

**Power Begins at Home:
DoD's Facilities Energy Strategy**

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Deputy Under Secretary of Defense
(Installations & Environment)

GreenGov Symposium
October 31, 2011



Key Points

Acquisition, Technology and Logistics

- The Department of Defense (DoD) has stepped up the effort needed to reduce its high level of energy consumption
- This effort is driven by mission considerations: energy dependence and climate change are threats to our effectiveness as warfighters ("threat multipliers")
- As a technology leader, DoD is well-positioned to be a "solutions multiplier" in our country's clean energy revolution

Report Documentation Page

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I. Why Facilities Energy Matters

II. Facilities Energy Core Strategy

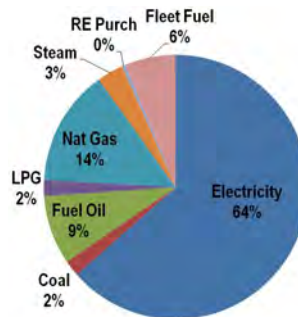
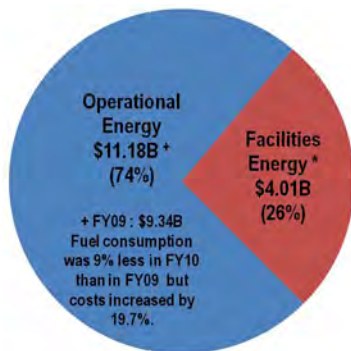
III. Key Role of Technological Innovation

IV. Energy Siting Clearinghouse



DoD Energy Costs, FY2010

DoD Energy Costs
FY10: \$15.2B
FY09: \$13.4B



Facilities Energy

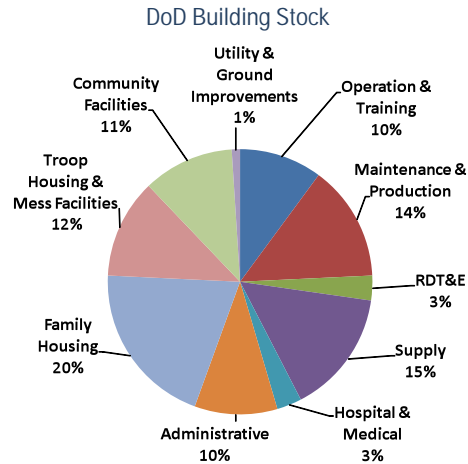
* \$4.01B includes fuel for non-tactical vehicles (\$0.25B)



DoD Built Infrastructure

Acquisition, Technology and Logistics

- 539,000 Facilities (buildings and structures)
 - 307,295 buildings
 - 2.2 billion square feet
- Comparisons
 - GSA: 1,500 government buildings
 - 176 million square feet
 - Wal-Mart US: 4,200 buildings
 - 687 million square feet
- 160,000 Fleet Vehicles



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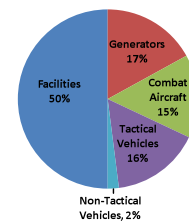


Why Facilities Energy Matters

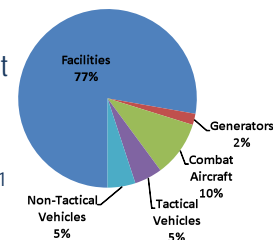
Acquisition, Technology and Logistics

- Significant Cost
 - FY10: \$4.0 billion (26% of total DoD energy costs)
 - Cost likely to increase (reduced presence in Iraq and Afghanistan, improved QoL)
- Environmental Impact
 - Contributes a disproportion share (~ 40%) of GHGs
- Mission Assurance/Energy Security
 - Permanent installations increasingly provide direct support to the warfighter
 - DoD's reliance on a fragile commercial electricity grid places continuity of missions at growing risk¹

Army CO₂ Emissions Today



Army CO₂ Emissions Future?



