solar system. A number of privately constructed military housing complexes, such as the Soaring Heights Communities at Davis-Monthan Air Force Base, in Tucson, Arizona, have taken advantage of incentives built into military housing allowances to go solar.¹ Yet many structures suitable for rooftop solar energy generation, such as the new Armed Force Reserve Center in my own community, are being built—or operate—without solar systems.



Armed Forces Reserve Center, under construction at Moffett Field, California
with world's largest wind tunnel in background

The military is sometimes criticized, internally and externally, as the nation's—probably the world's—largest user of energy. In 2009 the Defense Department spent over \$3.8 billion powering fixed installations. Facilities, including non-tactical vehicles, account for 28% of the Department's total energy use and 40% of its greenhouse gas emissions.² Earlier this year, Global Green USA wrote, “If the Pentagon and its

¹ SolarCity Press Release, “SolarCity Creates New \$90 Million Soaring Heights Communities at Davis-Monthan Air Force Base to Become Largest Solar-Powered Community in the Continental U.S. to Date,” October 26, 2009.

² *More Fight—Less Fuel: Report of the Defense Science Board Task Force on DoD Energy Strategy*, February 2008, p. 11. Dr. Dorothy Robyn, Deputy Under Secretary of Defense for Installations and Environment, Statement before the Senate Homeland Security and Governmental Affairs Committee,

subsidiary branches were to form a country, the Department would rank among the top 60 energy consuming nations in the world and the top 50 greenhouse gas emitters.”³

Of course, the military’s electrical consumption is primarily due its size as an institution. And it’s that “footprint,” with thirty million acres of real estate and more than 300,000 buildings and 2.2 billion square feet of space,⁴ that creates an opportunity for the Department to be a leader in the deployment of renewable power generation systems.

Like other federal agencies, Defense is under a complex set of mandates to generate more renewable energy and dramatically reduce its greenhouse gas emissions. For example, the 2007 Defense Authorization Action required that the Department obtain 25% of its electricity from renewable sources by 2025. In late January 2010, in response to government-wide targets set by the White House, the Defense Department announced that it plans to “reduce greenhouse gas emissions from non-combat activities 34 percent by 2020. The department set the target in keeping with a recent executive order signed by President Obama that seeks to have the federal government lead the country by example through improved energy and environmental performance.”⁵

Especially in the deserts and mountains of the Southwest, military bases and ranges seem well suited for large-scale wind and solar. And bases such as Nevada’s Nellis Air Force Base have done exactly that, but winning the series of approvals necessary to build centralized power generation is slow and often difficult. Solar facilities have the potential to interfere with the military mission, they are often incompatible with sensitive environmental areas, and those that require new transmission lines generate political opposition from people whose backyards are near their paths.

Texas Congressman Solomon Ortiz, chairman of the Armed Services Subcommittee on Readiness, stated:

[I]n a recent report conducted at this subcommittee’s request, the Government Accountability Office [GAO] recognized that development of renewable energy projects is not always compatible with the primary mission of a DOD installation... I would like to hear what steps the department is taking to ensure that large-scale energy projects on military installations don’t unintentionally impede a base’s primary mission or result in another form of encroachment.⁶

The environmental challenges are similarly formidable:

Subcommittee on Federal Financial Management, Government Information, Federal Services and International Security, January 27, 2010, p. 2.

³Schuyler Null, “Defense Sustainability: Energy Efficiency and the Battlefield,” Global Green USA, February, 2010, p. 5.

⁴Robyn, p. 2.

⁵Department of Defense News Release No. 079-10, “Greenhouse Gas Targets Announcement for DOD,” January 29, 2010.

⁶Jason Miller, “DoD tells Congress greening doesn’t affect goals,” Federal News Radio, February 25, 2010, p. 1.

From Death Valley to the Joshua Tree National Park, the Mojave Desert is home to environmentally sensitive resources. Because vegetation is sparse and threatened species are spread out over wide areas, large swaths of land are needed to protect and preserve sensitive habitats. Home to endangered species such as the desert tortoise and the Mohave ground squirrel, it is overlain with a patchwork of official “critical habitat” and slightly larger Desert Wildlife Management Areas.⁷

For example, the Solar Energy Generating Systems solar thermal facility in Kramer Junction, California, rated at 150 Megawatts, is among the oldest, largest solar electrical generating systems in the world. Built before surrounding areas were designated for protection of the desert tortoise, it scraped away the vegetation where its mirror fields lie. Today it prevents new growth with herbicides. Not only must the armed services avoid damaging such habitat themselves, but any destruction of habitat near military lands also puts pressure on the military to protect further the property it controls.

