

# Optimizing the Self-Healing Smart Grid

## *Benefits of an Integrated Network Management System*

### **How smart is your Smart Meter system?**

When implementing smart grid systems, what do you tend to think of? Most frequently, people think about smart, or digital, meter systems with their vast communication and data transfer capabilities.

Many utilities are installing Smart Meter systems, but they are primarily concerned about meter reading, load control/demand response, and service connect/disconnect. Many other characteristics of the modern grid are overlooked in such Smart Meter deployments.

The Smart Grid will:

- Enable active participation by consumers
- Accommodate all generation and storage options
- Enable new products, services and markets
- Provide power quality for the digital economy
- Optimize asset utilization and operate efficiently
- Anticipate & respond to system disturbances (self-heal)
- Operate resiliently against attack and natural disaster

Of the seven smart grid characteristics identified by the U.S. Department of Energy<sup>1</sup>, three of these key features are easily added using an Outage and Distribution (i.e. the network) Management System to the Smart Meter deployment:

- Self-healing – The grid is able to rapidly detect, analyze, respond to and restore power after outages or interruptions;
- Power quality – The grid provides a quality of power consistent with 21<sup>st</sup> century consumer needs and expectations, and
- Optimizes assets – The grid uses enabling information and sensor technologies to continually optimize the availability of capital assets while minimizing operations and maintenance downtime and associated costs.

A Network Management System (NMS) enables utilities to efficiently and effectively manage the energy distribution network under normal, outage, and emergency operating conditions. In normal conditions, the NMS maintains optimal feeder configurations and load balance by minimizing loss and optimizing power flow, while ensuring that safe switching orders and work plans are issued. In outage conditions, the system simultaneously enables effective customer communication, crew dispatch, and emergency load switching. In storm or other emergency conditions, the system facilitates collecting and analyzing damage assessment information as well as crew dispatch and management data. Upon exiting a condition, the system also automates the generation of regulatory and operational reporting, system event logs, customer outage tickets, and crew reports.

The full benefits of such Network Management Systems are achieved through integration with the utility's geographic and customer information systems, along with mobile workforce management, and the Smart Meter system.

### **Implementing a smart grid**

What's required is developing a long-term operating vision and strategic roadmap as part of your enterprise-wide transformation program that encompasses many discrete projects, several of which interface with a SmartMETER program. Under the comprehensive program, the you need to map out a comprehensive roadmap to improve operational efficiency and reliability through the application of refined business processes that leverage cost-effective enabling technologies.

Fundamentally, the program will upgrade the utilities' foundational IT systems and integrate them into a SmartMETER program to support a smart grid. Other smart grid systems under development

---

<sup>1</sup> [http://www.netl.doe.gov/moderngrid/opportunity/vision\\_characteristics.html](http://www.netl.doe.gov/moderngrid/opportunity/vision_characteristics.html)

should include an enterprise geographic information system and a condition based maintenance system for key distribution system assets.

Each project achieves cost savings and operational benefits, while simultaneously benefitting customers through increased reliability and more rapid outage response and restoration. The smart grid NMS provides an integrated view of near real-time distribution system performance, considering all relevant network information. Once implemented, the NMS will be an integral part of the utilities' state-of-the-art self-healing network.

### **Benefits of an integrated smart grid**

In a fully integrated distribution network, faults are detected by a field-installed component and localized via automated intelligent analysis. The fault can then be automatically isolated through communication to remote controllable switches on the network. Then, alternative power sources can be used to restore un-faulted sections of the feeder. Once the fault is cleared and power restored, communication with the smart meters helps to identify the possibility of nested outages. This capability provides the added benefit of proactively reducing the number of faults by providing critical data to improve ongoing vegetation management, line upgrade, and system maintenance programs.

Integrated automation also leads to improved decision-making as well as reduced potential for human error. This reduces service restoration time, resulting in improved customer satisfaction. The NMS also results in increased capacity utilization and responsiveness to unplanned outages and emergency operating conditions. It also supports increased capital investment efficiency results due to tighter design limits and optimized use of grid assets.

### **Where are the cost savings?**

In a final analysis, quantifiable cost savings have been identified in the areas of:

- Operator productivity
- Reduced telephone and radio communications time
- Improved switching plans
- Reduced switching plan review time, and
- Automated report generation.

Other benefits include training on standardized systems, promoting improved safety, and eliminating the need for secondary reviews by support staff. From a financial perspective, the utility expects to completely recover its investment in these systems in less than seven years.

The positive economics of a smart grid become achievable because the monitoring and control system communications infrastructure is integrated with the SmartMETER. A Smart Meter program is both a tactical solution to achieve meter reading and load management functionality as well as a strategic investment for smart grid and other future customer benefits. A combined Smart Meter and NMS lead to the next generation smart grid.

### **About General MicroGrids**

*Terry Mohn is the Chief Strategy Officer of General MicroGrids, which is located in San Diego. Balance Energy is focused on ensuring clean and renewable electric generation can reliably meet the demands of utilities, municipalities and communities.*

*Terry also presently serves as Vice Chairman of the GridWise Alliance, a consortium of public and private stakeholders who share a vision and stewardship that the nation's electric system must modernize for the country to remain competitive on the world market.*

*Terry was previously chief technology strategist for the Sempra Energy utilities. Prior to his energy roles, Terry was chief technology officer for an international broadband media company and founder of two other Internet companies.*