



# ***Federal Facilities Council Renewable Energy Workshop Department of Defense Facilities Energy Program***

***Dorothy Robyn  
DUSD(Installations & Environment)  
April 15, 2011***





# Key Points

*Acquisition, Technology and Logistics*

- **DoD has made energy a priority; we are doing this not to be “green” but to improve our effectiveness as warfighters.**
- **Renewable energy is a key element of our strategy in part because it contributes to the security of the energy supply on our installations.**
- **As a technology leader, DoD is well-positioned to play a key role in the energy innovation space.**



# ***I. DoD Facilities Energy Strategy***

## ***II. DoD Renewable Energy Program***

## ***III. Installation Energy Test Bed***



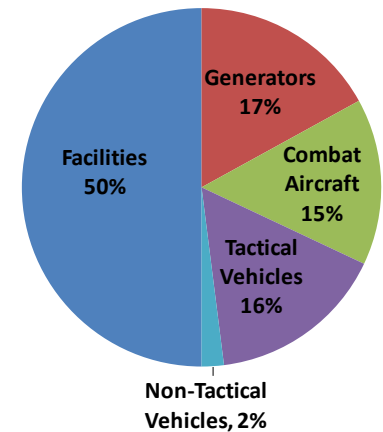
# Why Facilities Energy Matters

Acquisition, Technology and Logistics

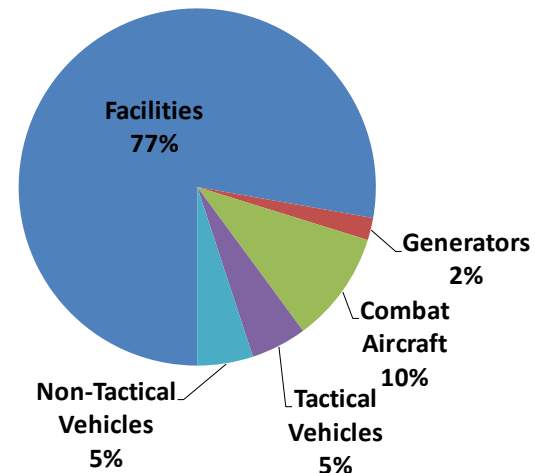
- **Significant Cost**
  - FY09: \$4.0 billion (26% of total DoD energy costs )
  - Cost likely to increase (reduced presence in Iraq and Afghanistan, improved QoL)
- **Environmental Impact**
  - Contributes a disproportion share (~ 40%) of GHGs
- **Mission Assurance/Energy Security**
  - DoD's reliance on a fragile commercial electricity grid places continuity of critical missions at serious and growing risk <sup>1</sup>

<sup>1</sup> Defense Science Board, "More Fight – Less Fuel," February 2008

Army CO<sub>2</sub> Emissions Today



Army CO<sub>2</sub> Emissions Future?





