DoD Installations, Energy and the Environment: An Update

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Installations & Environment

E²S² Symposium
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I. Why Facilities Energy Matters

II. Facilities Energy Core Strategy

III. Key Role of Technological Innovation

IV. Other I&E Priorities
DoD Energy Costs, FY2010

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

Operational
Jet Fuel 81%
Navy Special 12%
Auto Gasoline 4%
Other 1%
Diesel-Distillate 2%
Aviation Gasoline 0%

Installations
Electricity 64%
Fuel Oil 9%
LPG 2%
Coal 2%
NATGAS 14%
Steam 3%
RE PURCH 0%
FLEET FUEL 6%

Operational Energy
$11.18B +
(74%)
FY09: $9.34B
Fuel consumption was 9% less in FY10 than in FY09 but costs increased by 19.7%.

Facilities Energy*
$4.01B
(26%)

* $4.01B in facilities energy costs include non-tactical vehicle fuel
$3.76B – facilities energy
$0.25B – non-tactical vehicle fuel

* $4.01B includes non-tactical vehicle fuel
DoD Built Infrastructure

- **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**
Why Facilities Energy Matters

- **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 disproportional share (~40%) of GHGs
- **Mission Assurance/Energy Security**
  - DoD’s reliance on a fragile commercial electricity grid places continuity of critical missions at serious and growing risk

Key Energy Goals

Legislation and Executive Orders
- EPAct 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
DoD Progress Towards EISA2007 Sec. 431
Facilities Energy Intensity Reduction Goal

Acquisition, Technology and Logistics

DoD Progress Towards EISA2007 Sec. 431
Facilities Energy Intensity Reduction Goal

Reduce facilities energy intensity by 30% by 2015 and 37.5% by 2020 (2003 baseline).
**DoD Progress Towards EPAct 2005 Sec 203**

**Renewable Energy Goal**

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*Consume 7.5% of electric energy from renewable resources by 2013.*
Produce or procure 25% of electricity consumed from renewable sources by 2025.
Reduce potable water intensity by 26% from a 2007 baseline by 2020.
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Facilities Energy Core Strategy

• **Reduce Demand** – energy efficiency/conservation
  – Use SRM budget ($8.8B) to retrofit existing buildings
  – Use MilCon budget ($14.8B) to improve new construction
    • LEED Silver (40% of points from energy and water)
    • 30% above ASHRAE standards
  – Private financing (ESPCs) also key

• **Increase Supply** of renewable/alternative energy
  – Large military installations well suited to support solar, wind and geothermal, but T&E species a challenge
  – Potential for rooftop renewable on large scale
  – Private financing essential

• **Improve Energy Security** – focus on grid disruption
  – Risk mitigation plans
  – Micro-grid demonstrations
  – Net Zero Energy Installation initiatives
Facilities Energy Program Review

• Facilities energy budget not well defined
  – MilCon and FSRM represent the majority of expenditures that reduce facility energy consumption, but energy specific investments not separated.
  – ECIP: Only dedicated funding line for energy investments, <10% of total investments required to meet mandates.

• FY12 POM Review
  – Attempted to identify non-ECIP energy investments funded by MilCon and FSRM
  – Determined need for a facilities energy budget exhibit to identify requirements and program shortfalls to meet energy targets

• I&E working Comptroller and CAPE to develop budget exhibit
  – Add to Financial Management Regulation requirement for Services to submit facilities energy budget exhibit with Pres Bud
  – Budget exhibit will identify requirements to meet energy mandates and how much Services are programming across the FYDP
Energy Conservation Investment Program

- Small but key component of the Department’s strategy. ECIP projects historically obtained better than two dollars in life-cycle savings for every dollar invested.
- Funding: FY09--$210M, FY10--$174M, FY11--$120M (?), FY12--$135M request
- Project selection: Beginning in FY12, ECIP will move away from routine energy efficiency and renewable projects, which can be accomplished with O&M funds, to projects that will produce “game changing” energy efficiency improvements:
  - Integrate distributed generation & storage to improve supply resiliency for critical loads
  - Implement energy security plans, especially at those installations where such investments leverage partnerships with the Department of Energy
  - Dramatically change the energy consumption at individual installations (e.g. power and steam plant level investment)
  - Integrate multiple energy savings, monitoring, and renewable energy technologies to demonstrate synergistic benefits
  - Implement technologies validated in DoD’s Installation Energy Test Bed Initiative or other DoD/DoE sponsored demonstration programs
• DoD Enterprise Energy Information Management System
  – New OSD initiative to provide an enterprise-wide capability to effectively monitor, measure, manage and maintain energy systems at optimal performance level
  – Will enable more informed facilities energy investment and management decisions
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Technology Development Process

Science and Technology

SERDP

- Service Requirements
- Basic/Applied Research
- Advanced Development

Advanced Development

DUSD(I&E)

ASD(R&E)

DUSD(I&E)

Demonstration/Validation

ESTCP

- Demonstration/Validation
- Implementation

A Requirements Driven Integrated Program
Emerging technologies hold the promise of dramatic improvements in building energy performance but face major impediments to commercialization and deployment

