



Vector Uses “Intelligent Substation” to Meet Customer Satisfaction Goals



Substation” to Meet Customer Satisfaction Goals

Vector is one of New Zealand’s largest network infrastructure companies with a portfolio of businesses and services delivering electricity, gas, and high-speed broadband voice and data communications throughout New Zealand. One of Vector’s core businesses is the delivery of high quality and reliable power to customers. To support their customer satisfaction goals, Vector recently upgraded its bulk metering system. The upgrade provided Vector with an opportunity to take the first steps toward an “intelligent substation” solution. The vision included direct data transmission over the Internet as well as high-speed Ethernet, automatically generated reports for data sharing within the company and with customers, and advanced power quality analysis.

Intelligence “Out-Of-The Box”

The upgrade required the replacement of older metering equipment, and master station software that manages substation systems including data collection. Vector selected a monitoring system based on PowerLogic® ION Enterprise® software from Power Measurement (now part of Schneider Electric). The software was chosen because it offered a complete, affordable, web-enabled solution “out-of-the-box.” Intelligent PowerLogic® ION® meters and software deliver real-time, revenue-accurate energy and power quality information over the Internet, as well as high-speed Ethernet, telephone, or wireless networks. The system can also send emails or serve data straight to web pages, so personnel have access to the same data at the same time, wherever they are.

Richard Schwass, System Integrator at Quasar Electronics, Power Measurement’s New Zealand distributor, handled the system design, implementation, and commissioning. He explains how the system improves operational efficiency by controlling peak demand at the bulk supply points: “ION® meters have been installed on every feeder at all points of supply where energy enters Vector’s network from the grid. At each point of supply, meter data is aggregated to provide the point of supply total. These points of supply are also aggregated to provide a network total.”



Controlling the Load

Each point of supply and the total system load have adjustable alarm limits, or targets, against instantaneous and ½-hour average values. Targets are set to ensure that demand does not exceed capacity from the grid at the points of supply. In real time, the amount of load that needs to be shed or restored is displayed on the system operator’s workstation. If a load is not controlled by the end of the current ½-hour interval, then an alarm is generated on the operator’s screen. This application ensures that Vector’s equipment is protected from overloading, and that demand charges from the utility are minimized. Ultimately, the reduced demand charges are reflected in reduced line charges to customers, reinforcing Vector’s commitment to service.

High Quality Power Guaranteed

ION® meters that monitor power quality are also installed within many of the city’s substations, enabling Vector to resolve power quality issues more quickly, and analyze disturbances to prevent future occurrences. “The ION7600 meters were specifically chosen for their ability to capture sag, swell, and transient waveforms at high resolutions,” continues Schwass. Every day, a detailed power quality report is automatically generated showing sag, swell, and transient waveforms for all meters in the system. This enables Vector personnel to easily analyze the city’s disturbances, and investigate further where necessary using PowerLogic® ION Enterprise software. Comprehensive power quality and reliability information verifies the quality of power delivered to customers against the published Vector Service Levels. At some substations, the system automatically sends an email alert whenever a power quality event occurs. Following the alert, a detailed power quality report is then automatically produced and sent via email as a value-added service to select customers.

Increased Power System Stability

Under-frequency is a change to the power system frequency that can occur when there is not enough power generated to meet the demand. If under-frequency continues, a power system can collapse. As a corrective measure, load curtailment is typically implemented. “Vector’s energy management system increases network stability by automatically initiating load curtailment during under-frequency events,” comments Schwass. “The system’s real-time monitoring and high-speed communications enable Vector to immediately and accurately verify energy usage and curtailment activities.” Similar to a power quality event, an alert message is automatically emailed to key personnel when an under-frequency event occurs. At the end of the under-frequency event, automated reports are emailed with a high-resolution capture of conditions before, during, and after the event.



SQUARE D

by **Schneider Electric**



Lowered Equipment Maintenance

The ION[®] system enabled Vector to reduce the amount of equipment at each location, lowering equipment maintenance and replacement costs. For example, the instantaneous values recorded by the ION[®] 7600 meters enabled Vector to discard its original PSI data logging equipment. In addition, the system provides functionality that replaces an under-frequency relay, by combining meter functionality with PowerLogic[®] ION Enterprise software to signal an under-frequency trip. The new system also maximizes the value of existing infrastructure because it allows the original CT terminal blocks to be retained as the connection point for wiring the new equipment, and as a point to short the CT circuits.

Existing Communications Networks Leveraged

The ION[®] meters’ multiple communication ports make it possible for the system to use redundant communication architecture and a range of protocols (including ION[®], Modbus RTU, and DNP 3.0), to minimize the risk of a total loss of metering information being transferred from a single point of supply. For reduced installation and data acquisition costs, many substations are linked directly to Vector’s LAN/WAN, a sophisticated Ethernet-based IP routed communication network owned by Vector Communications, a wholly-owned subsidiary of Vector. These substations use the ION[®] protocol via high-speed Ethernet connections to provide data to the PowerLogic ION Enterprise[®] servers at the Control Center. For substations not linked directly to the LAN/WAN, some are connected to the backbone via DSL, which provides Ethernet communications over Vector’s existing copper telephone wires, while others are connected using GSM modems, polled twice daily.

Linking to SCADA

The PowerLogic[®] ION Enterprise servers are able to communicate with Vector’s new SCADA system over a serial connection, using the Modbus communication protocol to share metering data. If necessary in the future, the ION[®] meters’ serial communication links can be easily switched to the DNP 3.0 protocol, so that they can connect directly to the SCADA servers.

Significant ROI

Demand control at bulk supply points and under-frequency load curtailment enable Vector to contribute to grid stability, while avoiding penalty demand charges from the utility. Vector’s savings were so significant that the energy management system paid for itself within its first year.



Further Steps toward Intelligent Networks

Presently, Vector is collaborating with the national grid operator Transpower in a trial project for sharing data from ION® intelligent revenue and power quality meters being installed at the new Silverdale substation, north of Auckland. Keith Hitchings, Managing Director of Quasar Electronics notes: “Initially, Transpower will use the data for revenue purposes, accessing it via MV-90 protocol. Future possibilities include serving the wealth of meter information to all interested parties within the company via Ethernet. This metering innovation delivers real benefits and is a further step toward intelligent networks.”

Success in the Present and Future

According to Vector’s Protection and Control Manager, Zhelyko Popovich, the system is of great benefit to both the company and its customers. “It provides Vector with the essential information to better control the price, quality, and reliability of power delivered to our customers.”

And future success is anticipated. The intelligence provided by the ION® system will enable Vector and its customers, including distributed generator owners, to participate profitably in a far more dynamic deregulated energy market expected in the near future.

Vector’s first steps toward an “intelligent substation” solution have gone a long way, contributing to continued customer satisfaction with value-added services, and the ongoing delivery of reliable, high quality power.

Schneider Electric - North American Operating Division
295 Tech Park Drive
LaVergne, TN 37086
Tel: 866-466-7627 Toll Free
PowerLogic.com



by **Schneider** Electric

Square D, PowerLogic, System Manager and Modbus are trademarks or registered trademarks of Schneider Electric and/or its affiliates in the United States and/or other countries. Other marks used herein are the property of their respective owners.