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SPIDERS: The Smart Power Infrastructure Demonstration for Energy Reliability and Security

A coalition of government agencies and national laboratories is working to increase electric power surety by developing new microgrid architectures that can function independently of the bulk electric grid.

Vision

To create fully independent and secure microgrids that are resilient to power disruption, protected against cyber attack, and reflect more sustainable energy practices, including greater efficiency, less reliance on fossil fuels, and integrating renewable sources of electricity generation.

Our nation's security and economic prosperity depend on a fully functional electric grid; yet the bulk power grid that drives all facets of our economy—from banking to supply chain distribution to telecommunications—remains vulnerable to disruption. Not only is much of our power generated by fossil fuels, which have a negative impact on the global environment and are transported by an insecure supply chain, but the grid itself is fragile, vulnerable to overload and storms that bring down power lines, and cyber attack.

Increasing Our Nation's Energy Surety

To increase energy surety and ensure the continuity of operations—especially at mission-critical sites such as military installations—a coalition of government agencies and national laboratories is working on a Joint Capability Technology Demonstration (JCTD) called the Smart Power Infrastructure Demonstration for Energy Reliability and Security or SPIDERS.

A 3 year effort, SPIDERS will test microgrid architectures, the integration of distributed and renewable energy, the role of electrical energy storage, and the addition of a cybersecurity overlay.

Focused on three distinct military installations—Joint Base Pearl Harbor/Hickam, Hawaii, Fort Carson, Colorado, and Camp H.M. Smith, Hawaii—SPIDERS will enable those facilities to operate independent from the bulk power grid (that is, in an islanded mode) for extended time periods, with maximum assurance that cybersecurity is uncompromised. Specifically, SPIDERS has four goals for electric power surety at U.S. military installations:

1. To protect critical infrastructure from power loss in the event of physical or cyber disruptions to the bulk electric grid.
2. To provide reliable backup power during emergencies by integrating renewables and other distributed generation sources into the microgrid.
3. To ensure that critical operations can be sustained during prolonged utility power outages.
4. To manage electrical power and consumption at military installations more efficiently, thus reducing petroleum demand, carbon emissions, and transportation costs.

U.S. DEPARTMENT OF ENERGY

Partnering to Further Operational Surety

The SPIDERS JCTD is a joint effort between DoD and DOE. The SPIDERS JCTD will develop, install, and validate scalable, cyber-secure smart microgrid solutions to enhance continuity of operations at three separate DoD bases in the face of electrical power disruptions.

- Joint Base Pearl Harbor/ Hickam, Hawaii
- Fort Carson, Colorado
- Camp H.M. Smith, Hawaii

The three SPIDERS microgrids will be designed and developed over the course of three years using a graduated approach; each microgrid demonstration will integrate a higher number of critical mission loads, a more complex generation portfolio, and increased demand-response capabilities than the previous one. Capabilities to be examined will focus on the ability of islanded (disconnected from the main grid) microgrids to

- provide electricity to critical missions when service from the main electrical grid is disrupted,
- integrate renewable-energy generation and electrical energy storage into the microgrid,
- interconnect and share existing and new distributed energy resources (DERs) including emergency backup diesel generators, and provide the cyber security architecture required to ensure safe operations.

By instituting energy security policies and implementing renewable energy generation/use, the military can reduce our national dependence on foreign energy supplies and prototype/prove systems that can then be marketed to commercial and residential consumers.

Transitioning to Secure Energy Installations

The goal of SPIDERS is to demonstrate a secure microgrid concept that could strengthen the reliability, security, and resiliency of the national electric grid and enhance national security by

- maintaining 100 percent of critical load for at least 72 hours in the event of loss of grid power,
- integrating intermittent renewable energy generation during loss of grid power, and
- improving cybersecurity.

Indeed, the SPIDERS template, while currently aimed at military installations, is ultimately intended for a broader cross-section of the U.S. economy and to help both the public and private sectors become more resilient to interruptions to the critical supply of electricity.

SPIDERS
Smart Power Infrastructure Demonstration for Energy Reliability and Security

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