DoD’s Installation Energy Test Bed

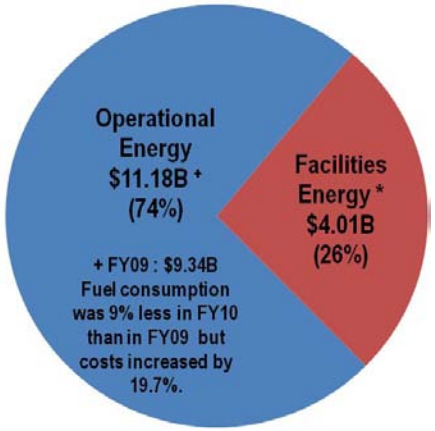
Dr. Jeffrey Marqusee

ESTCP

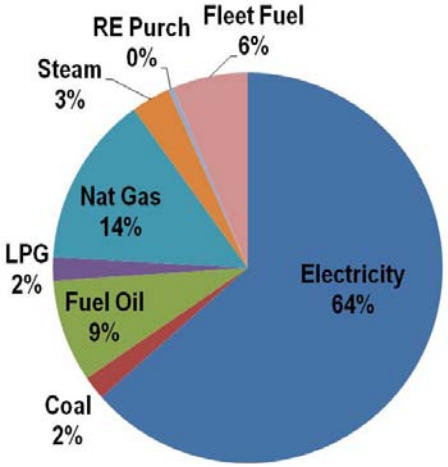
Installation Energy Challenge

- Significant Cost
  - ♦ $4B Annual Cost
- Environmental Impact
  - ♦ Contributes a disproportion share (~ 40%) of GHGs
- Mission Assurance/Energy Security
  - ♦ DoD's reliance on a fragile commercial electricity grid
- Legislative and Executive Orders
  - ♦ Facility Energy Efficiency and Renewable Energy