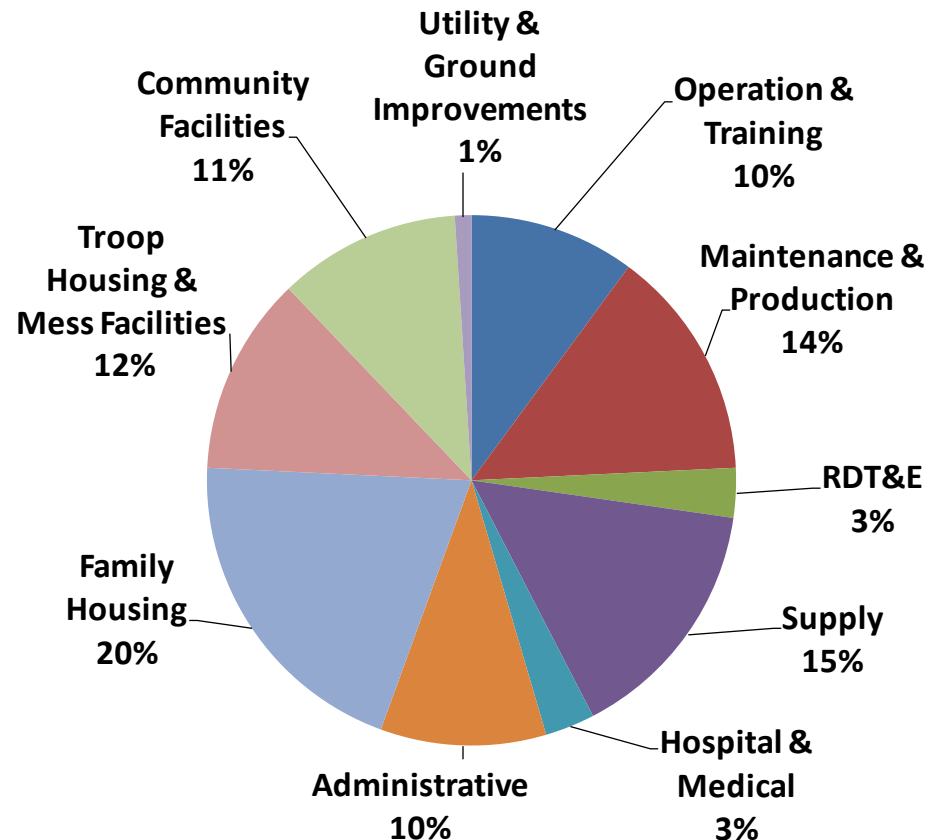


# DoD Built Infrastructure

*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**

DoD Building Stock





# Facilities Energy Core Strategy

Acquisition, Technology and Logistics



- **Reduce Demand** – energy efficiency/conservation
  - Leverage repair & maintenance budget (\$8.8B) to retrofit existing buildings
  - Leverage 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
- **Improve Energy Security** – focus on grid disruption
  - Risk mitigation plans
  - Microgrid demonstrations
  - Net Zero Energy Installation initiatives