¹ Defense Science Board, "More Fight - Less Fuel," February 2008

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Key Energy Goals

Acquisition, Technology and Logistics

- Legislation and Executive Orders
 - EPO 2005, EISA 2007, NDAA
 - EO 13423, EO 13514
- Key Targets
 - Facility Energy Efficiency
 - Reduce facilities energy intensity by 30% by 2015 and 37.5% by 2020 (2003 baseline)
 - Renewable Energy
 - Consume 7.5% of electric energy from renewable resources by 2013
 - Produce or procure 25% of facilities energy from renewable sources by 2025
 - Water
 - Reduce potable water intensity by 26% from a 2007 baseline by 2020.
 - Reduce non-potable water consumption by 20% by 2020 from a 2010 baseline



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Acquisition, Technology and Logistics

I. Why Facilities Energy Matters

II. Facilities Energy Core Strategy

III. Key Role of Technological Innovation

IV. Energy Siting Clearinghouse

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Facilities Energy Strategy: Reduce Demand

Acquisition, Technology and Logistics

- **Reduce Demand** – energy efficiency/conservation
 - Use O&M budget (\$8.8B) to retrofit existing buildings
 - Use MilCon budget (\$14.8B) to improve new construction
 - LEED Silver (40% from energy and water)
 - 30% above ASHRAE standards
 - Private financing (ESPCs, UESCs) also key



“Energy efficiency is the fruit laying on the ground.” –Steve Chu



Facilities Energy Strategy: Reduce Demand

Retrofits

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Naval Base Coronado (Daylighting)



NUWCD Newport (Energy Retrofits)



EMCS Upgrades



NSWC Corona (Energy Retrofits)



Dam Neck (Geothermal)



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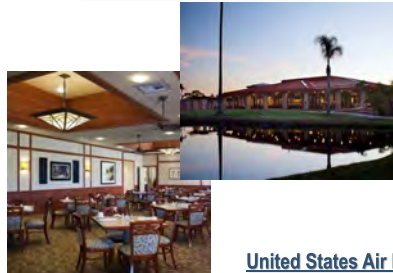


Facilities Energy Strategy: Reduce Demand

New Construction

Acquisition, Technology and Logistics

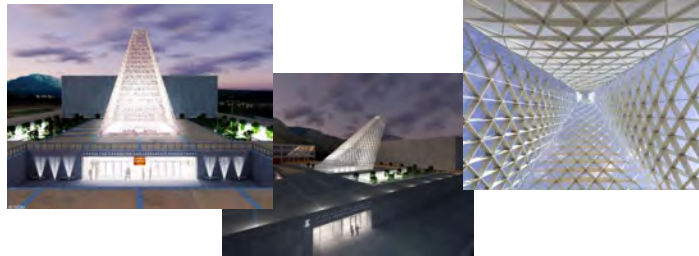
MCAS Miramar (LEED Gold)



Offutt AFB (LEED Gold)



United States Air Force Academy (Future LEED Platinum)



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Facilities Energy Strategy: Reduce Demand

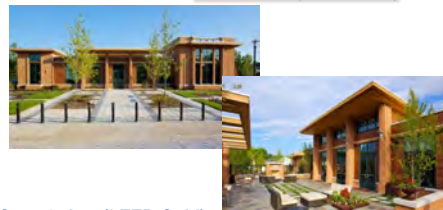
New Construction

Acquisition, Technology and Logistics

Fort Carson (LEED Gold)



Fort Belvoir (LEED Gold)



Naval Station Great Lakes (LEED Gold)



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Facilities Energy Strategy: Reduce Demand

Electric Vehicles

Acquisition, Technology and Logistics



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Better Buildings Challenge



Lend Lease is participating in President Obama's Better Buildings Challenge, an energy-efficiency program that will create jobs, save money, reduce our dependence on foreign oil and make our air cleaner.