DoD FY10 Energy Costs

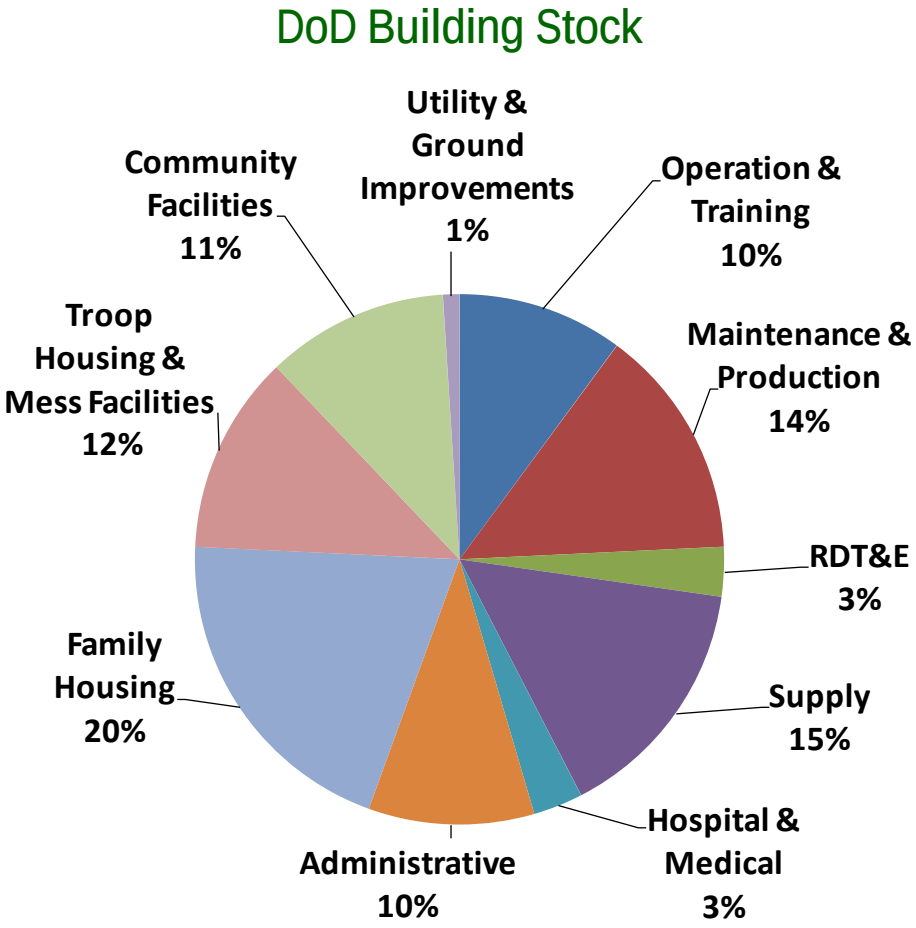


Installation Energy Sources



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



Environmental Security Technology Certification Program

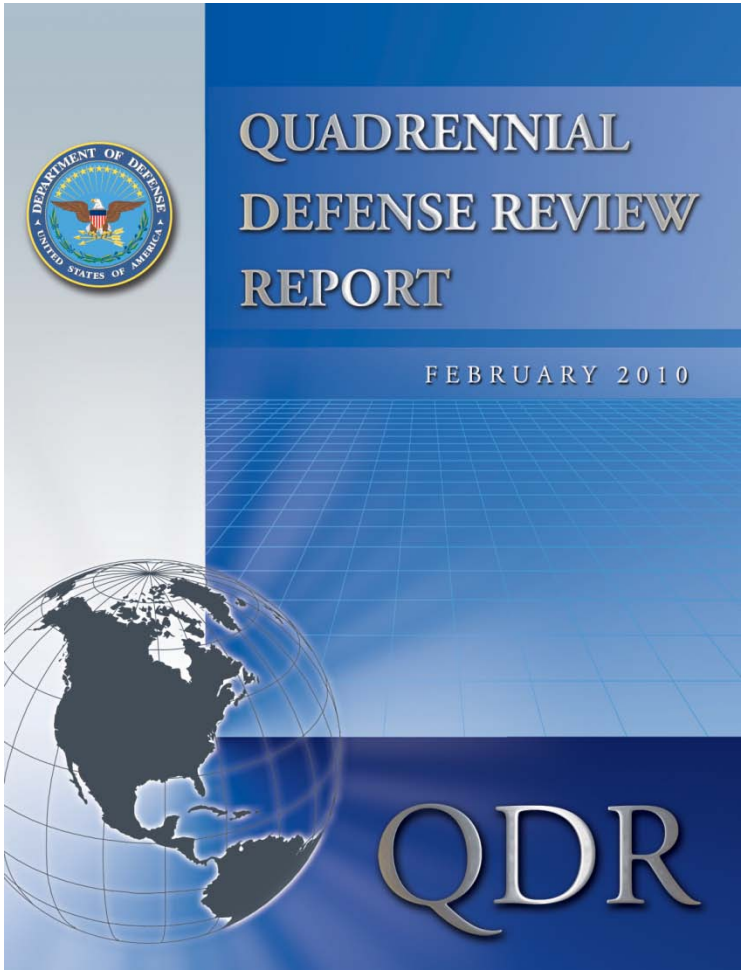
- Demonstrate Innovative Cost-Effective Environmental Technologies
  - ♦ Capitalize on past investments
  - ♦ Transition technology out of the lab
- Promote Implementation
  - ♦ Direct technology insertion
  - ♦ Gain regulatory and end user acceptance

➡ ***Priority: needs of the DoD user community***

ESTCP & QDR

Crafting a Strategic Approach to Climate and Energy

- "The Department will also speed innovative energy and conservation technologies from laboratories to military end users. The **Environmental Security and Technology Certification Program** uses military installations as a test bed to demonstrate and create a market for innovative energy efficiency and renewable energy technologies coming out of the private sector and DoD and Department of Energy laboratories."



Installation Energy Test Bed Drivers

- 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 is uniquely positioned
  - It is in DoD's self interest given the size of our inventory
    - 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 Test Bed