In addition, remote new centralized power complexes require the construction of new transmission lines. To build those, utilities must overcome financing, right-of-way, environmental, and above all, political obstacles. Despite California’s comprehensive Renewal Energy Transmission Initiative, which brought together diverse interests to develop the ground rules for siting transmission lines (and thus generation plants), the Los Angeles Department of Water and Power announced in March 2010 that it was abandoning its Greenpath North transmission project, proposed to convey power from geothermal beds and other renewable resources in the Salton Sea area to the city. It has decided instead to focus on solar projects in the Owens Valley, which is already served by high-power transmission lines.⁸

The Rooftop Solution

I suggest that the Defense Department and the armed services build on the Marines’ approach and commit to maximizing the installation of solar panels or other solar systems on appropriate roofs. Each installation should be able to develop quickly an inventory of its roof resources that distinguishes those buildings suitable for rooftop solar from those that are not. Screening criteria would include non-interference in military missions, compatibility with the age and condition of the roofs, and environmental concerns (which are unlikely to pose serious problems).

Furthermore, I suggest that the military draw upon its success stories to develop model arrangements for installing photovoltaic or solar water-heating systems on military rooftops and parking canopies. There is no one-size-fits-all contracting strategy, but at this point there are enough systems in place at Defense facilities to serve as positive examples. Just as the Department organized conferences in the 1990s to prepare Defense facility staff for the environmental challenges of base closure, similar conferences could prepare base personnel to implement the solar rooftop strategy.

⁷Lenny Siegel, “Renewable Energy: Avoiding a National Security ‘Train Wreck,’” CPEO, July 2008, <http://www.cpeo.org/pubs/Renewables.pdf>, p. 6.

⁸Janet Zimmerman, “Green Path North transmission line is officially off the table,” *Riverside Press Enterprise*, March 10, 2010.

Among those models, I expect that enhanced use leasing and power purchasing agreements, or similar instruments, will be the easiest way to move forward. The armed services would lease rooftops to solar companies, which would build and own the systems and sell the power back to the military or its electrical utilities at a predetermined rate. In addition to military projects, many solar companies already offer such deals to commercial businesses. In most cases, such projects rely upon private financing, eliminating the need for military construction appropriations, and the private firms are eligible for tax credits and other subsidies that the military, as a government agency, cannot obtain.

This is what the Air Force arranged at Nellis Air Force Base in Nevada and the Army arranged at its Hawai'i Family Housing Complex. Furthermore, in February, the Naval Facilities Engineering Command's Southwestern Division) awarded \$200 million in contracts "to construct up to 40 megawatts (MW) of solar photovoltaic power plants at Navy and Marine Corps installations throughout the southwestern United States.... Five solar development teams ... will construct, own, operate, and maintain the systems, and sell the power to the Navy and Marine Corps through power purchase agreements (PPA)."⁹



Solar canopy at Naval Base Coronado, California

⁹Lee H. Saunders, Naval Facilities Engineering Command Southwest Public Affairs, "NAVFAC Southwest Solar Energy Contract Will Generate 40 Megawatts," Navy News Service (NNS100302-01), March 2, 2010.

Under this strategy, the military would advertise its roof inventory to solar developers. It would be up to the developers to determine whether the solar resources at each site would financially justify the investment, based upon electrical rates projected over the life of each project. It would be up to the solar companies to assess the orientation and strength of each roof. They would also incorporate state and federal tax breaks and incentives, arrange appropriate metering, and create long-term management plans to cover repair, replacement, or eventual closure (removal). In California and numerous other states, grid-connected solar-panel-owners benefit from time-of-day metering that allows us to sell electricity at elevated rates during daytime peak-load periods and buy it back at cheaper rates at night, when our systems are not generating power.

Though there are currently no national solar developers, a high-profile Defense solar-roof strategy could promote the creation of national financing vehicles, either from the private sector or through Defense Renewable Energy Bonds, which Congress could create. Furthermore, as a large buyer, the Defense Department could directly negotiate low prices for solar panels and other components from vendors.

