DoD Installations, Energy and the Environment: The Challenge—and Opportunity

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**Report Documentation Page**

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Executive Order 13514
“Federal Leadership in Environmental, Energy and Economic Performance”

- Gives federal agencies 90 days to set 2020 greenhouse gas (GHG) reduction goal
- Sets targets for sustainable buildings water efficiency, waste reduction
- Expands green procurement ($500B/year in purchasing power)
Key Points

• Meeting the sustainability challenge is in DoD’s self interest.

• This is especially the case with respect to energy and climate change, which can act as a “threat multiplier.”

• With sufficient investment, innovation, and attention to economic incentives, DoD is well positioned to be a “solutions multiplier.”
Proactive Approach vs Environmental Risk

*Proactive vs Reactive*

- Early Emerging Contaminant Actions
- Readiness Impacts
- Cleanup Costs
- Compliance Costs
- Health Claims
- Platform/Facilities Life Cycle Costs

Small investment here

Large impact here
• Climate change and energy will play a significant role in shaping the future security environment.

• Climate change may act as an accelerant of instability and conflict.

• Energy efficiency can serve as a “force multiplier.”
DoD Built Infrastructure

- 539,000 Facilities (buildings, structures, linear structures)
  - 307,295 buildings
    - 2.2 B sq ft
- Comparisons
  - GSA: 1,513 government buildings
    - 176 M sq ft
  - Wal-Mart US: 4,200 buildings
    - 687 M sq ft
- 160,000 Fleet Vehicles
DoD Energy Use

- $13.4B direct costs in 2009
  - $9.8B fuel
    - Current optempo high
  - $3.8B facilities
    - 64% electricity purchases

- 2008 Cost: $20B

- Energy GHG Emission
  - 73.5 million MT CO$_2$eq in 2008
    - 1.3% of US emissions
    - Would be in top 40 countries
Army Energy GHG Emissions

Future footprint? (CO$_{2e}$)

- Facilities (77%)
- Generators (2%)
- Combat Aircraft (10%)
- Tactical Vehicles (5%)
- Non-tactical Vehicles (5%)

Current Optempo (CO$_{2e}$)

- Facilities (50%)
- Generators (17%)
- Combat Aircraft (15%)
- Tactical Vehicles (16%)
- Non-tactical Vehicles (2%)
Energy Security

• Defense Science Board Report, Feb 2008
  – DoD’s reliance on a fragile commercial electricity grid places continuity of critical missions at serious and growing risk.
  – Most installations lack the ability to manage their demand for and supply of electrical power and there thus vulnerable to power disruption due to natural disasters, cyberattacks, and overload of the grid.

• Changing role of military installations—which now provide more “reachback” support for combat operations—accentuates this concern
DoD Facility Energy Strategy

• Reduce impediments, such as flawed economic incentives

• Increase investment in the 3 “I’s”:
  – Infrastructure
  – Innovation
  – Information
Impediments to Doing More, Better

- Flawed economic incentives impede investment in energy efficiency
  - “Split incentives” (capital investment vs O&M)
  - Inability to keep savings from reduced energy consumption

- Lack of information
  - DoD lacks an enterprise-wide energy information management system

- Efforts to exploit and leverage DOE investments are limited and uncoordinated

- Little DoD R&D on installation energy
Investment in Infrastructure

- Reduce demand—energy efficiency and conservation
  - One-sixth of SRM dollars ($1.7B/yr) going to energy efficiency retrofits
  - Leveraging Milcon budget ($20B+)
    - LEED Silver
    - 30% above ASHRAE standards
  - Energy Conservation Investment Program (ECIP)
    - FY10: $174M, FY11: $120M
- Increase supply of renewable energy sources
- Private financing is key
  - ESPCs/ESCOs
  - EULs and PPAs
Reducing Demand: Energy Efficiency

• “Energy efficiency is not just the low hanging fruit; it’s the fruit laying on the ground” – Steve Chu

• Retrofit: high efficiency HVAC, energy mgt control systems, improved lighting, water-reducing devices

