DOE, NREL Help DoD Enhance Energy Security

The U.S. Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL) are helping the U.S. government, including the U.S. Department of Defense (DoD), deploy large-scale energy efficiency measures and renewable energy technologies to reduce costs, increase energy security, and meet federal mandates.

As the largest energy consumer within the U.S. federal government, DoD has long recognized the strategic importance of energy to its mission and is particularly challenged to address energy security, reliability, and cost concerns. DoD has more than 500 military installations encompassing nearly 2 billion square feet of space, and had an annual installations energy bill of more than $4 billion in 2010.

With the help of expertise from DOE and NREL, DoD is establishing net zero energy installations, or NZEIs, which produce as much energy on-site as their buildings, facilities, and fleet vehicles consume.

DoD’s ability to reach net zero energy goals at a growing number of installations will have a profound impact on its push toward energy security and surety—as best practices, strategies, and processes are replicated across all military branches.

The U.S. Marine Corps Air Station (MCAS) Miramar in California is one example of a NZEI. To help the facility meet the DoD’s goal to get 25% of its energy from renewables by 2025, DOE and NREL performed an assessment at MCAS to evaluate the potential for achieving energy reduction goals.

Simulations Lead to Good Decision-Making

Using NREL resource maps for solar, wind, biomass, and geothermal energy, the NREL team conducted hour-by-hour system operations and load profile simulations of various MCAS Miramar configurations for distributed energy resources to evaluate performance and identify the lowest cost of energy. The analysis created a combination of recommended energy measures spanning photovoltaics (PV), landfill gas, renewably powered fuel cells, microturbine co-generation, solar water heating, energy efficiency, and additional daylighting.

The team initially analyzed various large-scale PV potential scenarios before recommending that Miramar install 2.2 megawatts (MW) of additional PV to enhance the 2.3 MW of PV, 600 PV street lights (220 watts each), and the 100 kilowatt (kW) concentrating solar power system, which the
DOE and NREL also analyzed several combined heat and power opportunities, including cogeneration, biomass, microturbines, and fuel cells. The most cost effective option identified was 2.8 MW of renewably powered fuel cells that could be implemented through a power purchase agreement. These systems would not only produce heat and electricity, but also allow Miramar to strengthen its micro-grid.

In addition, the team analyzed a micro-grid with distributed generation sources to continue critical base operations despite a disruption to the electrical grid and recommended integrated “smart” controls to allow Miramar to maintain power off the grid in emergency situations. NREL is currently working on a follow up project to provide Miramar with a more detailed microgrid design.

Replication Across the Military

MCAS Miramar is on track to achieve a 40% reduction in facility source Btu through base-initiated projects. The installation currently has a 3 MW landfill gas Power Purchase Agreement and approximately 1 MW of solar PV. NREL developed an additional plan that would allow the base to achieve a 90% reduction in facility source Btu by 2015, if all of the NREL recommendations were implemented by the installation.

Based on the MCAS Miramar project, NREL developed a standardized NZEI process template for other military installations. Widespread replication is planned, with assessments already underway at several installations, including: the U.S. Air Force Academy in Colorado, the U.S. Army Garrison’s Pohakuloa Training Area in Hawaii, the U.S. Naval Support Activity South Potomac in Virginia, and the United States Military Academy at West Point in New York.