# ***I. DoD Facilities Energy Strategy***

## ***II. DoD Renewable Energy Program***

### ***III. Installation Energy Test Bed***



# DoD Renewable Energy Activities

Acquisition, Technology and Logistics

**Nellis AFB  
Solar Array (14 MW)**



**Fort Huachuca  
Photovoltaic Roof**



**Marine Corps Base Hawaii  
Solar Hot Water Heating  
Family Housing**



**China Lake  
Geothermal Power Plant  
(270 MW)**

## DoD Renewable Energy Projects

**Electricity Generation - 287**

**Solar - 279**

**Wind - 25**

**Hydro/Ocean - 1**

**Natural Gas - 6**

**Landfill / Biomass/MSW**

**Thermal Energy - 261**

***TOTAL PROJECTS – 443***

**Renewable Energy Generation:**

**5,806 BBTU**

**Renewable Electricity:**

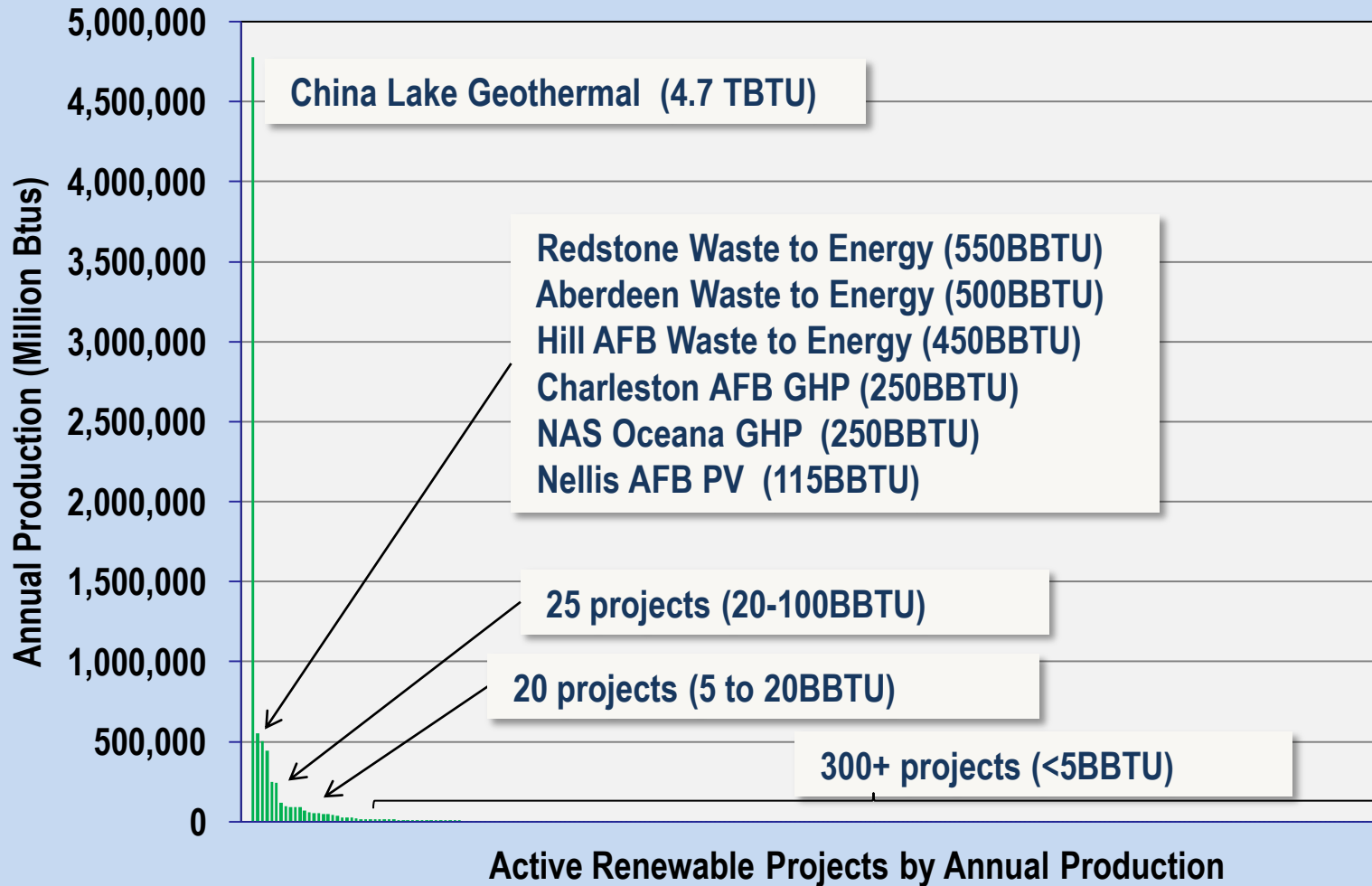
**1,530 GWh**





# Large DoD Renewable Energy Projects Are Few

Acquisition, Technology and Logistics



**To meet the 2025 renewable energy goal DoD will require  
2 China Lake geothermal projects or 63 Nellis solar PV projects.**



# ***Use of Third Party Financing***

*Acquisition, Technology and Logistics*

- **Vast majority (80%) of DoD's renewable energy comes from systems financed and operated by outside investors**
  - **The geothermal plant at China Lake represents almost half of the total renewable energy either purchased by the department or produce on DoD installations**
- **To reach its renewable energy goals, DoD will have to depend heavily on third-party financing mechanisms such as power purchase agreements and associated land-use agreements to enable large scale renewable projects**