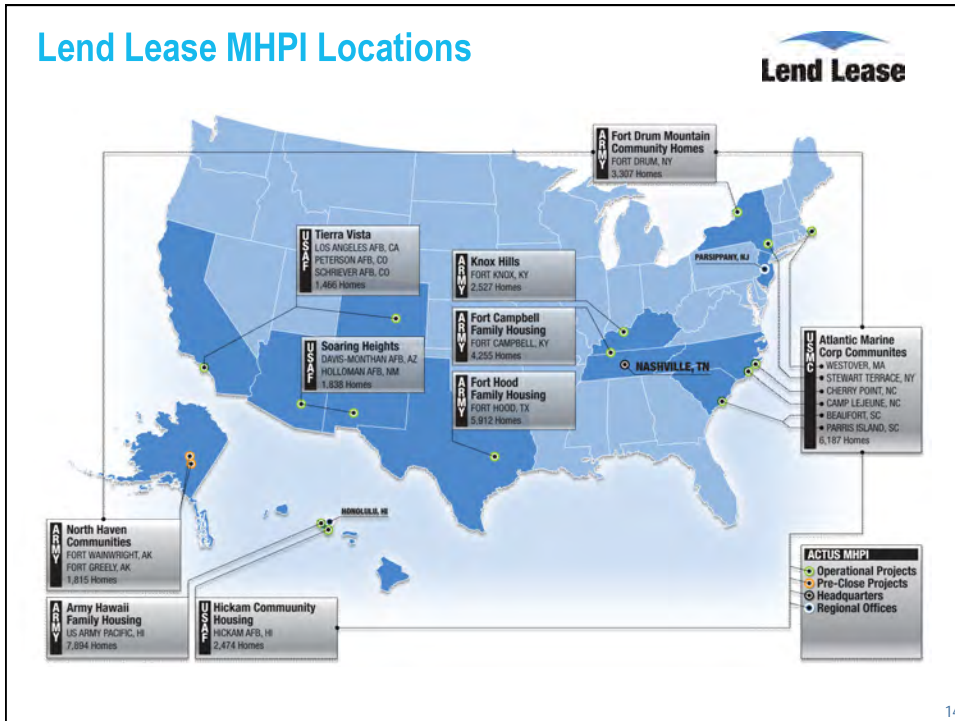
Lend Lease has committed to at least a 20% energy-reduction goal within the next two-to-five years for our Military Housing Privatization Initiative (MHPI) portfolio consisting of approximately 40,000 homes, 800 historic structures, 19 offices, and 19 community centers. This encompasses more than 65.3 million square feet of real estate nationwide.



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Lend Lease MHPI Locations



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Facilities Energy Strategy: Increase Supply

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Increase Supply of RE and Distributed Energy Generation

- Bases well suited to support RE but T&E species a challenge
- Potential for rooftop solar on a large scale
- Private financing essential
 - PPA's can extend 30 yrs
- >443 Projects:
 - Electricity Generation - 287
 - Solar - 279
 - Wind - 25
 - Hydro/Ocean - 1
 - Natural Gas - 6
 - Landfill / Biomass/MSW
 - Thermal Energy - 261

Nellis AFB Solar Array (14 MW)



Fort Huachuca Photovoltaic Roof



Marine Corps Base Hawaii Solar Hot Water Heating



China Lake Geothermal Power Plant (270 MW)



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Facilities Energy Strategy: Increase Supply

Air Force

Acquisition, Technology and Logistics

Nellis AFB



FE Warren AFB



March AFB



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Facilities Energy Strategy: Increase Supply

Navy

Acquisition, Technology and Logistics

China Lake Geothermal



Joint Expeditionary Base Little Creek



Solar PV on Parking (Various)



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Facilities Energy Strategy: Increase Supply

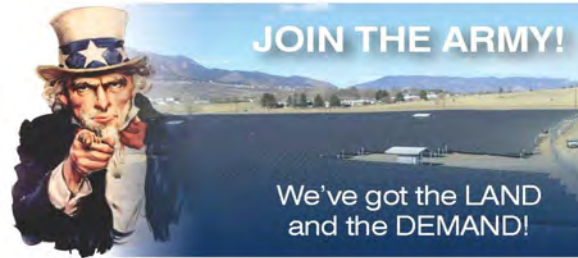
Army

Acquisition, Technology and Logistics

Fort Carson



Tooele Army Depot



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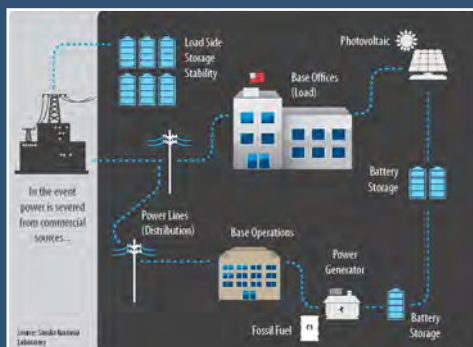


