



# The Hydro One Smart Network

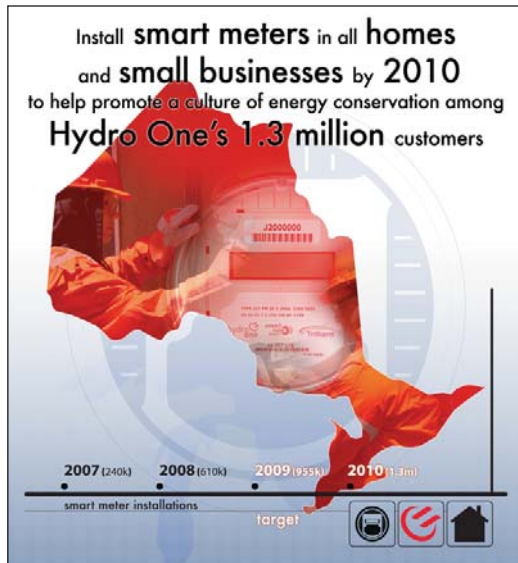
## The Future Has Arrived

Hydro One Networks Inc., wholly owned by the Province of Ontario, delivers electricity safely, reliably and responsibly to homes and businesses across the province. The company owns and operates Ontario's 29,000 kilometer (km) high-voltage transmission network that delivers electricity to large industrial customers and municipal utilities, as well as a 122,000 km low voltage distribution system that serves approximately 1.3 million end-use customers and smaller municipal utilities.

### The Situation

Between now and 2025, Ontario must build almost a whole new electricity system. This includes replacing about 80% of its current generating facilities as they retire over time, and expanding the system to meet future growth. Building new supply will be vital. But so will energy conservation and demand management. That's why the provincial government directed all local distribution companies to install smart meters in every home and small business in the province by 2010. Smart meters, when teamed with time-of-use pricing, are a key part of building a culture of conservation across the province and achieving significant reductions in peak demand through load shifting.

The scope of this challenge for Hydro One, the province's largest electricity distributor, is formidable. Hydro One's service territory has a land mass twice the size of Texas, and its 1.3 million customer base is a mix of urban, rural, and remote customers, some accessible only by air, rail, boat, or snowmobile.



*“We are implementing a highly functional and upgradable AMI solution for our 1.3 million customers.”*

Myles D'Arcey  
SVP Customer Operations  
Hydro One Networks Inc.

### Hydro One's Advanced Metering Infrastructure (AMI) Vision

Hydro One's vision is to deploy a smart meter and intelligent communications network solution to meet the provincial government's goals at the lowest possible cost; and one that is an enabler for future enterprise-wide business efficiencies, modernization of distribution infrastructure, and enhanced customer service. To accomplish this task, Hydro One assembled a strong team of industry leaders to develop its vision for an end-to-end solution that embraces open standards and Internet Protocols (IP) at all communication levels.

Hydro One's award winning smart meter solution is built on an intelligent communications network foundation that maximizes flexibility and interoperability to meet both provincial energy management needs and the needs of the smart network/grid of the future. The solution rests on a secure foundation that is non-proprietary,



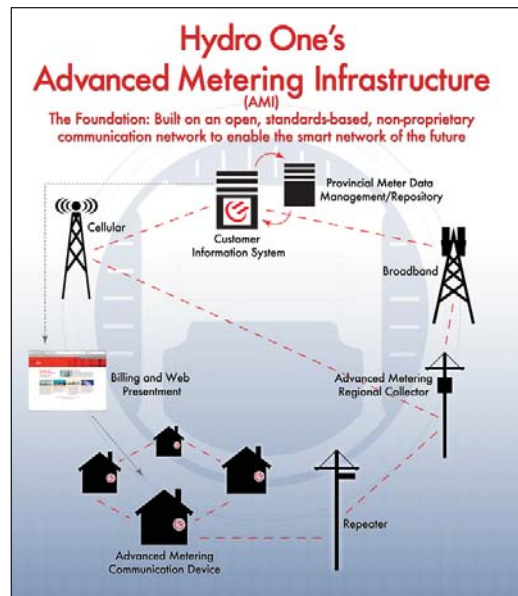
*“This team leverages business partners and hundreds of utility field personnel who actively seek assignment to our challenging and exciting Smart Meter Project. Having worked on numerous projects during my time with Hydro One, I have never seen such a diverse, professional and capable team come together.”*

Rick Stevens  
Director, Development  
Strategies  
Hydro One Networks Inc.

high bandwidth enabling, and based on industry standards. These elements enable the utilization of data from many types of devices from a broad range of leading manufacturers—meters, load control, in-home displays, distribution monitoring and control—by posting and making the information available to numerous enterprise applications, such as customer information systems, outage management, asset management, GIS, and work execution systems.

