

Powering Military Bases: DoD's Installation Energy Efforts

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Introduction

The U.S. Department of Defense (DoD) is the largest single consumer of energy in the world.¹

The largest share of DoD's consumption is for operational energy – the energy used to fight, train and transport the force. This is mostly composed of petroleum based liquid fuel.

Often overlooked, however, is that the military is also a large consumer of energy on its bases. Known as “installation energy,” this is the power that DoD uses to heat and cool its buildings, electrify its operations, and to operate fleets of non-tactical vehicles.

The U.S. military's vast energy needs leave it vulnerable to price volatility and supply disruptions. Currently, back-up power is provided on bases primarily by diesel generators, which have their own vulnerabilities.

To mitigate these vulnerabilities, the military is undertaking a variety of initiatives to increase renewable energy generation. The stated objective of building out substantial renewable energy capacity is to increase installation resilience in the face of unknown events. President Obama recently reaffirmed DoD's goal of building 3 gigawatts of renewable energy on military installations by 2025 as part of his administration's Climate Action Plan.²

This fact sheet explores how DoD is working to improve the management and production of installation energy from clean sources. It is not a full catalog of every initiative or installation; instead it outlines the top installation energy priorities for the military and the progress made in achieving those goals.



Why Are Leaders Focused on Installation Energy?

Fixed military installations support the warfighter both at home and abroad. They are critical to mission preparedness, training and housing warfighters in all services of the military. Military bases are the staging ground for emergency response scenarios such as responding to natural disasters or terrorist attacks. They are the operational bases for many critical national security missions.

It is important, therefore, for national security that military bases have assured access to the energy they need to meet their missions. However, military installations are also large consumers of energy. Energy consumed at DoD's installations accounts for almost 1% of total energy consumption in the United States.³

Importantly, the goal of DoD's energy initiatives is not to separate military bases from the national grid; it is to increase the resilience of both. Private sector utilities, public power districts, and local cooperatives remain central to the military's missions. The ability to generate renewable power on base combined with investments in a smarter grid can help the resilience of both the military and the civilian national grid.

Cost

- DoD operates over 500 installations in the U.S. and abroad.⁴
- The DoD operates nearly 300,000 buildings, covering 2.3 billion square feet of space. That is three times larger than Walmart and six times greater than the General Services Administration (GSA).⁵
- The energy costs for installations for FY2011 are estimated at \$4.1 billion, comprising 26% of DoD's overall energy expenditure.⁶

Mission Assurance

- DoD installations rely on the commercial power grid for 99% of their electricity needs.⁷ This is appropriate because the military is not a utility.
- A disruption of electric power to military bases – whether from a natural disaster, a physical or cyber attack, or simply a grid malfunction – would interfere with mission preparedness.
- Currently, in the event of a loss of power, installations are dependent upon backup diesel generators to ensure steady access to electricity.⁸ On average these installations have only 3-7 days of backup fuel, and have not planned for the potential for a long-term loss of power.⁹

How Can the Military Alleviate These Threats?

- DoD plans to scale up renewable energy and energy storage on bases.
- By using distributed generation, bases will be able to “island” – or separate – bases from the commercial power grid in the event of a supply disruption.
- As of now, the “microgrids” that will allow this are not widespread, but they will mark a cornerstone of DoD's efforts at improving energy security for its installations.

- By the end of FY2011, DoD had a total of 44 installations in the U.S. with plans for microgrids, or that have conducted microgrid studies or demonstrations.¹⁰
- These microgrids range from demand response and small solar PV arrays that work in conjunction with the commercial grid, to higher concentrations of solar PV with energy storage that can separate from the commercial grid when necessary.

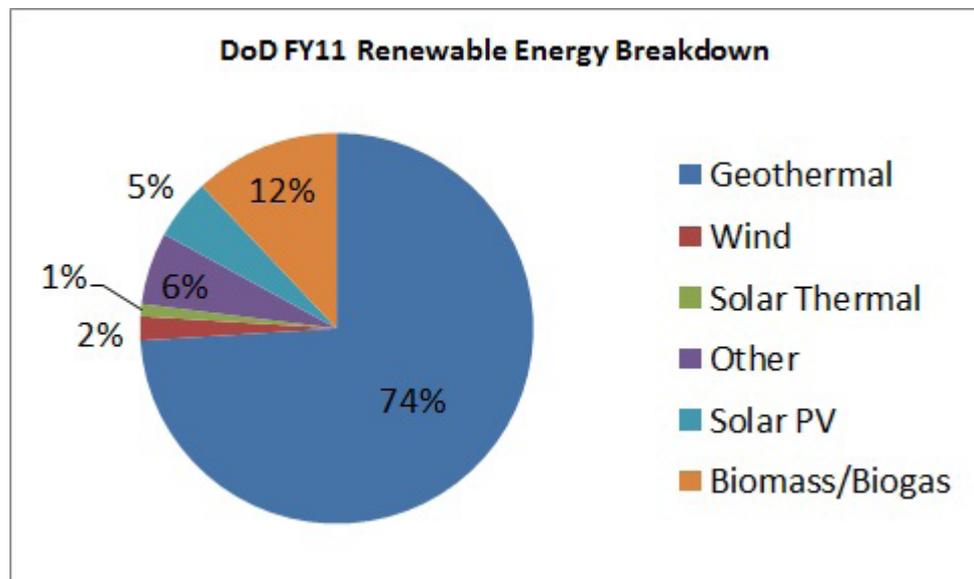
The Role of Microgrids in Improving Energy Security