Facilities Energy Strategy: Improve Security

Acquisition, Technology and Logistics

Improve Energy Security—focus on grid

- Micro-grid demonstrations
- Energy storage
- Plug-in electric vehicles
- Net Zero Energy Installation initiatives



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Facilities Energy Strategy: Improve Energy Security

Acquisition, Technology and Logistics

Microgrid (conceptual)

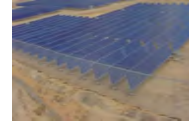


Renewable/On-site Integration

PV shading



PV farm



Cogeneration Plant



US Electric Grid

Interconnected grid



High voltage transformers



Management, Storage, & Integration

Substation



Facilities Energy Strategy: Improve Energy Security

Acquisition, Technology and Logistics

WANTED!

DEAD OR ALIVE



WATER-WASTER

HAVE YOU SEEN THIS ITEM? REPORT IT TO:
CE CUSTOMER SERVICE - 228-3171

WANTED!

DEAD OR ALIVE



ENERGY-WASTER

HAVE YOU SEEN THIS ITEM? REPORT IT TO:
THE DM ENERGY TEAM
DMENERGY@DM.AF.MIL



I. Why Facilities Energy Matters

II. Facilities Energy Core Strategy

III. Key Role of Technological Innovation

IV. Energy Siting Clearinghouse



Installations: Test Bed for Energy Technology

- Emerging technologies hold the promise of dramatic improvements in building energy performance but face major impediments to commercialization and deployment
 - Building industry is highly fragmented
 - First user bears significant costs
 - A&E firms face liabilities but do not share in savings
 - Lack of operational testing deters potential adopters
- DoD is uniquely positioned to help overcome these barriers
 - It is in DoD's self interest given the size of our inventory (Wal-Mart has its own energy test bed but it is limited to big-box stores)
 - DoD's built infrastructure is unique for its size and variety— it captures the diversity of building types and climates in U.S.
 - Military has 150 years of experience as a sophisticated first user of new technology and an early, market-creating customer (jet engines, aircraft, integrated circuits, GPS, internet)



ESTCP Installation Energy Test Bed

Acquisition, Technology and Logistics

- Use DoD Facilities As Distributed Test Bed For Innovative Energy Technologies
 - Validate performance, cost and environmental impacts
 - Transfer lessons learned and design/procurement information across all Services and installations
 - Directly reach out to private sector for innovations
 - Leverage DOE investments
- Test & Evaluate for all DoD Facilities Technologies for:
 - Energy Conservation & Efficiency
 - Renewable and Distributed Energy Generation
 - Control & Management of Energy Resources & Loads
- Reduce Energy Costs - Improve Security

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Installation Energy Test Bed: Roadmap

Acquisition, Technology and Logistics



- Smart Secure Installation
Energy Management
- Micro-grids
 - Energy Storage
 - Ancillary Service Markets



- Efficient Integrated Buildings
- Design, Retrofit, Operate
 - Enterprise Optimized Investment
 - Advanced Components
 - Intelligent Building Management



- On-Site Generation
- Cost Effective Renewables
 - Waste to Energy
 - Building Integrated Opportunities

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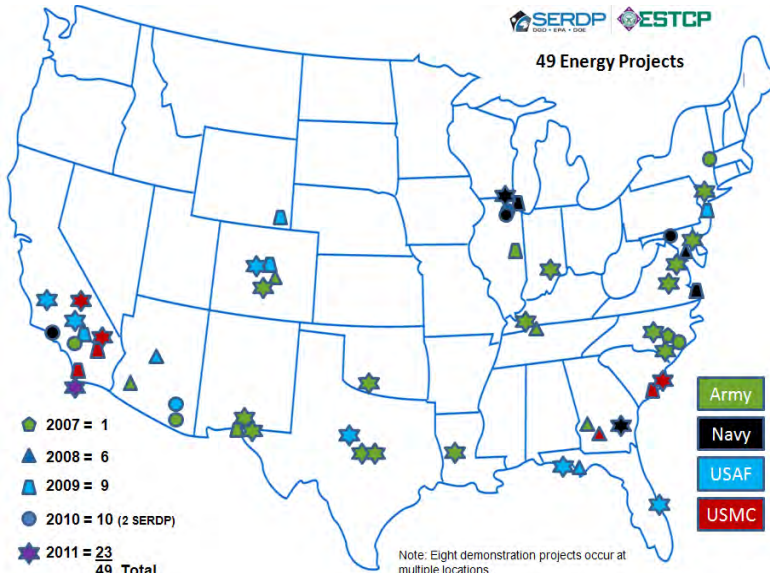