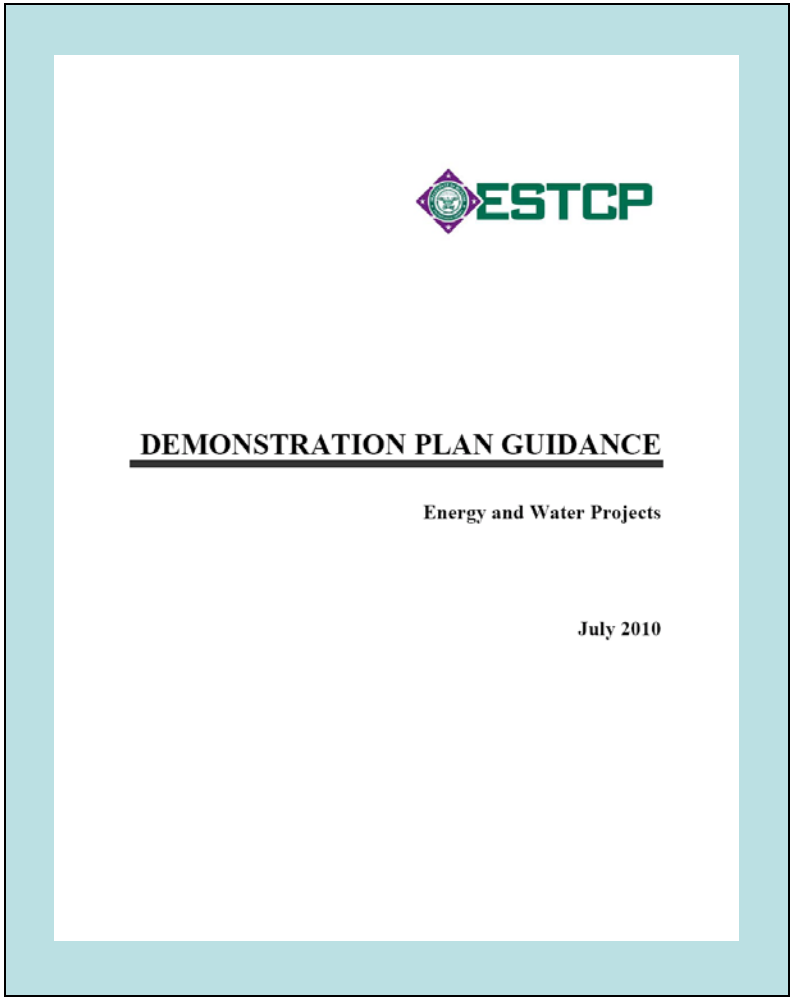
- Use DoD Facilities As Test Bed For Innovative Energy Technologies
  - Validate performance, cost, and environmental impacts
  - Transfer lessons learned, design and procurement information across all Services and installations
  - Directly reach out to private sector for innovations
  - Leverage DOE investments

- Develop, Test & Evaluate For All DoD Facilities
  - Energy Conservation & Efficiency
  - Renewable and Distributed Energy Generation
  - Control & Management of Energy Resources & Loads

Reduce Energy Costs - Improve Security

Project Requirements

- Formal Demonstration Plans
  - Quantitative performance objectives
    - metrics, data requirements, success criteria
  - Lifecycle cost assessment
    - simple cost model
    - identify data requirements
  - Independent technical review

