SPIDERS:

Developing a Smarter, More Sustainable Microgrid for Energy and National Security

A new U.S. energy initiative aims to create a resilient, more reliable microgrid designed to protect against extended power outages caused by natural disasters, accidents or attacks — and, ultimately, to enhance electric power surety for national security.

Known as SPIDERS, or Smart Power Infrastructure Demonstration for Energy Reliability and Security, this program focuses on the use of Smart Grid technologies, integration of renewable power generation, and energy storage, demand-side management, redundant power back-up, and protection from cyber threats to sustain mission-critical loads. SPIDERS represents the latest Joint Capability Technology Demonstration (JCTD) project involving the Department of Energy , Department of Defense (DOD) and Department of Homeland Security.

Since most U.S. military bases rely on local utilities for electric power, these agencies believe the SPIDERS JCTD will guide facility improvements while reducing the unacceptably high risk of extended grid outages.

Demonstrate, Then Transform

Phase one of this demonstration will result in design of a circuit-level microgrid at Joint Base Pearl Harbor Hickam in Honolulu. Using a best value/firm fixed-price contract approach, the U.S. Army Corps of Engineers, Philadelphia District, selected Burns & McDonnell as the project's system integrator in November 2011.

"We're developing, designing, building and testing an energy surety microgrid — one of the few within the military on this scale," says David Barr, director of federal projects for Burns & McDonnell and the senior project manager on Phase one. "The work under way at Pearl Harbor Hickam combines our military construction facilities expertise on mission-critical facilities with our utility-scale transmission and distribution expertise."

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The SPIDERS JCTD serves as a catalyst for helping the modern military evolve its power infrastructure. Using the conceptual designs of an Energy Surety Microgrid™ developed by Sandia National Laboratories, the program's objectives address four critical areas:

- Protect defense-critical infrastructure from power loss due to physical disruptions or cyber attacks to the bulk electric grid.
- Integrate renewable energy sources and other distributed generation to power defense-critical infrastructure in times of emergency.
- Sustain critical operations during prolonged utility power outages.
- Manage DOD installation electrical power and consumption efficiently to reduce petroleum demand, carbon footprint and cost.

Moving Forward

The Energy Surety Microgrid demonstration at Pearl Harbor Hickam will debut in December 2012, designed to meet critical criteria.

In turn, the Corps will deploy two additional microgrid installations (still in proposal or conceptual design stages). Phase two, at Fort Carson in Colorado, focuses on creation of a larger microgrid featuring a large-scale photovoltaic system and vehicle-to-grid storage. Phase three will incorporate all of Hawaii's Camp Smith into the microgrid, implementing significant renewable energy and storage. Upon its completion, the SPIDERS JCTD will provide a template for DOD-wide implementation and, eventually, microgrid adoption within the broader civilian sector.

As technical manager for the SPIDERS JCTD, Harold Sanborn, technical manager at the Corps' Construction Engineering Research Lab in Champaign, Ill., sees this program as building on past microgrid efforts to integrate renewable energy or distributed generation schemes.

"A JCTD project typically focuses on a weapons system or product rather than infrastructure," Sanborn says. "So we're actually taking that warfighter systems engineering toolset and applying it to energy security and energy surety on an installation. We're also combining a defined set of requirements for acquisitions connected with military construction, as well as research and development on the same contract. That makes this unique as a pilot program for the Department of Defense."

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