



Fact Sheet

DoD's Energy Efficiency and Renewable Energy Initiatives

July 2011

The U.S. Department of Defense (DoD) is the nation's largest energy user. In recent years, DoD has launched several initiatives to reduce its fossil fuel use by improving energy efficiency (i.e., reducing wasted energy) and shifting to renewable energy such as biomass, hydropower, geothermal, wind, and solar to meet operational and installation needs. Energy efficiency and renewable energy can benefit mission effectiveness, the environment, and the bottom line, as outlined in the following excerpt from a 2010 Memorandum of Understanding between DoD and the Department of Energy (DOE):

Energy efficiency can serve as a force multiplier, increasing the range and endurance of forces in the field while reducing the number of combat forces diverted to protect energy supply lines, as well as reducing long-term energy costs. DoD is also increasing its use of renewable energy supplies and reducing energy demand to improve energy security and operational effectiveness, reduce greenhouse gas (GHG) emissions in support of U.S. climate change initiatives, and protect the DoD from energy price fluctuations. Solving military challenges through innovation has the potential to yield spin-off technologies that benefit the civilian community as well.

This fact sheet outlines major energy efficiency and renewable energy initiatives underway by the Department of Defense, Army, Navy, Marine Corps, and Air Force. It also provides some examples of U.S. military installations with energy efficiency and renewable energy projects.

MAJOR INITIATIVES

Department of Defense

In 2010, DoD's [Office of the Assistant Secretary of Operational Energy Plans and Programs](#) was established to coordinate energy issues. In 2011, DoD published its [Operational Energy Strategy](#) to set the overall direction for operational energy security. DoD and DOE published a [Memorandum of Understanding](#) (MOU) in July 2010 to facilitate cooperation to accelerate the research, development, and deployment of energy efficiency and renewable energy technologies.

Army

The Army published the [Army Energy Security Implementation Strategy](#) in 2009 with the following goals:

- Reduce energy consumption
- Increase energy efficiency across platforms and facilities
- Increase use of renewable/alternative energy supplies
- Assure access to sufficient energy supplies
- Reduce adverse impacts on the environment

The Army set a specific goal to have five installations meet "[net-zero](#)" energy goals by 2020, and an additional 25 achieve net-zero energy by 2030. Net-zero energy means the installation produces as much energy on-site as it uses.

In 2011, [Base Camp Systems Integration Laboratory \(SIL\)](#) opened at Fort Devens, MA to assess new systems and technology with the goal of increasing energy efficiency and reducing fuel usage in base camp operations. Stateside, the Army is in the process of [transforming its non-tactical fleet](#), having already deployed more than 500 hybrid vehicles and 4,000 low-speed electric vehicles at domestic installations, to cut fossil fuel use.

Navy and Marine Corps

The Department of the Navy (DoN) established its [Task Force Energy](#), consisting of an executive steering committee, the [Navy Energy Coordination Office](#), and seven working groups encompassing both tactical and shore programs to meet energy goals. Goals include:

- Energy Efficient Acquisition: Evaluation of energy factors will be mandatory when awarding DoN contracts for systems and buildings.
- Sail the “Great Green Fleet”: DoN will demonstrate a Green Strike Group (biofuels and nuclear powered vessels) in local operations by 2012 and sail the Great Green Fleet by 2016.
- Reduce non-tactical petroleum use in the commercial fleet by 50 percent by 2015.
- Produce at least 50 percent of shore-based energy from alternative sources by 2020; 50 percent of Navy and Marine Corps installations will be net-zero by 2020.
- By 2020, 50 percent of total energy consumption will come from alternative sources.

The Navy launched its first hybrid electric-drive surface combatant, the [USS Makin Island](#), in 2006; estimated cost savings will be \$248 million over its service life.

The Marine Corps (part of DoN) established the [Expeditionary Energy Office](#) to reduce energy consumption, with the goals of increasing combat effectiveness by reducing the need for liquid fossil fuel by 50 percent by 2025 and using liquid fuel only for mobility systems, which will be more energy efficient than systems are today.

In its efforts to reduce fuel use, the Office of Naval Research developed the [Experimental Forward Operating Base \(ExFOB\)](#). The ExFOB includes small unit water purification, photovoltaic energy, shelter insulation, and energy efficient lighting, heating and cooling. One ExFOB project is the development of [SPACES](#) (Solar Portable Alternative Communication Energy System) to charge batteries and run electronics and communication equipment in field operations.