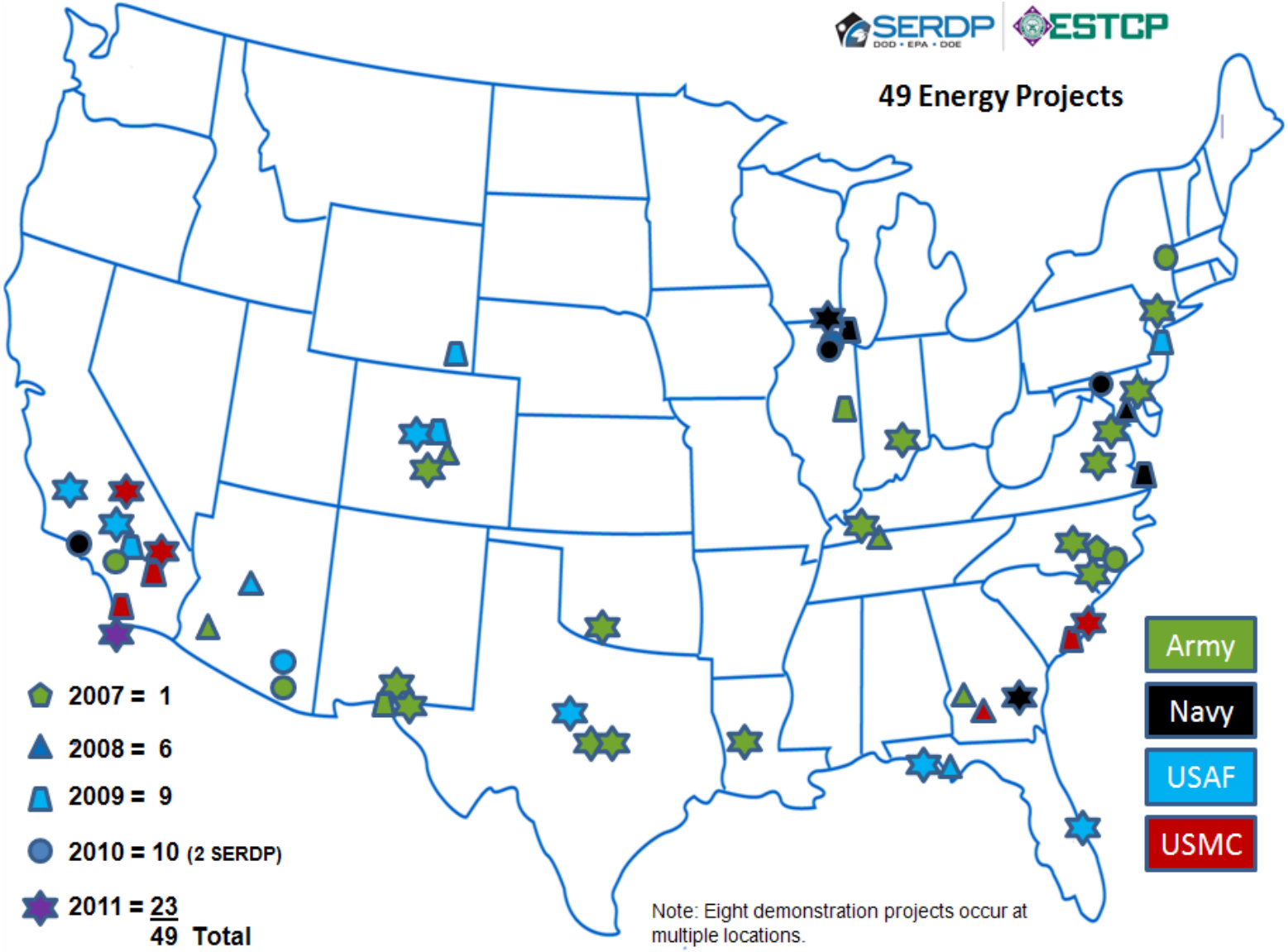

ESTCP

DEMONSTRATION PLAN GUIDANCE

Energy and Water Projects

July 2010

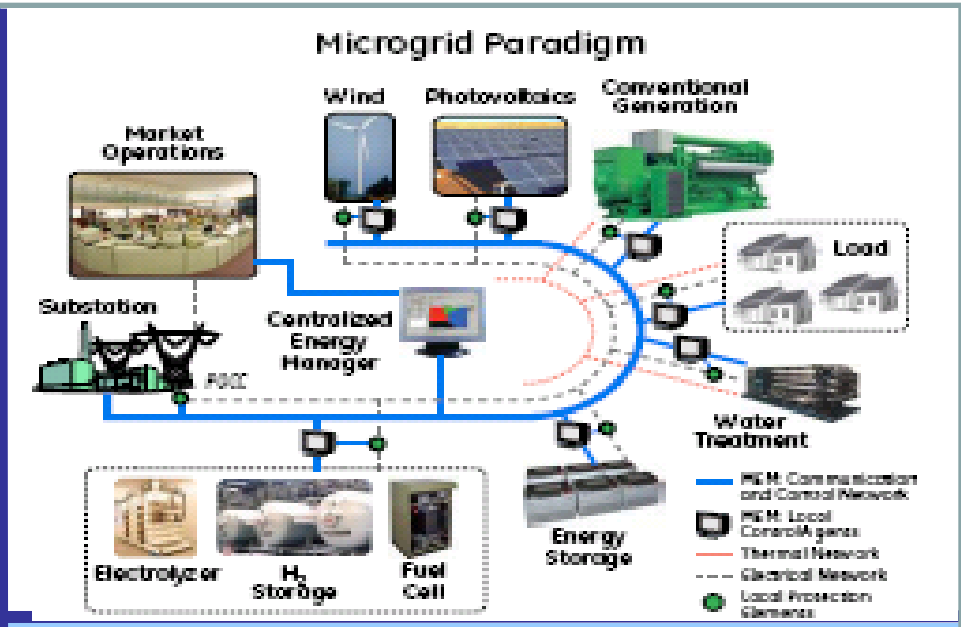
Test Bed Project Locations



Smart Microgrids

DESCRIPTION

- Enhance and demonstrate an advanced micro grid 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