# ***Potential Major DoD Renewable Energy Initiatives Using Third Party Financing***

*Acquisition, Technology and Logistics*

## **Project Location**

Fort Irwin, California  
Hawthorne Army Depot, Nevada  
Nellis AFB Phase II, Nevada  
Marine Corps Air Station Miramar, California  
Yuma Proving Ground, Arizona  
Multiple Sites, Hawaii  
Chocolate Mountain, California  
El Centro NAF, California  
Fallon NAS, Nevada  
Eglin AFB, Florida  
Vandenberg AFB, California

## **Technologies**

Solar, Geothermal, Wind  
Solar, Geothermal  
Solar  
Landfill gas  
Solar  
Solar  
Geothermal  
Geothermal  
Geothermal  
Biomass  
Wind



***I. DoD Facilities Energy Strategy***

***II. DoD Renewable Energy Program***

***III. Installation Energy Test Bed***





# ***Installation Energy Test Bed***

*Acquisition, Technology and Logistics*

- **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)



# ***ESTCP Facility Energy Test Bed***

*Acquisition, Technology and Logistics*

- **Use DoD Facilities As Test Bed For Innovative Energy Technologies**
  - Validate performance, cost, and environmental impacts
  - Transfer lessons learned, design and procurement information across all Services and installations
  - Directly reach out to private sector for innovations
  - Leverage DOE investments
- **Develop, Test & Evaluate For All DoD Facilities**
  - Advanced components to improve building energy efficiency
  - Advanced building energy management and control
  - Smart microgrid and energy storage to improve energy security
  - Tools and processes for design, assessment and decision-making for energy use and management
  - Renewable energy generation on DoD installations