Air Force

In May 2010, the Air Force published its [Air Force Energy Plan](#) with the vision: To “make energy a consideration in all we do.” Goals include:

- Reduce energy demand by installations, flight operations, and ground operations
- Increase energy supply by developing and utilizing renewable and alternative energy wherever possible
- Change the culture to increase energy awareness in day-to-day operations
- Meet energy “End State Goals” by 2030:
 - Bases meet Air Force energy security criteria, while optimizing the mix of on-base and off-base generation
 - Aircraft are flying on alternative fuel blends if cost competitive, domestically produced, and have a lifecycle greenhouse gas footprint equal to or less than petroleum
 - Forward Operating Bases are capable of operating on renewable energy
 - Energy utilization is optimized as a tactical advantage across disciplines

The Air Force also is testing different blends of biofuels and jet fuels, known as “[Hydrotreated Renewable Jet](#)” (HRJ) fuels, to see which merit further research. They also are working to create cleaner, more efficient engines. The Air Force hopes to acquire [50 percent of its domestic aviation fuel](#) from alternative fuel blends by 2016.

The Air Force is recognized by the Environmental Protection Agency (EPA) as a [Green Power Partner](#), one of the nation’s top purchasers of green power. “Green power” is defined by the EPA as electricity produced from environmentally preferable resources, such as solar, wind, geothermal, biogas, biomass, and low-impact small hydroelectric resources.

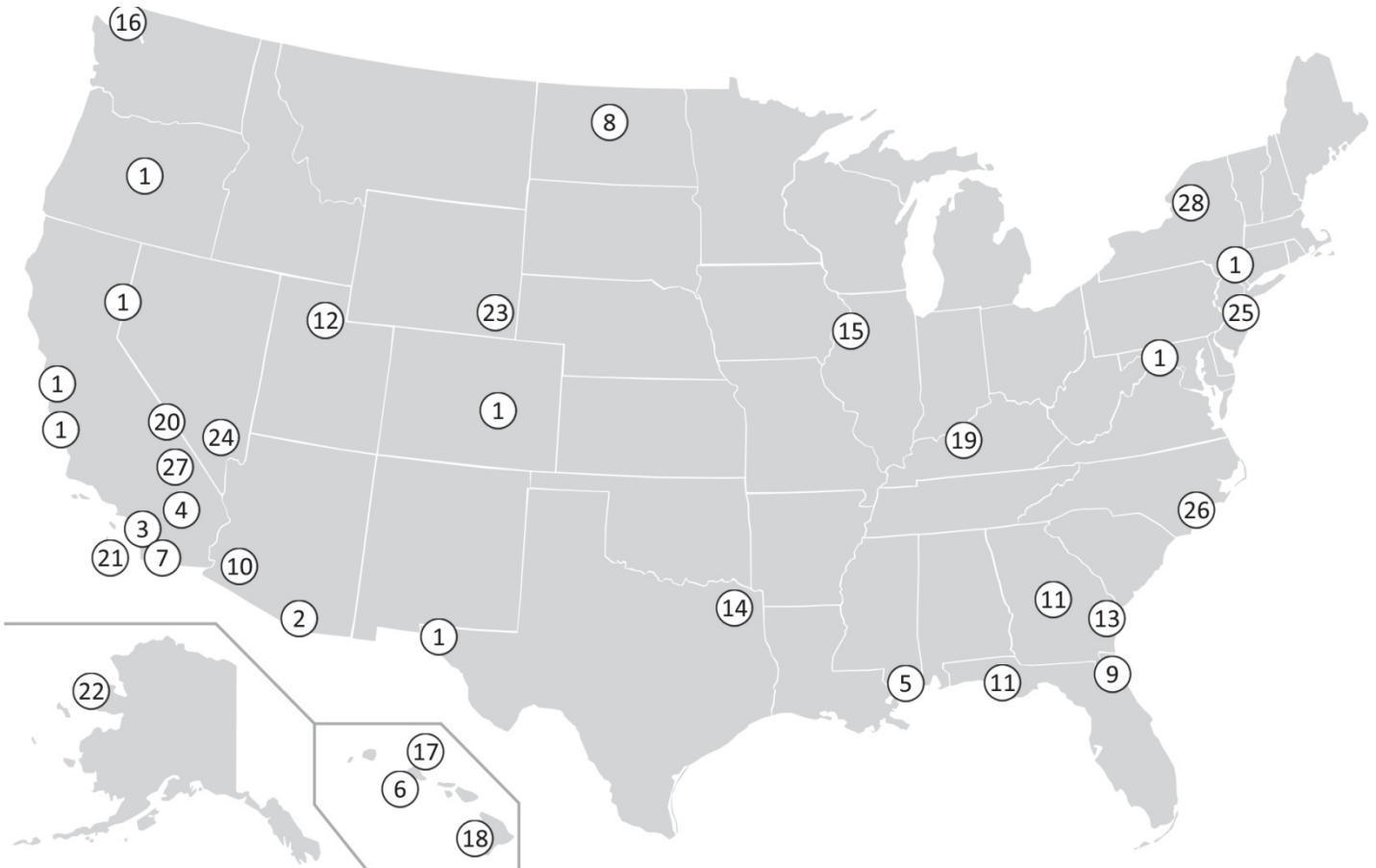
FEDERAL LEGISLATION AND EXECUTIVE ORDERS

