Microgrids vs. Smart Grids

Sain Engineering Associates, through strategic partnering with **CH2MHill** and **Clark Nexsen**, has recently assisted the United States Navy with developing a ***Smart Power Partnership Initiative (SPPI)*** Pilot Study for Navy and Marine Corps installations in southern California.

Smart Power Partnership Initiative

The "Smart Power Partnership Initiative" represents the Navy's intent to capture concepts relating to "Base Clustering" and "Smart Grid/Smart Energy" with a focus on leveraging win-win collaborations with community partners.

The Joint Venture Team identified stakeholders and developed the methodology for pooling resources from the community such as utility companies, electricity marketers, transmission operators, commercial firms, and utility regulators to explore more advantageous opportunities and mutually beneficial "power partnerships" for cost savings, energy security and renewable energy production at USN and USMC installations.

Target opportunities included investigating infrastructure investments (such as advanced metering), operational scenarios (such as demand-response), regulatory changes, and technology innovation (including smart grids). The selected opportunities are processed through a detailed, systematic cost and benefit analysis and the potential benefits are documented. In addition, rough order of magnitude (ROM) costs, savings-to-investment (SIR) ratios, and simple payback timelines were generated.

Identified in the Infrastructure category were:

- **Power Management**
- **Metering**
- **Control Systems**
- **Operation and Maintenance**
- **Generation**
- **Demand Response**

Included in the Market/Contract category were:

- **Aggregated Purchasing**
- **Demand Response**
- **Procurement Strategies**

An analytical tool was developed to allow the user to rank and prioritize opportunities. The "adjusted weight" is made based on seven dimensions or rating categories:

- **Impact**
- **Ease of Implementation**
- **Quickness of Implementation**
- **Certainty of Execution**
- **Expense**
- **Benefits**
- **Regional-Specific Criteria**

A primary goal of the SPPI was the assessment of smart energy and smart grid initiatives. The Scope of Work identified the six primary areas of baseline research:

- **Industrial Control Systems (Microgrids) and Electrical Infrastructure**
- **Demand-response Infrastructure**
- **Critical Load and Power Requirements**
- **Energy Market Factors**
- **Regulatory Environment**
- **Power Export**

Smart Grids

For the purposes of this analysis, a ***smart grid*** is an electrical distribution system that is designed to be controlled as a complete networked utility system. An electrical grid is not a single component but an aggregate of multiple networks and multiple power generation utilities with multiple operators employing varying levels of communication and coordination, most of which is manually controlled. ***Smart grids*** increase the connectivity, automation, and coordination between suppliers, consumers, and networks. The modernization is directed at a set of goals including facilitating greater competition between providers, enabling greater use of variable energy sources, establishing the automation and monitoring capabilities needed for bulk transmission at cross-continent distances, and enabling the use of market forces to drive energy conservation.

A ***smart grid*** incorporates information and communications technology into every aspect of electricity generation, delivery, and consumption in order to efficiently link supply with demand and achieve benefits of improved reliability, safety and cyber security, energy efficiency, and reduced environmental impact, as well as direct financial benefits.

A ***microgrid*** was viewed as a subset of the ***smart grid***. A basic ***microgrid*** exists at any military installation with its own distribution system. The ***microgrid*** vision, however, is to create a distribution system on an installation-, campus-, or building-wide level that has adequate generation, preferably supported by renewable sources, and energy-storage capacity to allow the system to operate in an "islanded" mode during periods of grid outages.

Through Business Case Analysis of all the factors, the Team identified recommended Courses of Action for the Navy:

COA	Description	Savings	Costs
Interim Operational Capability	**$1.3 M/yr**	**$15.8 M**	**COA 2 includes 2 megawatt (MW) of new generation and 6.4 MW of existing generation configured to support microgrid. A Regional Operations Center (ROC) is included to support operation of the microgrid in normal and emergency operations.**
Full Operational Capability	**$12.8 M/yr**	**$132 M**	**COA 3 includes 33 MW of new generation and 21 MW of existing generation configured to support microgrid. A second ROC would be required for resiliency purposes. Leverages smart grid infrastructure investments underway as part of other DoN initiatives.**

SAIN ENGINEERING ASSOCIATES, INC
An Employee-Owned Company

Sain Engineering Associates, Inc.

100 Corporate Pwy, Suite 100
Birmingham, AL 35242
P: 205-979-9966
www.saineng.com