- Advanced microgrids with renewable energy can enhance energy security and help assure mission effectiveness in the event of power interruptions or demand surges.¹¹
- Today, no bases operate using solely renewable energy. With a microgrid, renewable energy with energy storage can significantly extend islanding time in the event of a power outage.
- If power is cut off to an installation, microgrids can automatically prioritize mission critical activities, and shed less important uses of power.
- Microgrids can also improve the resiliency of the civilian power grid by allowing military bases to automatically shut down non-critical systems during commercial demand spikes. This would allow utilities greater flexibility in managing power loads.

What Has DoD Done So Far?

The Energy Independence and Security Act of 2007 requires the federal government – including DoD facilities – to reduce energy use in its buildings by 30% by FY2015.¹² The John Warner National Defense Authorization Act for Fiscal Year 2007 mandates DoD obtain 25% of its electricity from renewable sources by 2025.¹³ In 2012, the Defense Department made a commitment to install 3 gigawatts of renewable generating capacity, one from each of the Army, Navy, and Air Force Installations by 2025.¹⁴

- As of FY2011, DoD achieved a 13.3% reduction in energy intensity at its facilities from a 2003 baseline.¹⁵
- As of FY2011, DoD produced or procured 8.5% of its total facility electricity consumption from renewable energy.¹⁶
- The Navy’s large 270 megawatt China Lake geothermal facility alone accounts of nearly three quarters of the military’s renewable energy capacity.

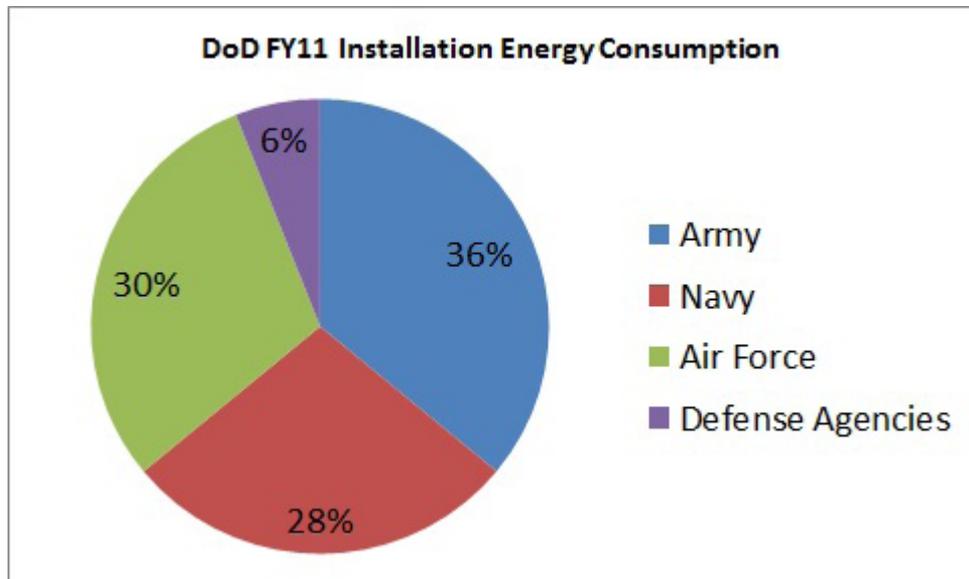


- DoD has planned to install 1.9 gigawatts of renewable energy projects between 2012-2017, 58% of which will come from solar PV.¹⁷

Each of the branches has their own goals and metrics for increasing resilience in their installation energy use.

ARMY

- The Army is the largest installation energy user in the DoD, making up 36% of total facility energy consumption in FY2011.
- By 2020 the Army aims to produce 1 gigawatt of energy from renewable sources, earlier than its 2025 mandate.¹⁸
- Based on the FY2003 baseline, the Army reduced energy intensity 11.8% by FY2011.¹⁹



- The Army’s flagship clean energy program is the “Army Net Zero Initiative.”²⁰
 - Launched in 2010, the Army Net Zero Initiative has the stated goal of – where fiscally responsible – providing greater water and energy security and increasing operational flexibility.
 - The Army defines a “Net Zero Energy Installation” is one that produces as much energy on site as it consumes; uses water so as not to deplete the watershed; and reduces waste to the point of contributing zero waste to landfill.
- Since 2011, there have been 17 pilot projects.
- The Army hopes to establish 25 Net Zero Installations by 2030.²¹
- The Army intends to institutionalize the Net Zero approach by directing all installations to implement Net Zero practices to the maximum extent possible.²²

Fort Bliss

Fort Bliss, located in New Mexico and Texas, is the nation’s largest Army base and will showcase the Army’s Net Zero Initiative.²³ The Army expects Fort Bliss to produce as much energy as it consumes, allowing it to be designated as a “Net Zero Installation” by 2018. The base will host 20 megawatts of solar power; already, the installation of 1 MW of solar energy is underway. Military planners are also considering wind and geothermal power.