# BIPV Roofs



*Acquisition, Technology and Logistics*

## 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



# Smart Microgrid

Acquisition, Technology and Logistics

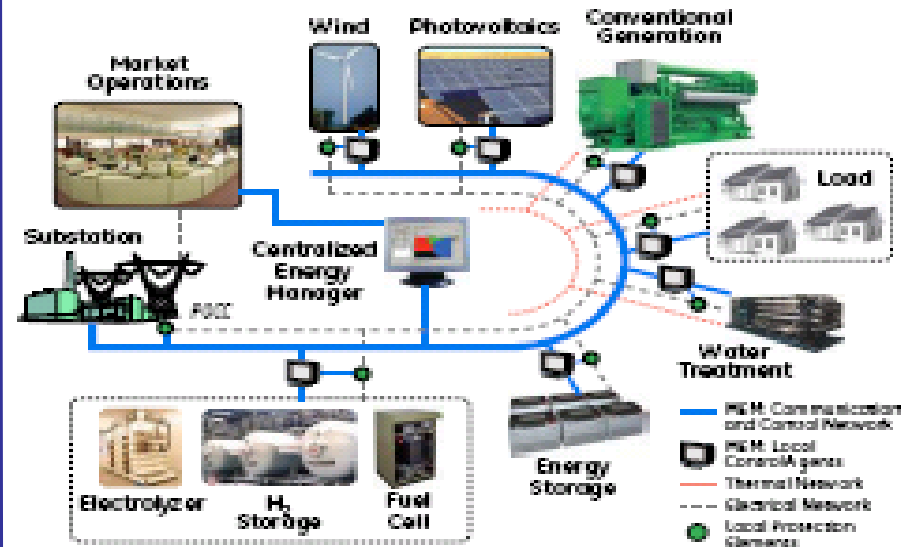
## DESCRIPTION

- 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

## Microgrid Paradigm



## FUNDING

\$2M

- GE Global Research
  - Leverages DOE and GE investments





# 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

Naval Base Ventura County, McGuire AFB, & CERL

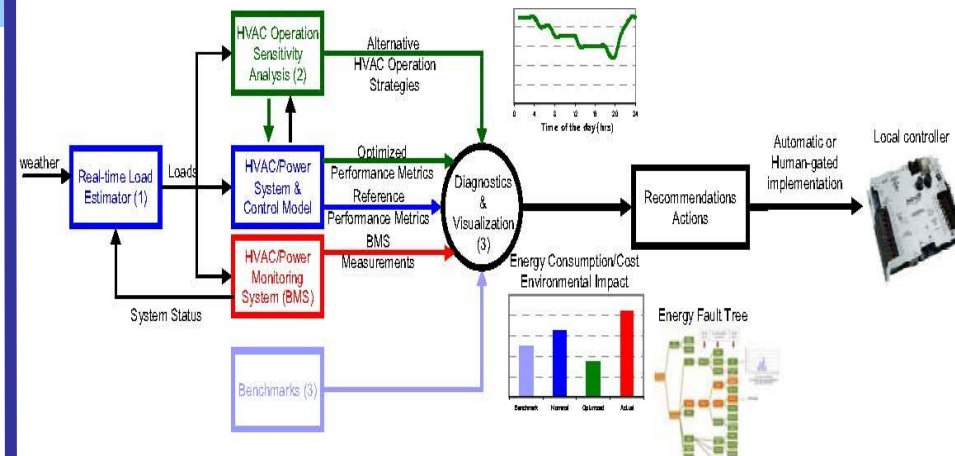


Figure 1. Block diagram of the proposed Advanced Building Energy Management Systems

## 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.

## FUNDING

**\$3.2M**

**Awarded through competitive solicitation**

- United Technologies Research Center
- Lawrence Berkeley National Laboratory
- University of California, Berkeley
- Oak Ridge National Laboratory



