Smart Power Infrastructure Demonstration for Energy Reliability and Security (SPIDERS)

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COCOM Sponsors: USPACOM and USNORTHCOM

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The Situation

Defense Science Board

Feb 08 - "Critical national security and homeland defense missions are at an unacceptably high risk of extended outage from failure of the electric grid."

CNA ANALYSIS & SOLUTIONS

May 09 - "Aurora threat revealed the possibility that sophisticated hackers could seriously damage the grid by destroying mechanisms downstream from the initial point of attack."

QDR

Feb 10 - "DoD will conduct a coordinated energy assessment, prioritize critical assets, and promote investments in energy efficiency to ensure that critical installations are adequately prepared for prolonged outages caused by natural disasters, accidents, or attacks."

References:

- *The Defense Science Board Task Force on DoD Energy Security, "More Fight – Less Fuel," February 2008.*
- *Powering America's Defense, Energy and the Risks to National Security, by the Center for Naval Analyses Military Advisory Board, May 2009*
- *Quadrennial Defense Review Report, February 2010*

What Is SPIDERS?

Reduce the "unacceptably high risk"* of mission impact from an extended electric grid outage by developing the capability to maintain energy delivery for mission assurance

- ***Demonstrate:***
  - *Cyber-security of electric grid*
  - *Smart Grid technologies & applications*
  - *Secure microgrid generation & distribution*
  - *Integration of distributed & intermittent renewable sources*
  - *Demand-side management*
  - *Redundant back-up power systems*
- **Results in:**
  - Technically sound, commercially viable secure microgrid demonstration with mixed generation including renewables
  - First complete DoD installation with a secure, smart microgrid capable of islanding
  - Template for mission critical asset energy security for an entire installation and transition to commercial use

**From Defense Science Board Task Force on DoD Energy Security, Feb 2008*

Expected SPIDERS Outcome

STAIRWAY TO ENERGY SECURE INSTALLATIONS

Year 1

PEARL-HICKAM CIRCUIT LVL DEMO

- Renewables
- Hydrogen Storage
- Hydrogen Fuel Cell
- Energy Management
- VSE SCADA Test at Idaho National Lab

Year 2

FT CARSON MICRO-GRID

- Large Scale Renewables
- Vehicle-to-Grid
- Smart Micro-Grid
- Critical Assets
- CONUS Homeland Defense Demo
- COOP Exercise

Year 3

CAMP SMITH ENERGY ISLAND

- Entire Installation Smart Micro-Grid
- Islanded Installation
- High Penetration of Renewables
- Demand-Side Management
- Redundant Backup Power
- Makana Pahili Hurricane Exercise

TRANSITION

- Template for DoD-wide implementation
- CONOPS
- TTPs
- Training Plans
- DoD Adds Specs to GSA Schedule
- Transition to Commercial Sector
- Transition Cyber-Security to Federal Sector and Utilities

CYBER SECURITY BEST PRACTICES

RIGOROUS ASSESSMENT WITH RED TEAMING IN EACH PHASE

SPIDERS Participants

- **USPACOM, USNORTHCOM DOE, and DHS**
- **DOE - 5 Nat'l Labs**
- **Military Services**
- **Army Construction Engineering Research Lab (CERL)**
- **Naval Facilities Engineering Cmd**
- **Local Utility Companies**
- **States of Hawaii & Colorado**

Results to Date

1. **Conducted initial experiment of cyber strategy at Idaho Nat'l Lab's National SCADA Test Bed, funded by DHS**
   - PACOM-led with Sandia and Army red team attackers
   - Proved the concept with a simplified architecture
2. **Issued RFI, held two industry days**
   - Oct in Colorado Springs, 40 companies
   - March in Honolulu, 50 companies
3. **Year 1 JB Pearl Harbor-Hickam preliminary design completed April 2011**
   – Sandia National Labs, with assistance from Oak Ridge, Idaho and NREL
4. **Conceptual designs for Phase 2 and 3 in progress**
5. **TARDEC awarded $1.5M contract for five Smith electric vehicles and charging stations to support Phase 2**
6. **Congressional notification complete – Official start 17 June 2011**
7. **Issued Request for Proposal on FedBizOps – Aug 2011**