The base is hosting the military's first microgrid pilot project that involves renewable energy, energy storage, and computer systems to allow the base to "island" itself from the grid.²⁴ The microgrid system will allow the base to operate independently of the commercial power grid when necessary, and it will save \$10,000-\$20,000 annually by more appropriately matching electricity generation with demand.

AIR FORCE

- The Air Force is the 2nd largest facility energy user in the DoD, comprising 30% of total facility energy consumption in FY2011.²⁵
- From 2003-2011, the Air Force reduced energy intensity by 16.3%.²⁶
- Under statutory requirements, the Air Force has the goal of achieving 25% of its energy from renewable sources by 2025.²⁷ It also plans to deploy 1 gigawatt of renewable energy capacity by 2016, earlier than the Obama Administration commitment.²⁸

The LA Air Force Base

The LA Air Force Base is implementing several efforts in clean energy.

In 2011, Air Force officials established the goal that this would be the first federal facility to replace 100% of its general purpose fleet with Plug-in Electric Vehicles. This base is the Federal government's testing ground for "vehicle to grid" technology. This allows the vehicles on base to act as battery back-up for the installation.

This installation has a total 800 kilowatt solar array which covers 1% of the base's energy use and saves \$100,000 on annual utility costs.²⁹ When the solar array generates electricity not needed by the installation, that energy can be diverted to the batteries of the Plug-in Electric Vehicles. Then, when the installation energy needs exceed the amount of energy generated by the solar array, the installation can pull electricity from the batteries.



NAVY and MARINE CORPS

- The Department of the Navy (including both the Navy and Marine Corps) accounted for 28% of the DoD's facility energy use in FY2011.³⁰
- From 2003-2011, the Department reduced energy intensity by 15.8%.³¹
- The Navy is aiming to hit several aggressive installation energy targets in the coming years:
 - Reduce installation energy intensity by 50% by 2020.³²
 - Achieve "Net Zero" for 50% of its installations.³³
 - Install 1 gigawatt of renewable energy by 2020, earlier than the 2025 mandate.

Naval Air Weapons Station China Lake

The Naval Air Weapons Station at China Lake hosts the Naval Air Warfare Center Weapons Division, where the Navy and Marine Corps develop and test major airborne weapons systems. It is also home to a large 270 megawatt geothermal power plant – DoD’s largest single renewable energy project.

In October 2012, the Navy agreed to a 20-year power purchasing agreement to procure 13.78 megawatts of solar PV, which will power 30% of the bases electricity.³⁴ The project claims that it will save the Navy \$13 million over its lifetime.



Marine Corps Air Station (MCAS) Miramar

Located outside of San Diego, CA, MCAS Miramar was selected to serve as a prototype “Net Zero” installation. In June 2012 a 3.2 megawatt waste-to-energy facility began operations at MCAS Miramar.

The facility converts methane gas from a landfill to electricity, and it provides 50% of the base’s needs.³⁵



Forward Outlook

- The military has ambitious plans to roll out renewable energy, including the President’s plan for 3 gigawatts of renewable power on military installations by 2025.
- DoD relies heavily on the private sector, using power purchase agreements to procure renewable energy.
- Renewable energy can contribute to the military’s mission effectiveness by allowing bases to “island” from the commercial grid in the event of a supply disruption, providing resiliency and redundancy across the grid.
- DoD’s microgrid initiatives can improve the civilian electric grid as well by providing utilities with flexibility.
- DoD will need to scale up microgrids in order to fully take advantage of the potential of renewable energy.

Conclusion

In the last few years the U.S. military has invested significantly in renewable energy and energy efficiency for its bases. While installed renewable capacity remains only a fraction of total energy use, it is displacing fossil fuels for DoD's energy needs.

There are multiple benefits of DoD's renewable energy initiatives. Military installation can lower energy costs by locking in long-term power purchasing agreements. They can also enhance energy security by providing resiliency – renewable energy combined with energy storage can provide bases with backup power in case of a power disruption.

Moreover, DoD's microgrids can be an asset to commercial utilities by allowing them more flexibility. Bases with islanding capability can be separated from the grid when utilities need to manage periods of high demand.

The military's installation energy initiatives are still in their infancy and most bases rely overwhelmingly on the commercial grid with inadequate plans for backup power. DoD's goal of installing 3 gigawatts of renewable power by 2025 is an important first step in improving energy security for U.S. military installations.

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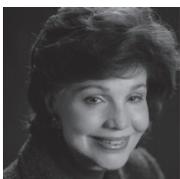
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