

**A Systems Approach to DOD
Facility Energy**

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(Installations & Environment)*

**Defense, National Security and Climate Change:
Building Resilience and Identifying Opportunities
Related to Water, Energy and Extreme Events**
June 2012



Key Points

Acquisition, Technology and Logistics

- DoD's effort to reduce its high level of facility energy consumption is driven by mission considerations— cost and energy security.
- Renewable energy— combined with advanced microgrid and storage technologies— can significantly improve the energy security of our military installations.
- As a technology leader, DoD can play an important role in our country's clean energy revolution by pursuing its own strategic goals and self-interest.



Why Facility Energy Matters

Acquisition, Technology and Logistics

- **Significant Cost**
 - FY11: \$4.1B (21% of total DoD energy costs)
 - Cost likely to increase as troops return
 - 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 risk ¹



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



Facility Energy Strategy

Acquisition, Technology and Logistics

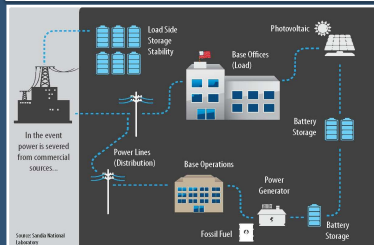
Reduce Demand



Expand Supply



Enhance Security



Leverage Advanced Technology

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



Facility Energy Strategy: Reduce Demand

Acquisition, Technology and Logistics

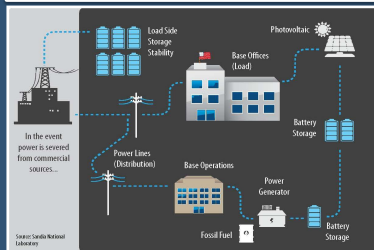
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Facility Energy Strategy: Reduce Demand

Acquisition, Technology and Logistics

- **New Construction**
 - LEED Silver (or equivalent), ASHRAE +30%, etc.
 - New Unified Facilities Criteria due in late '12– will draw on ASHRAE 189.1
- **Retrofits**
 - \$1.1B in FY13 budget
 - Commitment to execute \$1.2B in performance-based contracts in FY12-13
- **Information Management**
 - Updated metering policy (Spring '12)
 - Enterprise Energy Information Management system (Spring '12)



NSWC Corona (energy retrofits)



Reno ANGB (shading in building design)



U.S. Air Force Academy (future LEED Silver)



Facility Energy Strategy: Expand On-Site Generation

Acquisition, Technology and Logistics

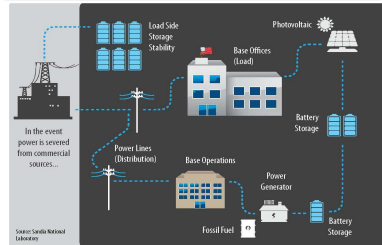
Reduce Demand



Expand On-Site Generation



Enhance Security



Leverage Advanced Technology

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Facility Energy Strategy: Expand On-Site Generation

ICF Solar Study

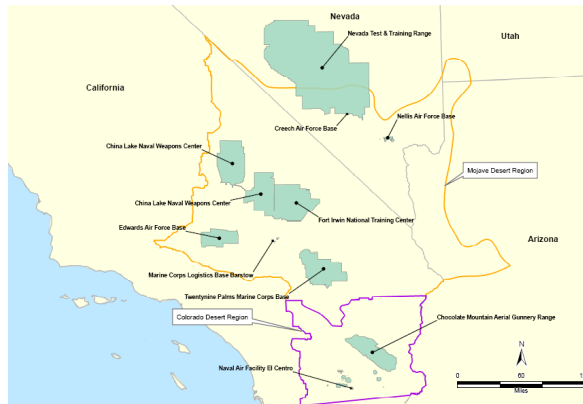
Acquisition, Technology and Logistics

Army: 1
Fort Irwin

Navy: 2
NAWS China Lake
NAF El Centro

Air Force: 3
Edwards AFB
Nellis AFB (including NTTR)
Creech AFB

Marine Corps: 3
MCAGCC Twentynine Palms
MCLB Barstow
Chocolate Mountain Aerial Gunnery Range



Study restricted to land inside installation boundaries including Withdrawn Lands.



