



Engineers now have 24-hour access to critical energy data

## Application:

Remote substation monitoring

## System:

ION® 7700 meters  
ION® 7600 meters  
ION Enterprise® software

## Benefits:

- ◆ Increased reliability
- ◆ Improved power quality
- ◆ Expandability

## Powercor Maximizes Reliability on the Australian Grid

As Victoria's largest electricity distributor, Powercor Australia devotes considerable energy to maintaining and developing the quality and reliability of the power it delivers to its customers. Although not an electricity retailer, Powercor owns and operates a distribution network delivering electricity across 76,000 km of circuits to more than 600,000 premises throughout Western Victoria, from Melbourne's western suburbs to the borders of South Australia and New South Wales.

### Investing in Growth

The company has grown considerably since its formation in 1996, and continues to add more than 10,000 new connections to its distribution network each year. To guarantee its customers a reliable source of quality power, Powercor Australia invests \$100 million AUD each year in maintenance and development, and since 2000, has pumped a further \$10 million into its distribution infrastructure.

When Powercor embarked upon a major upgrade of 55 zone substations, plus several strategic customer-related installations, it installed a network of intelligent energy meters and software. The goal was to enable Powercor engineers to remotely monitor and control conditions at each zone substation, and to optimize power quality and reliability across the entire distribution network spanning more than 74,000 substations.

According to Joe Thomas, network planning manager for Powercor Australia, the decision to upgrade the company's distribution network was motivated by several factors, including a regulator's requirement to report any voltage fluctuations occurring at the 22kV supply points of each zone substation.

### Commitment to Quality

To align with annual network performance targets set by Victoria's Essential Services Commission, Powercor must maintain high-quality "Guaranteed Service Levels" to each of its customers.

To ensure this safe, reliable and high-quality electricity supply, the company's Network Planning group identified a need for remote access to detailed energy-metering data from each zone substation. They also required tools to help pinpoint potentially damaging conditions, such as excessive harmonic frequencies, sags and swells, transients, and phase unbalance.

"Aside from a few protection relays, the zone substations originally offered very basic equipment for metering, and no capacity for monitoring power-quality conditions such as transients or sags and swells," explains Thomas. "We knew that a more comprehensive system for monitoring energy would provide our Network Planning group with the type of detailed metering data necessary to make informed system-augmentation decisions."

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# Case Study: Utility

## Accurate Usage Tracking

According to Thomas, the Network Planning group also needed a way to gather accurate consumption data to better assess customer usage patterns, and proactively prepare for periods of increased power consumption. "Although energy consumption is high throughout Australia's winter months (June through August), demand increases significantly in the summer (December through February) mainly due to the increased use of equipment such as air conditioning and cooling storage units," says Thomas. "We knew that creating a profile of energy consumption across the entire distribution network, and using this information for trending system quantities on an ongoing basis would be invaluable to support decision making."

## Enterprise Energy Management, Region-Wide

To meet these exacting requirements, Powercor installed an ION® enterprise energy management ("EEM") system. With the assistance of the regional representative for ION technology, Eltec Energy Services, Powercor equipped its zone substations with ION® 7600 or ION® 7700 intelligent energy meters, and connected the meters to a centrally located computer workstation running ION Enterprise® energy management software. Each meter was configured to collect detailed power quality and energy data at source, and provide it to the ION Enterprise software server located at Powercor's head office. Once the EEM system was brought online, the software could automatically monitor each meter in the network, analyze the data, and notify personnel of any threats to power quality or reliability.

Because of the remote locations and considerable distances involved, each meter was equipped with expanded onboard memory to accommodate additional data in the event of a communications interruption. Although the meters currently communicate with the head-end software via modem, Powercor is upgrading its communication's network to Ethernet over fiber for improved speed and reliability.

At each zone substation, the ION meters measure electricity delivered to the substation at 66kV, and leaving the substation at 22kV. Additionally, they monitor power quality parameters such as sags and swells, transients, harmonics, flicker, voltage unbalance and current unbalance. To monitor consumption across the entire distribution network, the system automatically records total kWh as interval data logs, presenting this information as monthly reports. The company plans to install additional meters at the terminal stations that supply power to the Powercor network.

## Controlling Power Quality and Reliability

The end result is an enterprise-wide energy management system that provides real-time power monitoring and control capability across the entire distribution network. With 24-hour access to each zone substation, energy managers can now review real-time conditions and accurate system data from multiple metering points to help determine effective maintenance strategies, or assess potential trouble spots.

The system also delivers alarm notifications to alert staff of conditions requiring an immediate response. For example, the ability to trend harmonics is a key benefit of the system; if left unchecked, harmonics can severely damage electrical equipment, overheating transformers, conductors, capacitors, and motors. "Due to the many new and varied technologies used by our customers, harmonics are an ever-increasing challenge," confirms Thomas. "But with our improved power-quality monitoring capabilities, we can quickly identify potential trouble spots and take corrective action before reliability can be affected."

The ability to remotely identify potential trouble spots has also helped Powercor improve reliability through enhanced awareness, increased efficiency, and reduced response time. Although Powercor employs comprehensive mitigation strategies to help minimize supply interruptions caused by bushfires, pole fires and wildlife, occasional damage or disruption along a line still occurs, resulting in potentially damaging variations in voltage levels. By rapidly pinpointing the source of a problem and alerting staff, Powercor's energy management network helps maintenance crews respond quickly and efficiently to minimize damage and remove threats to reliability.

## Identify and Protect Weak Spots

Powercor recently used its enhanced metering capability to monitor the effect of a hot water peak load which existed on a very weak network. "Our data illustrated how the distribution system tended towards voltage instability," explains Thomas. "Using the system, we identified voltage regulators that were unable to coordinate or respond fast enough, and were able to quickly address the situation." Although Powercor's Network Planning engineers are among the EEM system's primary users, the detailed energy information it provides has also proven useful to protection engineers, operations engineers, and regional managers throughout the organization.

## Profile Every Substation

Additionally, the meters' high sampling rate provides impressive power quality analysis to help staff identify geographical areas that may be susceptible to transient events. This capability also allows Powercor's network planning team to view actual network voltages that result from changing system conditions, and develop a profile for each zone substation supply point. With this combined information on transients, sags and swells, personnel can better understand plant capability requirements across each segment of the network.



The ION 7600 meter

By upgrading its zone substations with advanced power monitoring and control technology, Powercor Australia now has the tools to track energy consumption, analyze power-quality conditions, and maximize reliability throughout its extensive distribution network.

This initiative is one of the key strategies and programs that guarantee Powercor Australia customers a safe, reliable and affordable supply of high-quality electricity.



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