- A&E firms face liabilities but do not share in savings
- Disincentives for ESCOs
- No incentive for first use
- Highly cost-sensitive market
- Lack of operational testing deters potential adopters

DoD's Test Bed Initiative is designed to overcome these barriers

DoD is uniquely positioned to play this role

- 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)
Installation Energy Solicitation Released on February 1, 2011

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
Installation Energy Test Bed Project Locations

49 Energy Projects

Note: Eight demonstration projects occur at multiple locations.
# BIPV Roofs

## Description

- Validate whether BIPV roofs can endure weather conditions as well as conventional roofs
  - Luke AFB, MCAS Yuma, NAS Patuxent
- 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

- Demonstrations will document energy savings, costs, reliability and applicability to DoD roofs
- Effectively low cost per Watt installed

## Performers

- NAVFAC ESC
- Lawrence Berkeley National Laboratory
- ERDC- CERL
- SEI Group, Inc
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

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
# Smart Microgrids

**Acquisition, Technology and Logistics**

## Description

- Enhance and demonstrate an advanced microgrid technology for DoD installations
  - Microgrid design
  - Optimal dispatch
  - Load shedding
  - Intentional islanding
  - Energy management
- Demonstrations at 29 Palms and Ft. Bliss

## Benefits/Metrics

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

## Performers

- GE Global Research
  - 29 Palms
- Lockheed Martin
  - Ft. Bliss
- FY 2012 BAA
  - TBD
The Purpose:

- Identify a framework for cooperation and partnership between the Department of Energy (DOE) and the Department of Defense (DOD)
- Strengthen coordination of efforts to enhance national energy security, and demonstrate Federal Government leadership in transitioning America to a low carbon economy
Executive Committee Co-Chairs

- Patricia Hoffman, Office of Electricity Delivery and Energy Reliability, DOE
- Sharon Burke, Assistant Secretary, Operational Energy, DOD
- Dorothy Robyn, Deputy Under Secretary, Installations and Environment

DOE

- Electricity Delivery and Energy Reliability (OE)
- Office of the Deputy Secretary
- Energy Efficiency and Renewable Energy (EERE)
- Advanced Research Project Agency-Energy (ARPA-E)
- Nuclear Energy (NE)
- Fossil Energy (FE)
- Office of Science (SC)

DOD

- Operational Energy Plans and Programs
- Installations and Environment (I&E)
- Army
- Navy
- Air Force
- Research and Engineering (DDR&E)
- Joint Staff (J4)
Advisory Group Priority Areas

- **Mobility and Strike Capability**
  - Vehicles
  - Biofuels
  - Storage

- **Energy Reliability and Efficiency on DOD Bases**
  - Smart grids/Microgrids/Power Management
  - Storage
  - Soldier Systems
  - Small Modular Reactors
  - Siting Renewables
  - Building Efficiency
  - Energy Parks/Asset Revitalization

- **Institutional Cooperation**
  - COCOM Energy Advisors
  - Professional Military Education
  - DOE-DOD MOU Catalog
**Voltage Ride-through**
Stability During Pulsed Power Requirements for Radar, etc.

**Continuity of Operations**
Short-term and Long-Term Blackout Contingency Capacity

**Black-Start Capability**
Post-Blackout Restart Capability

**Energy Savings**
Reduced Fuel Costs, Reduced Demand Charges/Energy Charges

**Goal:** Develop Profile of Capacity / Duration / Reliability and Cost for Energy Storage at DoD CONUS facilities

**Target:** Approximately Five DoD Relevant Uses of Energy Storage

**Outcome:** Address ‘Serial #1’ Problem for Adoption of New Storage Technologies on Grid

**Team:** Leverage EPRI’s expertise of grid storage applications, ARPA-E’s technology knowledge, and ESTCP’s understanding of facilities
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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

- DoD weighs in late in process because of nature of the FAA review process
Shepherd’s Flat – We Were Unprepared

Acquisition, Technology and Logistics
Renewable Energy Siting – Way Forward

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

- Timely, repeatable, and predictable process that promotes compatibility between energy independence and military capabilities: two key facets of national security
- Most projects will be reviewed and cleared by Services in 30 – 45 days
- Only projects with significant impacts or that need multi-Service coordination will receive full Clearinghouse attention
• Less than 4% of excavations are UXO
  – Usually <1%
  – Ex. Camp Butner
    • 7 items out of >100,000 digs
• Most items are harmless scrap
• Excavation of suspected UXO drives cost and time
SERDP/ ESTCP have been investing in this area for 10 years. The result is technology that can distinguish UXO from clutter with high degree of reliability.

Advanced Sensor at former Camp Butner, NC

- Near-Perfect Results are Achievable on a Real UXO Site
  - 100% of munitions correctly called UXO
  - Over 2000 correctly called clutter out of about 2100 total
  - Eliminate ~95% of clutter with no missed UXO

![Graph showing discrimination results](image)
ESTCP Live Site Demonstration Program

• Demonstrations on real munitions response sites completed at:
  – Camp Sibert, AL
  – Camp San Luis Obispo, CA
  – Camp Butner, NC

• Demonstrations are ongoing at:
  – Mare Island Naval Shipyards, CA
  – Pole Mountain, WY
  – Camp Beale, CA

• Five additional demonstrations are planned