# ***Back Up***

---

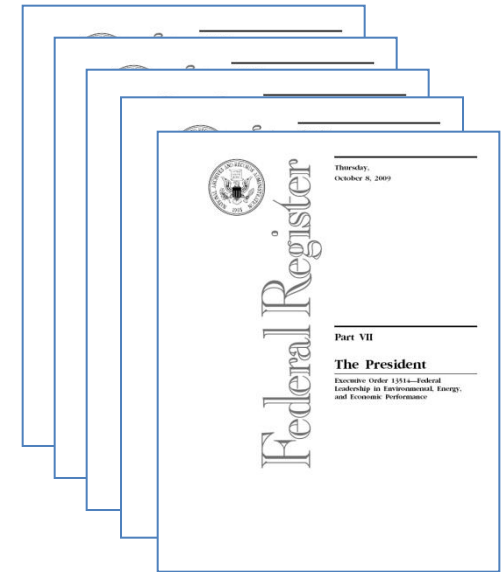
*Acquisition, Technology and Logistics*



# Key Energy Goals

Acquisition, Technology and Logistics

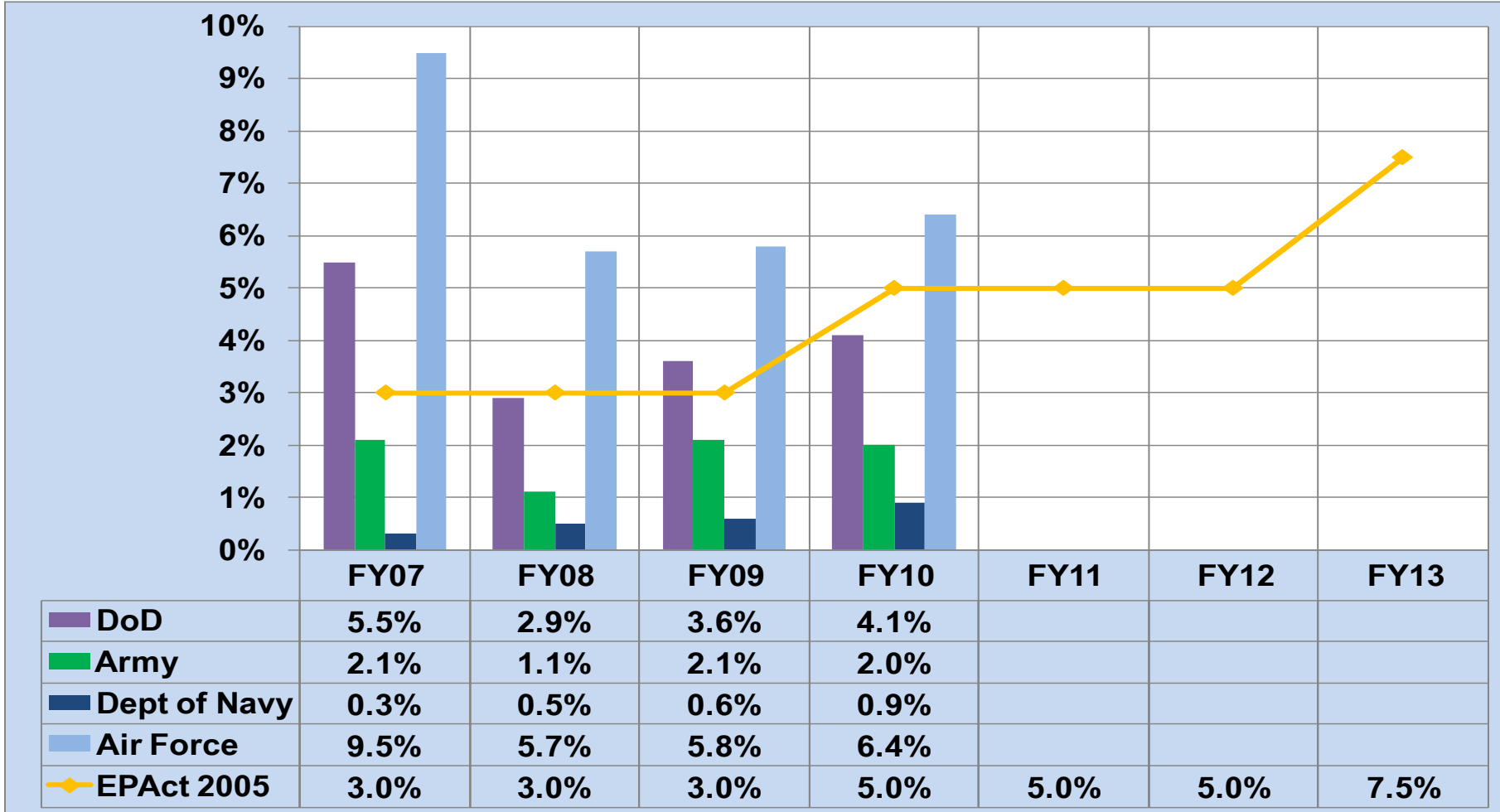
- **Legislation and Executive Orders**
  - EPAAct 2005, EISA 2007, NDAA
  - EO 13423, EO 13514
- **Key Targets**
  - **Facility Energy Efficiency**
    - Reduce facilities energy intensity by 30% by 2015 and 37.5% by 2020 (2003 baseline)
  - **Renewable Energy**
    - Consume 7.5% of electric energy 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 EPOA 2005 Sec 203 Renewable Energy Goal