Installation Energy Test Bed: Project Locations

Acquisition, Technology and Logistics



49 Energy Projects



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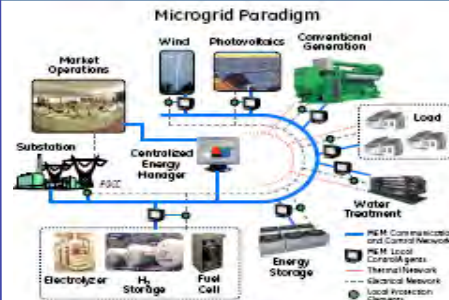


Smart Microgrids

Acquisition, Technology and Logistics

DESCRIPTION

- Enhance and demonstrate an advanced microgrid technology for DoD installations
 - Secure microgrid design
 - Optimal dispatch
 - Load shedding
 - Intentional islanding
 - Energy management
- 29 Palms, Ft. Bliss and McGuire AFB



BENEFITS/METRICS

- Allow secure islanding of DoD installation and reduce costs of electricity
- Increase use of renewables, increase energy efficiency and improve power quality
- Reduce energy security costs

PERFORMERS

- GE Global Research
- Lockheed Martin
- UTRC
- FY 2012 BAA
 - TBD

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Continuous Building Commissioning

Acquisition, Technology and Logistics

DESCRIPTION

Objectives are to demonstrate whole-building modeling and monitoring systems capable of:

- 1) identifying, classifying, and quantifying energy and water consumption deviations from design intent or optimal,
- 2) identifying the causes of those deviations, and
- 3) recommending, prioritizing, and implementing corrective actions

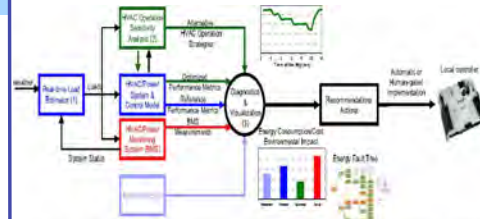


Figure 1. Block diagram of the proposed Advanced Building Energy Management Systems

BENEFITS/METRICS

- Demonstrations will document energy savings, costs, reliability and applicability to DoD buildings.
- Successful implementation of this technology will enable reduced energy consumption, peak electric demand, and water use in DoD buildings by providing actionable information to facility managers and building operators.

PERFORMERS

- United Technologies Research Center
 - Lawrence Berkeley National Laboratory
 - University of California, Berkeley
- Multiple Projects
 - Model based performance of single buildings
 - Scalability through reduced order models
 - Campus scale

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Advanced Lighting Controls

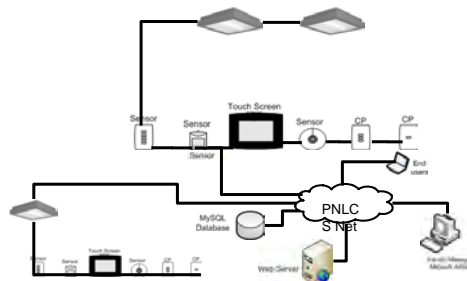
Acquisition, Technology and Logistics

DESCRIPTION

Quantify energy, environmental and economic benefits of three lighting control strategies:

- 1) OccuSwitch Wireless: room-based control
- 2) Wired PNLCS: distributed control
- 3) Hybrid ILDC: wireless area based control

Three Buildings at Ft. Irwin



BENEFITS/METRICS

- Lighting represents a major energy use at DoD Facilities.
- Greater than 45% reduction in energy use intensity compared to baseline code
- Greater than 25% reduction in peak lighting power density

PERFORMERS

- Philips Research North America
- Lawrence Berkeley National Laboratory

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Low-BTU Landfill Gas Capable Microturbine

Acquisition, Technology and Logistics

DESCRIPTION

- Establish economics, reliability, and applicability of the technology to a variety of DoD installations.
- Demonstrate the ability of a unique micro-turbine to generate electrical power from Landfill Gases.
- Demonstration at Ft. Benning



BENEFITS/METRICS

- Landfill gas energy capture technology will reduce the cost of DoD facility energy
- High number of landfills on DoD installations, implementation of these technologies can yield enormous cost savings and energy security.