Cost Issues

Such a solar rooftop strategy could stimulate the broad development of Defense solar resources, but most of the experts that I've talked to, in and out of government, agree that it would be difficult to implement at many bases where solar resources are weak or existing sources of electricity are relatively inexpensive. The Government Accountability Office concluded:

However, as we have previously reported, energy from renewable sources generally costs more than energy from nonrenewable sources, such as fossil fuels. According to our analysis of DOD data, most DOD installations would need to spend more money to generate or purchase renewable electricity than they would to purchase conventional electricity offered by their local utilities. That is because the cost of renewable electricity is often greater than the cost of conventional electricity, the latter of which makes up the majority of the electricity sold by utilities. Furthermore, in most states, DOD's installations pay below-average rates for nonrenewable electricity. That means that most domestic DOD installations are even more likely to pay a higher price for renewable electricity than for the nonrenewable electricity provided by their local utilities. Thus, it may be challenging for DOD to develop on-site renewable energy systems that qualify for the goals while also attempting to follow DOD policy and DOE guidance that encourage investment in renewable energy projects when cost-effective.¹⁰

¹⁰“DEFENSE INFRASTRUCTURE DOD Needs to Take Actions to Address Challenges in Meeting Federal Renewable Energy Goals,” U.S. Government Accountability Office, GAO-10-104, December, 2009, p. 20.

There are a few approaches to overcoming the cost challenge. Each has its advantages and disadvantages. But as the Department develops a solution, Congress should be prepared to act quickly to evaluate and authorize or modify it.

- In projecting the life-cycle economics of solar rooftop projects, installations could be authorized to assume that there will be a price on carbon—that is, greenhouse gas emissions. The existing mandates for renewables and reduced emissions are based upon the imperative of such a policy, but the financial scoring—conducted or supervised by the White House Office of Management and Budget—places no value on such reductions.
- The Federal government could enact a *feed-in tariff* specifically for Defense facilities, with the specified prices adjusted by region and the type of renewable energy. According to the national Feed-In Tariff Coalition:

A Feed-in Tariff or FIT is a fixed price contract that utilities pay to electricity generators for producing renewable energy. It consists of a pre-defined PPA (Power Purchase Agreement) and typically offers a guarantee of:

1. **Payments** to project owners for the total amount of renewable electricity they produce;
2. **Access to the electricity grid;** and
3. **Stable, long-term contracts** (20+ years)

FIT Programs are government policies implemented at the local, state, or national level to spur the development and deployment of renewable energy projects. These programs typically mandate that utilities must provide a standard energy contract and pay the pre-determined price for any project that meets all the criteria for energy type, size, connection points, etc.¹¹

This is my preferred approach, because a National Defense Feed-In Tariff could serve as a pilot for the creation of a broader national Feed-In Tariff. Some critics, however, are concerned that it might transfer costs to other power generators or consumers, and they question the Federal government's constitutional authority to make regulatory decisions normally under state jurisdiction.

- The Defense Department could commit to solar rooftops where they directly serve the military mission by providing clean emergency power supplies. At many locations, solar with sufficient storage may compete favorably with the diesel generators that currently back up critical functions. Significant solar investment could ensure the continuous functioning of water and sewage systems needed to support emergency operations, not just emergency operations themselves. The military has a long history of paying extra for mission-critical equipment, such as semiconductors, computers, and jet engines, and those investments have paid off for the entire economy by driving down the price of production.

However, GAO reports that Defense officials believe that “it is particularly difficult

¹¹FIT Coalition, “Feed-In Tariffs: The Basics,” <http://www.fitcoalition.com/introduction-to-fits/>.

to develop on-site renewable energy for backup power that is cost-effective.” They cite the intermittent nature of wind and solar, as well as the cost of integrating such systems with the grid.¹² Still, I believe that storage and integration technologies can be developed to make solar backup competitive with inefficient, polluting diesel generators.

Other Defense officials worry that backup systems that “keep the lights on at military installations” while neighboring communities are in the dark would create serious political problems for the military. However, if the military coordinates with its neighbors—particularly the off-post fire, police, medical, and infrastructure agencies that often serve the base as well as the communities that house Defense personnel—they could create renewables-based backup systems that are designed to maintain military and host-community critical functions at the same time.

- The Department can commit to using roofing materials with built-in solar generating capacity in new construction and roof replacement—called Building Integrated Photovoltaics (BIPV). Such materials cost little more to install than conventional roofing materials, so the electricity they generate quickly converts to payback.

A universal Defense solar rooftop strategy would require the support of Congress, if not new legislation. Fortunately, Congress seems willing to promote renewables at the Defense Department even as it stalls over climate change in general. The Fiscal Year 2010 Defense Authorization Act contained several such provisions—primarily studies and reports designed to encourage renewable energy initiatives—and one can expect Congress to support implementation efforts in Fiscal Year 2011 and beyond.

A systematic program to install rooftop solar systems at Defense facilities throughout the United States is perhaps the quickest, most dramatic way for the U.S. government to increase renewable power generation and reduce greenhouse gas emissions. The roofs are there. The technologies exist. The Department appears to have the will to move forward. All that is needed are financial decision-making mechanisms that internalize the benefits of alternative energy.

¹²GAO, pp. 21-22.