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, Naval Station Great Lakes, & CERL

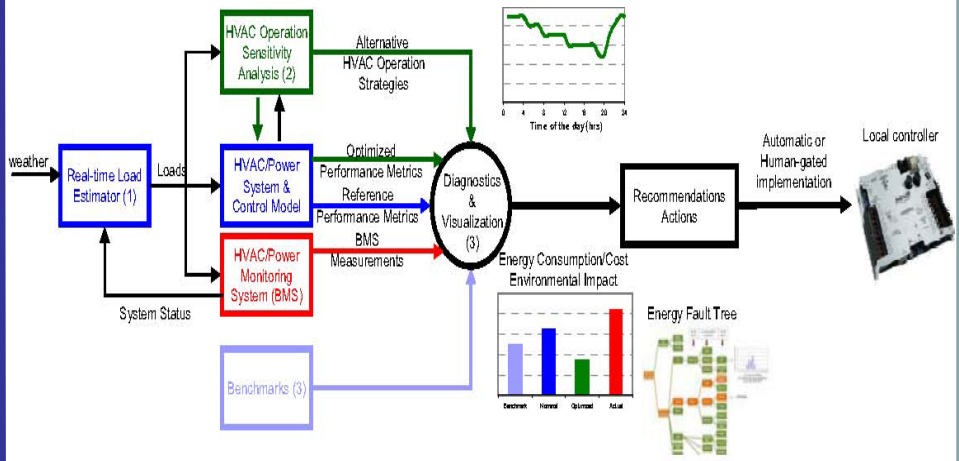


Figure 1. Block diagram of the proposed Advanced Building Energy Management Systems

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.

PERFORMERS

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

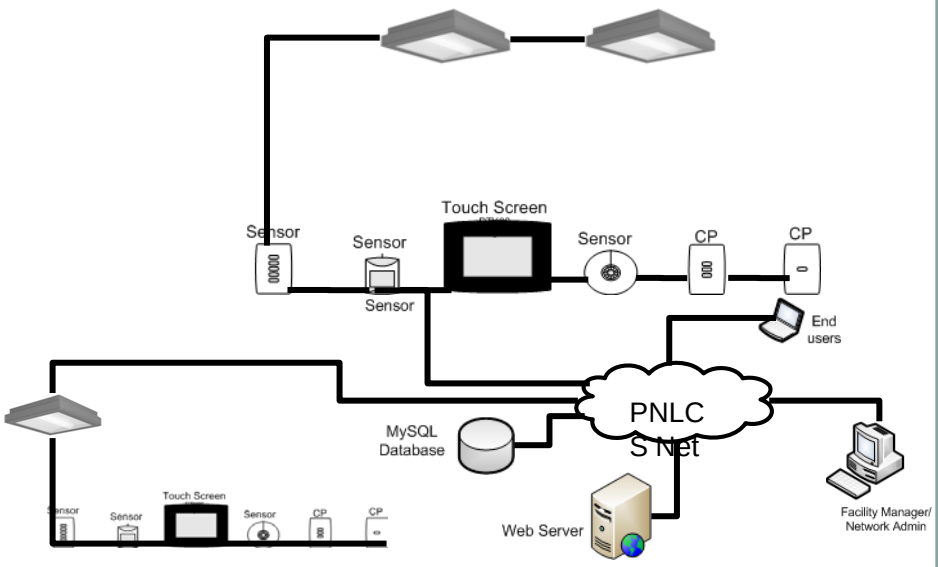
Advanced Lighting Controls for Reducing Energy Use and Cost

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 25% reduction in peak lighting power density

PERFORMERS

- Phillips Research North America
- Lawrence Berkeley National Laboratory

Low-BTU Landfill Gas Capable Microturbine

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
- Flex Energy
- SCS Engineers
- Integrity Air Monitoring

FY 2012 Plans

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

Sponsored By
SERDP and ESTCP

Partners in Environmental Technology

Technical Symposium and Workshop

29 NOVEMBER - 1 DECEMBER 2011

Washington Hilton Hotel, Washington, DC

www.serdp-estcp.org