The DoD also must comply with the following [executive orders and federal legislation](#):

- **[Executive Order 13423 \(2007\)](#)**: Requires federal agencies to reduce energy intensity by three percent annually or 30 percent by end of fiscal year 2015 (compared to FY 2003 baseline), with the goal of improving energy efficiency and reducing greenhouse gas emissions. Agencies must reduce their vehicle fleets' total consumption of petroleum by two percent annually through the end of FY15 (FY 2005 baseline).
- **[Executive Order 13514 \(2009\)](#)**: Required federal agencies to set percentage reduction targets for greenhouse gas emissions for FY 2020. Agencies shall consider reductions through reducing energy intensity in buildings, increasing use of renewable energy, and reducing the use of fossil fuels in vehicles. Agencies shall implement high performance sustainable Federal building standards for new construction and major renovation beginning in 2020.
- **[Energy Independence and Security Act of 2007](#)**: Section 431 requires federal buildings to reduce total energy use 30 percent by 2015 (FY 2003 baseline). Section 526 prohibits federal agencies from purchasing fuels with higher lifecycle greenhouse gas emissions than conventional petroleum fuels.
- **[National Defense Authorization Act of 2010](#)**: Section 2842 requires DoD to produce or procure 25 percent of its total facility energy use from renewable sources beginning in 2025.

PROJECTS AT U.S. INSTALLATIONS

The following is *just a sample* of the many energy efficiency and renewable energy projects already operating or in the planning stages at military installations across the United States. There are many more projects at U.S. installations across the nation and abroad.



