Enhancing the Smart Grid: Integrating Clean Distributed and Renewable Generation

Empowering Consumers

Imagine a grid where utilities and consumers work together to alleviate congestion and meet growing energy demands. RDSI is working to facilitate this reality by focusing on the integration of on-site, clean distributed and renewable generation.

New Solutions Require New Thinking

America's demand for power threatens to overburden an already congested electric system. The U.S. Department of Energy is addressing these energy challenges with innovative solutions to energy generation. Its **Renewable and Distributed Systems Integration (RDSI)** Program is helping to alleviate congestion, reduce greenhouse gas emissions, and improve reliability by investigating answers such as

- Microgrid technologies
- Distributed generation
- Two-way communication systems
- Demand response programs

Reducing Peak Demand

The RDSI program aims to **reduce peak load on distribution feeders 20% by 2015**. To help achieve this goal, RDSI is sponsoring demonstration projects nationwide. From California to New York, these projects are bringing together stakeholders across the distribution chain: homebuilders, industry, utilities, universities and national labs. The public-private partnerships are developing new approaches to generating energy by harnessing the power of cutting-edge technologies as diverse as photovoltaics, fuel cells, hydro turbines and pumped water storage.

Renewable Distributed Generation is "Smart" because it...

- Reduces greenhouse gas emissions
- Improves efficiency
- Helps defer system upgrades
- Reduces peak load
- Alleviates congestion
- Improves reliability
- Enhances energy security

Hydro turbine photo courtesy of AlstomPower

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New Thinking at Work

To help address the nation's energy challenges, the U.S. Department of Energy's Renewable and Distributed Systems Integration (RDSI) Program recently selected nine demonstration projects. Each one will integrate on-site, clean, distributed generation to demonstrate a 15% peak load reduction on a distribution feeder. The nine projects, located throughout the United States, cut across all levels of the distribution chain, from neighborhoods to industrial facilities to utilities, and are developing different approaches for reaching their goal. Some of the technologies being integrated are plug-in hybrid vehicles (PHEVs), wind turbines, photovoltaics, pumped storage, compressed air storage, microgrid technologies, and feeder automation systems.

Chevron Energy Solutions

What: CERTS Microgrid Demonstration

Where: Santa Rita Jail, Alameda County, California

Technologies: Microgrid technology, large-scale battery storage, photovoltaics, fuel cell, wind turbines

ATK Space Systems

What: Powering a Defense Company with Renewables

Where: Promontory, Utah

Technologies: Hydro-turbines, compressed air storage, solar thermal, wind turbines, waste heat recovery system

City of Fort Collins

What: Mixed Distributed Resources

Where: Fort Collins, Colorado

Technologies: Photovoltaics, combined heat and power, thermal storage, fuel cell, microturbines, PHEV, demand response

Illinois Institute of Technology

What: The Never-Failing Perfect Power Prototype

Where: Illinois Institute of Technology, Chicago, Illinois

Technologies: Advanced meters, intelligent perfect power system controller, gas fired generators, demand response controller, uninterruptable power supply, energy storage

SDG&E

What: Beach Cities Microgrid

Where: San Diego, California

Technologies: Demand response, energy storage, outage management system, automated distribution control, advanced metering infrastructure

Consolidated Edison

What: Interoperability of Demand Response Resources

Where: New York City, New York

Technologies: Demand response, PHEVs, fuel cell, combustion engines, intelligent islanding, dynamic reconfiguration, fault isolation

University of Hawaii

What: Transmission Congestion Relief

Where: Maui, Hawaii

Technologies: Intermittency management system, demand response, wind turbines, dynamic simulations modeling

University of Nevada, Las Vegas

What: "Hybrid" Homes - Dramatic Residential Demand Reduction

Where: Las Vegas, Nevada

Technologies: Photovoltaics, advanced meters, in-home dashboard, automated demand response, energy storage

Allegheny Power

What: West Virginia Super Circuit - Dynamic Feeder Reconfiguration

Where: Morgantown, West Virginia

Technologies: Biodiesel combustion engine, microturbine, photovoltaics, energy storage, advanced wireless communications, dynamic feeder reconfiguration