Compact Fluorescents at Pearl Harbor Bachelors Enlisted Quarters
Daylighting: Ramstein Air Base, Germany
Investment in Innovation: Testbed Initiative

- **DoD facilities can serve as testbed for new energy technologies**
  - DoD’s built infrastructure is unique for its size and variety, which captures the diversity of building types and climates in U.S.
  - Facilities can serve two key roles in which military has excelled

- **Sophisticated first user**
  - Validate performance, cost, and environmental impacts
  - Directly reach out to private sector for innovations
  - Leverage Department of Energy investments

- **Early customer**
  - Transfer lessons learned, design and procurement information across all Services and installations
  - Help create a market, as with aircraft, electronics and the internet

- **ESTCP is doing this on a small scale**
**Smart Micro-Grid**

**DESCRIPTION**

- Enhance and demonstrate an advanced micro grid technology for DoD installations
  - Optimal dispatch
  - Load shedding
  - Intentional islanding
  - Energy management
- Demonstrate cost and performance at 29 Palms

**BENEFITS/METRICS**

- Allow secure islanding of DoD installation and reduce costs of electricity
- Increase use renewables, energy efficiency and reduce carbon footprint

**FUNDING**

- $2M
- Awarded through competitive solicitation
- GE Global Research
  - leverages DOE and GE investments
Continuous Building Commissioning

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
- Naval Base Ventura County, McGuire AFB, & CERL

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.

FUNDING

- $3.2M
  - Awarded through competitive solicitation
  - United Technologies Research Center
  - Lawrence Berkeley National Laboratory
  - University of California, Berkeley
  - Oak Ridge National Laboratory
**Systems Approach to High Performance Buildings**

**DESCRIPTION**
- Develop and evaluate advanced scalable methodologies and tools for design and analysis of low energy systems for DoD building retrofits
  - Failure Mode Effects Analysis
  - Whole Building Computational Modeling
  - System Decomposition and Analysis Tools
  - Critical Parameter Management tools

**BENEFITS/METRICS**
- Efficiency gain of 50% in existing buildings
  - Reduce energy costs
  - Reduced carbon footprint
  - Supports net zero energy installation

**FUNDING**
- $3.3M
  - Awarded through competitive solicitation
  - United Technologies Research Center
  - Virginia Tech
  - AimDyn
  - Building Intelligence Group
  - Robust systems and Strategy
Innovation Needed: Wind Farms/Radar

- Wind turbines can cause interference with radar
  - Implications for LRRs and military test/training ranges

- DoD relies on the FAA’s obstacle evaluation process to review proposed projects
  - Almost all proposed turbines approved so far
  - But potential for interference is growing

- DoD must not slow the growth of this new industry
  - Improvements to FAA review process can help
  - But, ultimately, answer is better mitigation technology
Current Statutory & Regulatory Targets

- By 2015, reduce facility energy demand 30% (2003 baseline)
- By 2015, reduce petroleum use in non-tactical vehicles by 20% (2005 b/l)
- By 2020, reduce water use 26% (2008 b/l)
- By 2025, increase supply of renewable energy 25% (2005 b/l)
- By 2020, reduce GHG emissions by 34% (2008 b/l)

Wave power buoy testing at MCB Kaneohe Bay
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Vision: Maintain our ability to operate into the future without decline - either in the mission or in the natural and manufactured systems that support DoD’s mission.

Built on 4 Key Mission Oriented Themes

- Continued Availability of Resources
- DoD is a US Gov’t Leader in reducing GHGs
- Minimize Waste & Pollution
- Mgm’t & Practices Built on Sustainability and Community
DoD Sustainability Goals

Reduce Use of Fossil Fuels
- Reduce energy intensity
- Increase use of renewable sources
- Reduce vehicle fleet consumption

Reduce Greenhouse Gas Emissions
- Scope 1 and 2 by 34%
- Scope 3 by 13.5%

Improve Water Resources Management

Minimize & Optimally Manage Solid Waste

Minimize Chemicals of Concern

Sustainability is Built into DoD Management Systems & Becomes the Norm