1. [Fort Detrick, MD; Fort Hunter Liggett, CA; Parks Reserve Forces Training Area, CA; Sierra Army Depot, CA; and West Point, NY](#) are among the Army's six pilot net-zero energy installations. [Fort Bliss, TX and Fort Carson, CO](#) are the Army's two pilot integrated net-zero installations (net-zero in energy, water, and waste). Additionally, the Oregon Army National Guard will pilot a Net-Zero Energy Initiative that encompasses all installations in the state.
2. [Fort Huachuca, AZ](#) has completed a number of [renewable and efficiency projects](#), including photovoltaic (PV), concentrated solar power, solar water heating, and wind generation.
3. [Camp Pendleton, CA](#) has partnered with GM, Ford, and Quantum Technologies to test hydrogen-powered vehicles, develop refueling infrastructure, and reduce the base's use of petroleum fuel.
4. [Marine Corps Air Ground Combat Center, Twentynine Palms, CA](#) installed a 7.2 MW dual-fueled cogeneration (heat and electricity) plant which saves \$5.8 million a year, a 1.2 MW PV solar array, daylighting, and heating/air-conditioning upgrades.
5. [Keesler Air Force Base, MS](#) is home to the largest *Leadership in Energy and Environmental Design* (LEED) housing project in the nation, where more than 700 homes are in the process of being built and LEED-certified.
6. [Camp H.M. Smith, HI](#): Smart Power Infrastructure Demonstration for Energy Reliability and Security (SPIDERS) project is working to develop microgrids on U.S. military bases, which would incorporate renewable energy such as photovoltaics, fuel cells, and wind alongside back-up diesel generators. This medley of fuel sources would have energy storage and advanced metering capabilities, and could function off the commercial grid during peak hours or in an emergency.
7. [Marine Corps Air Station Miramar, CA](#) was selected as the prototype installation by the DoD/DOE Net-Zero Analysis Task Force, focusing on its energy and greenhouse gas emissions baseline, energy efficiency measures, renewable energy potential, electrical system, and transportation fuel use.
8. [Minot Air Force Base, ND](#) replaced its primary heating plant with high efficiency boilers, saving \$2.6 million in water and energy costs.
9. [Naval Air Station Jacksonville, FL](#) installed two new LEED-certified aircraft hangars and traded in 60 base cars and trucks for battery and solar electric low-speed vehicles for use on base.
10. [Marine Corps Air Station Yuma, AZ](#) installed a Building Integrated Photovoltaic system, which includes cool roof technology; constructed a solar vehicle charging station and "fast fill" compressed natural gas refueling station; and installed 102 KW of additional solar photovoltaics (PV) on existing structures.
11. [Eglin Air Force Base, FL and Robins Air Force Base, GA](#) are each planning a 25-35 MW wood waste biomass power plant.
12. [Hill Air Force Base, UT](#) generates 15,113 MWh/year of electricity from landfill gas, [saving over \\$335,000](#) per year.
13. [Fort Stewart, GA](#) generates high-pressure steam using wood chips at the central energy plant.
14. [Red River Army Depot, TX](#) generates renewable energy through burning wood scrap.
15. [Rock Island Arsenal, IL](#) generates one-third of its electricity from the island's [hydroelectric plant](#).
16. [Puget Sound, WA](#): A kinetic hydropower system using tidal energy is under development by the Navy.
17. [Marine Corps Base Hawaii](#): The Navy partnered with Ocean Power Technologies to deploy the "PowerBuoy" wave energy device and prove its grid compatibility. The buoy has produced power for more than 7,000 hours of operation.
18. [Natural Energy Laboratory of Hawaii Authority](#): Lockheed Martin continues development of an Ocean Thermal Energy Conversion (OTEC) system under contract by the Navy, based on the company's previous development of a smaller 50KW OTEC plant which ran for three months. The first plant will likely be installed at [Naval Station Pearl Harbor](#).
19. [Fort Knox, KY](#) converted barracks and other buildings to use geothermal energy, more than 4,000,000 sq. ft. in 130 buildings.
20. [Geothermal Coso Facilities, China Lake, CA](#): Four Navy and Bureau of Land Management power plants yield enough energy to power 180,000 homes.
21. [San Clemente Island, CA](#) (Navy) uses three wind turbines to reduce diesel use and save up to \$160,000 a year.
22. [Tin City Long Range Radar Station, AK](#) (Air Force): A 250 kW wind turbine project under development is projected to cut diesel fuel use at the remote Alaska station by 30 to 35 percent, and save \$443,000 per year in energy costs.
23. [F.E. Warren Air Force Base, WY](#) installed the first Air Force wind project in the continental United States, expected to save more than \$3 million in energy costs over the next 20 years.
24. [Nellis Air Force Base, NV](#) is home to the [second largest photovoltaic project in the world](#); the base obtains 25 percent of its electricity from solar using a 70,000 panel, 14.2 MW system, and has [plans to expand](#).
25. [Sea Girt Photovoltaic Project, NJ](#): The New Jersey National Guard has solar photovoltaic (PV) carport projects at Fort Dix and Sea Girt, NJ, which provide about \$116,000 in electric savings and \$350,000 from Solar Renewable Energy Credits.
26. [Camp Lejeune, NC](#) broke ground in March 2011 on a solar PV project; installing PV on barracks and other buildings is expected to save the base more than \$582,000 annually. The base is already one of the largest residential producers of solar thermal energy, thanks to a 2010 project installing solar water heaters on the roofs of 900 homes.
27. [Fort Irwin, CA](#) is developing a 500 MW concentrated solar power and PV project, with possible expansion [up to 1,000 MW](#).
28. [Fort Drum, NY](#) installed a solar wall which uses the sun's energy to pre-heat ventilation air for industrial buildings, with projected natural gas savings of \$1,000 a month. Fort Drum also [uses geothermal to heat barracks](#) and administrative buildings.

For more information, see the [Army Energy Program](#), [Navy Task Force Energy](#), and [Air Force Facility Energy Center](#).

This fact sheet is available electronically (with hyperlinks) at www.eesi.org/papers.