PERFORMERS

- Southern Research Institute
 - Greenhouse Gas Institute
- FlexEnergy
- SCS Engineers
- Integrity Air Monitoring

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Grid Parity Solar Power

Acquisition, Technology and Logistics

DESCRIPTION

- Design and build a Nanosolar power plant for \$3.20/watt DC fully-installed
- Validate performance and levelized cost of energy
- Create a set of standard free field solar power plant designs
- Demonstrations at Camp Roberts



BENEFITS/METRICS

- Cost-effective solar power that can provide the energy security, reliability and independence required for US military installations
- Standardized, modular system design can be repeated at multiple sites

PERFORMERS


- Nanosolar
- Belectric

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BIPV Roofs

Acquisition, Technology and Logistics

DESCRIPTION	
<ul style="list-style-type: none">• Validate whether BIPV roofs can endure weather conditions as well as conventional roofs<ul style="list-style-type: none">– Luke AFB, MCAS Yuma, NAS Pax River• Verify whether a roof integrated solar photovoltaic system can perform as a cost effective energy efficient roof• Promote adoption of BIPV roof technology within DoD through the Unified Facilities Guide Specification (UFGS)	
BENEFITS/METRICS	PERFORMERS
<ul style="list-style-type: none">• Demonstrations will document energy savings, costs, reliability and applicability to DoD roofs• Effectively low cost per Watt installed	<ul style="list-style-type: none">• NAVFAC ESC• Lawrence Berkeley National Laboratory• ERDC- CERL• SEI Group, Inc

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FY 2012 Solicitation

Acquisition, Technology and Logistics

ESTCP Solicitation

1. Smart Micro-grids and Energy Storage to Increase Energy Security on DoD Installations
 2. Renewable Energy Generation on DoD Installations
 3. Advanced Component Technologies to Improve Building Energy Efficiency
 4. Advanced Building Energy Management and Control
 5. Tools and Processes for Design, Assessment and Decision-making Associated with Energy Use and Management
- Strong industry response; selected projects to be announced in November

573 pre-proposals – over \$1B in opportunities

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Renewable Energy Siting Challenges

- Turbines and solar towers can interfere with military radar and flights
- Problem arises in 3 contexts
 - Surveillance
 - Weapon system testing
 - Operations & training
- In the past, DoD weighed in late in process because of nature of the FAA review

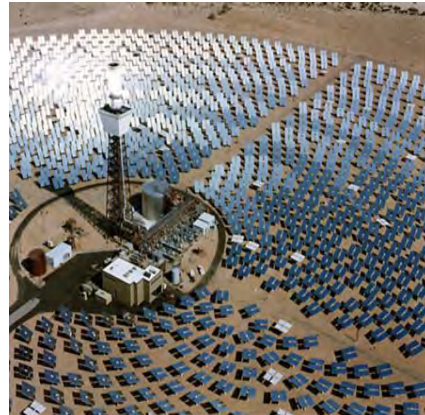




Renewable Energy Siting – Way Forward

Acquisition, Technology and Logistics

- Energy Siting Clearinghouse
- R&D to better model impact and mitigate potential adverse effects
- Accelerate upgrades to and replacement of surveillance radars



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DoD Siting Clearinghouse

Acquisition, Technology and Logistics

- A Single DoD Voice
 - Timely, repeatable and predictable process that promotes energy independence while protecting military capabilities
 - In June, Clearinghouse cleared 229 of 249 back-logged projects; 10 MW of wind alone
 - Most projects will now get reviewed and cleared in 30-45 days
 - Only projects with significant impacts or that need multi-Service coordination will receive full Clearinghouse attention



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Back Up

Acquisition, Technology and Logistics