NERC CIP Compliant Smart Grid IP Network

by Dan Frein and Dan Belmont

Network expertise and a collaborative design process create the foundation for moving forward with a Utility of the Future network.

A major Midwest electric utility wanted to improve grid efficiency and make better use of its personnel—at the same time complying with new standards for securing "Critical Cyber Assets." Working with West Monroe Partners, the utility created a comprehensive IP network design that meets its operational and security requirements.

Creating a forward-looking network design.

A 500,000-meter Midwestern utility embarked on a long-term strategy to upgrade the operation of its electric power grid by investing in scalable networked infrastructure capabilities and IT systems that are capable of:

- Automating distribution system components
- Sending and receiving information from distributed intelligent devices and smart meters
- Using these linked networks to improve customer satisfaction and operational efficiencies

The utility's grid is not "intelligent"—that is, it is not able to re-route power around an outage on the fly. In addition, company personnel must travel to remote service areas in order to collect meter readings. By using Smart Grid technology and a far-reaching communication infrastructure, the utility would be able to automate many critical processes.

The utility wants to improve grid efficiency and make better use of its personnel. For example, by using Advanced Metering Infrastructure (AMI) meters that can report readings over the communications infrastructure, the utility can redeploy its employees to higher-value service calls. Improving grid efficiency also will enable the utility to produce more power in the future, without building new power plants. Finally, the utility hopes to:

- Manage outages in a more intelligent manner
- Gain better insight into overall grid usage
- Provide operational efficiencies and improve customer satisfaction
- Respond to new governmental priorities around Smart Grid technology; the new administration has set aside $4.5 billion for Smart Grid Initiatives as part of the American Recovery and Reinvestment Act

Tapping high-availability networking expertise.

On the recommendation of its strategy consultant, the utility initially hired West Monroe Partners to assist with planning for AMI and telecommunications components—a critical step in building the rate case for its regulators. West Monroe Partners offered a unique combination of information and communication technology experience and, in particular, the ability to help the company implement real-time controls through the use of wireless communication technologies.

Based on that work and West Monroe Partners' extensive experience designing highly available networks, the utility asked the firm to assist with the first phase of its Smart Grid design and implementation project. In particular, it looked to West Monroe Partners' IP networking design experience to create a high-level IP and architecture design that incorporated the chosen vendors for backbone, 2-way voice and data, AMI and broadband.

Complying with cyber-security requirements.

West Monroe Partners conducted a series of "workshops" to gather security requirements, followed by individual meetings with the vendors supplying the equipment. Once the project team had a strong understanding of how each vendor's equipment worked, West Monroe Partners began formulating a layered security design to manage the access and flow of the Smart Grid's data. One of the project's critical design considerations was compliance with the Critical Infrastructure Presentation (CIP) standards set for by the North American Electric Reliability Corporation (NERC). These standards provide a cyber security framework for identifying and protecting "Critical Cyber Assets."

Collaborating to win the support of all stakeholders.

West Monroe Partners' solution was a communication and IP design that allowed all of the proposed vendor products to interoperate, forming the "Utility of the Future" network.

Throughout the entire process, the project team worked with closely with utility stakeholders to validate the design ideas—ensuring that everyone had a say in the final product. In the end, the design was a hybrid of West Monroe Partners' suggestions and stakeholder requests.

The project team also created a cyber-security handbook that provided the utility with detailed instructions for maintaining compliance with the eight CIP standards—from incident reporting, to physical security requirements, to systems security management.

Gaining insight. Moving to the next stage.

By working with West Monroe Partners to complete this first phase of creating a "Utility of the Future" network, the company has gained a better understanding of how Smart Grid technology will interface with its existing systems. The utility's telecommunications and IT departments are sleeping more soundly knowing how to transport the massive amounts of data that come from the millions of intelligent devices that will be on their network in a reliable, efficient, cost effective, and very secure manner that is compliant with the NERC CIP standards.