Transition

1. Transition Manager is NAVFAC HQ assisted by Pacific Northwest National Lab

- Transition to occur both in DoD and commercial sector

2. DoD Transition Plan includes:

- Smart grid design guides-Uniform Facilities Criteria (UFC) for Services
- Cyber design guides for ICS
- MOAs with services and service labs
  - U.S. Army Construction Engineering Research Lab (CERL)
  - Naval Surface Warfare Center – Dahlgren, Mission Assurance Division
  - AF Civil Engineering Support Agency

3. Commercial Transition Plan includes:

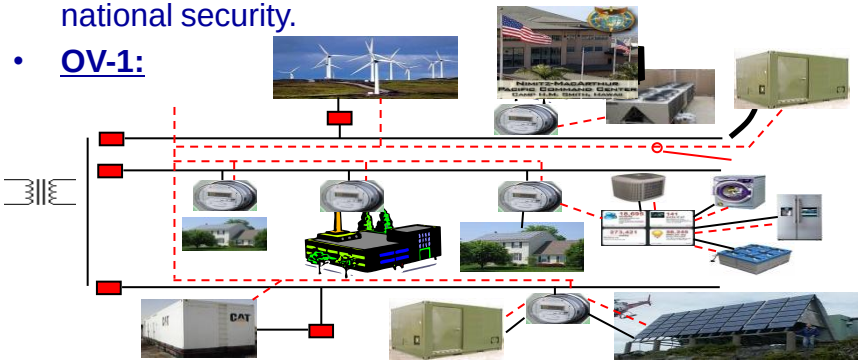
- Cooperation with NIST
- Working with industry associations (NERC, EEI, etc.)

QUESTIONS?


SPIDERS
Smart Power Infrastructure Demonstration for Energy Reliability and Security

Quad Chart: SPIDERS JCTD FY11-13

- **Operational Problem:** The ability of today's warfighter to command, control, deploy, and sustain forces is adversely impacted by a fragile, aging, and fossil fuel dependent electricity grid, posing a significant threat to national security.
- **OV-1:**



Specifics:

- **Circuit Level Micro-Grid Demo – Hickam AFB, HI**
  - Incorporate existing renewables, diesel generators and energy storage; add fuel cell and EMS; test micro-grid on an essential asset
- **Validate VSE cyber security strategy on SCADA testbed simulation of utility grid mgt system – INL**

Year 2 & Beyond:

- Larger smart micro-grid with cyber defense and vehicle-to-grid storage leverages 2MW of existing PV and $20M in recent electric upgrades – Ft. Carson, CO
- Entire installation cyber secure smart micro-grid with battery storage & islanding capability – Camp Smith, HI

Requirement:

- **Protect task critical assets (TCAs) from loss of power due to cyber attack**
- **Integrate renewable and other distributed generation electricity to power TCAs in times of emergency**
- **Sustain operations during prolonged power outages**
- **Manage installation power/consumption efficiently**

Competing Technology:

- **Existing "dumb grid" with little or no cyber defense**
- **Renewables disabled/useless when grid goes down**
- **CANDID/POINT JCTDs address C2 nets, not SCADA**

Funding ($Thousands):

ORG	FY-11	FY-12	FY-13	TOTAL
DOE (committed)	$5,000	$2,000	$2,000	$9,000
DHS (in-kind)	$2,000	$2,000	$2,000	$6,000
AF (in-kind)	$1,000	$500	$500	$2,000
Army (in-kind)	$500	$500	$500	$1,500
Navy (committed)	$1,000	$500	$500	$2,000
OSD I&E (committed)	$6,000	$3,000	$3,000	$12,000
OSD/RFD (committed)	$4,000	$1,500	$1,500	$7,000
TOTAL	$19,000	$9,500	$9,500	$39,500