Acquisition, Technology and Logistics



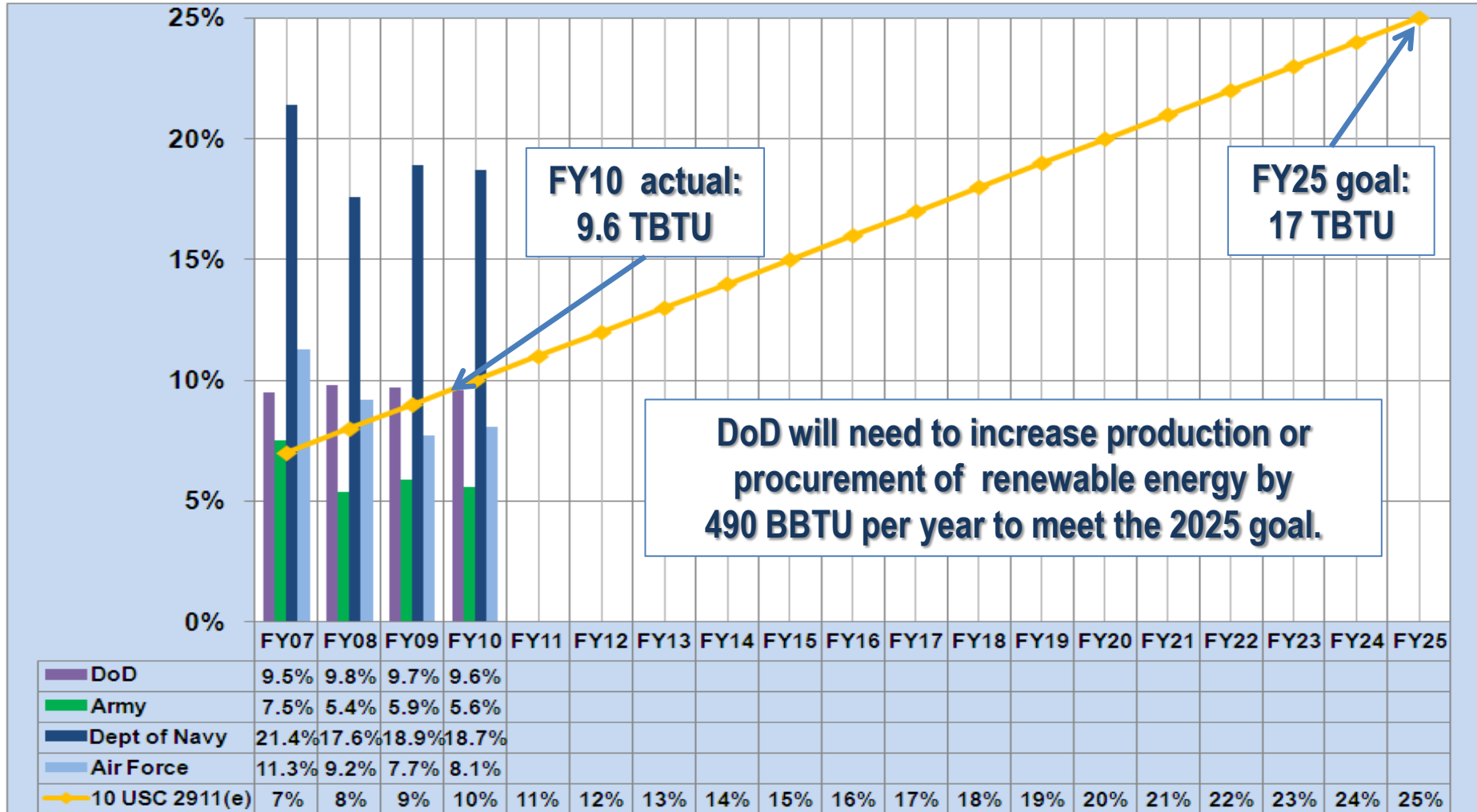
**Current accounting rules will make it difficult to achieve EPOA goal. Energy from third party funded projects like China Lake don't count toward goal.**





# DoD Progress Towards 10 USC 2911(e) Renewable Energy Goal

Acquisition, Technology and Logistics



**DoD produced or procured 9.6 TBTU of renewable energy in 2010.  
DoD needs to increase this amount to 17 TBTU to meet the 2025 goal.**



# Renewable Energy Siting

*Acquisition, Technology and Logistics*

- **Challenges**
  - Turbines and solar towers can interfere with military radar
  - Problem arises in 3 contexts: surveillance; weapon system testing; and operations & training
  - DoD weighs in late in process b/c of nature of the FAA review process
- **Way Forward**
  - Energy Siting Clearinghouse
  - R&D to better model impact and mitigate potential effects
  - Accelerate upgrades to/replacement of surveillance radars