Facility Energy Strategy: Expand On-Site Generation

ICF Solar Study

Acquisition, Technology and Logistics

Key Findings:

- 96% of the surface area of the CA installations is technically infeasible due to conflicts (mission, slope, flood hazard, biological & cultural resources)
- 7,000 megawatts (MW) of solar energy development is nevertheless technically feasible and financially viable
- Private developers can tap the solar potential with no capital investment requirement from DoD
- Federal government could potentially receive approximately \$100 million/year in rental payments/reduced cost power
- Technical, policy and programmatic barriers exist (transmission, withdrawn land management)



Facility Energy Strategy: Improve Energy Security

Acquisition, Technology and Logistics

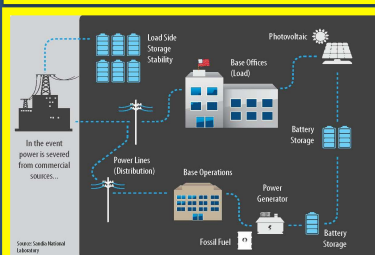
Reduce Demand



Expand On-Site Generation



Improve Energy Security



Leverage Advanced Technology

Installation Energy Test Bed: Roadmap

Smart Secure Installation Energy Management

- Micro grids
- Energy Storage
- Ancillary Service Markets

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On-Site Generation

- Cost Effective Beneficiaries
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Facility Energy Strategy: Improve Energy Security DoD and Microgrids

Acquisition, Technology and Logistics

Microgrids are a triple play for DoD:

- Reduce energy costs by allowing for load balancing and demand response
- Facilitate the incorporation of renewable and other on-site energy
- Allow an installation to maintain mission-critical loads if the grid goes down

Microgrid (conceptual)



US Electric Grid

Interconnected grid



High voltage transformers



Facility Energy Strategy: Leverage Advanced Technology

Acquisition, Technology and Logistics

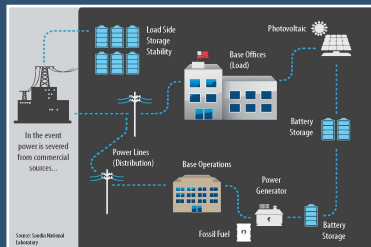
Reduce Demand



Expand On-Site Generation



Improve Energy Security



Leverage Advanced Technology

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Facility Energy Strategy: Leverage Advanced Technology

Acquisition, Technology and Logistics

- Use bases as distributed test bed to demonstrate promising pre-commercial technologies
- Led by Environmental Security Technology Certification Program (ESTCP) and modeled after DoD's highly successful program for "dem-val" of environmental technology
- Variation on traditional DoD innovation model (e.g., DARPA)



Science and
Technology



Demonstration/Validation



Installations: Test Bed for Pre-Commercial Energy Technology

Acquisition, Technology and Logistics

- Emerging technologies hold the promise of dramatic improvements in facility 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 Roadmap

Acquisition, Technology and Logistics



**Smart Secure Installation
Energy Management**

- Microgrids
- Energy Storage
- Ancillary Service Markets



Efficient Integrated Buildings

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On-Site Generation

- Cost Effective Renewables
- Waste to Energy

Building Integrated Opportunities



Conclusion

Acquisition, Technology and Logistics

- DoD is pursuing a multi-pronged facility energy strategy both to reduce energy costs and to improve the energy security of our installations.
- Renewable and on-site generation, if connected to advanced microgrid and storage technology, can contribute to energy security in particular.
- The Services have ambitious renewable energy efforts underway. Although we have “the land and the demand,” we are not (yet) agile.
- With their 300k buildings and thousands of acres of solar-compatible land, military installations can be a significant platform for innovation through the demonstration and validation of new technologies.
- DoD and DoE are natural partners in the mission of applying technology to improve energy security.