Hydro One’s AMI solution architecture is comprised of a two-way self-healing mesh radio network based on the global 2.4 GHz IEEE 802.15.4 standard. The solution provides the flexibility to accommodate cellular, broadband, or fibre WAN backhaul capability. Somewhat unique to AMI deployments, the province has established a centralized Meter Data Management Repository (MDMR) to efficiently serve the needs of all local distribution companies across the province.

**Smart Meter & Network Deployment**



The logistical challenges associated with replacing 1.3 million meters with a geographically dispersed work force are

significant. The first step in the process was to field test the processes, procedures, and tools with a deployment of 15,000 meters to discover lessons learned that could be applied to the mass deployment of meters. One of the unique aspects of this pilot was the design and implementation of a paperless change meter order process, an application that delivers and processes orders electronically from Hydro One’s Smart Meter Control Centre to “hand held” devices and back—eliminating paper entirely from the process. This new application has led to efficiency gains of over 90% in the manual intervention of change meter orders.

While meter installers were field testing tools and procedures, a market research firm was following behind, gathering customer feedback on the installation process and education materials. The results of the customer survey speak for themselves—over 90% of customers surveyed were very pleased with the process and over 80% of customers felt the information provided by Hydro One was useful and informative.

After successfully completing the pilot and incorporating lessons learned, Hydro One staff began the work of safely and efficiently deploying the AMI infrastructure across the province. In 2007, the project surpassed its share of the provincial government’s objective by installing over 240,000 meters. As of December 2008, over 700,000 meters from three major meter manufacturers have been installed, exceeding the installation target of 610,000 meters by the end of 2008. The project is on track for installation of 1.3 million meters by 2010.

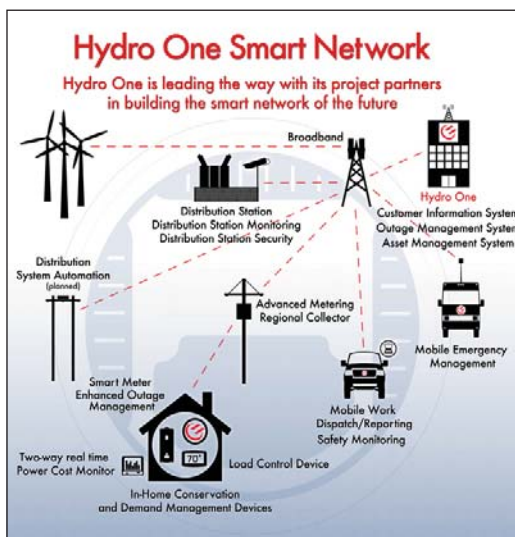
With a significant number of meters deployed and the roll-out of the communication network, automated meter reading for conventional billing was launched in June 2008. Upon successful integration testing with the provincial MDMR (expected in 2009), customers will begin the transition from conventional rates to time-of-use pricing.

## Building the Smart Network of the Future Today

The benefits of smart metering and time-of-use rates are numerous and well documented—streamlining meter reading operations, providing consumers with superior information and the opportunity to better manage bills, reducing strain on power systems during peak periods and decreasing environmental impact—to name just a few. But equally important, Hydro One’s intelligent communications infrastructure has laid the foundation for the smart grid of the future—a smart network that will integrate energy efficiency, demand response, automation and distributed generation to enable the grid to operate more efficiently and reliably. Further still, it will enable enterprise-wide business efficiencies that will drive cost reductions and improved customer service over Hydro One’s extensive service territory.

Hydro One and its project partners are not just planning for the smart network of the future, they’re developing it today through a series of smart grid initiatives. These initiatives are employing numerous smart network and smart home technologies enabled by an integrated combination of standards-based mesh radio and state-of-the-art WiMAX wireless technology, including:

- Distribution station and security monitoring;
- Mobile work dispatch and accomplishment reporting;
- Automated vehicle locate safety monitoring;
- Emergency management vehicle communications;
- Time-of-use rate pilot in combination with real-time energy monitors;
- Automated two-way communicating home thermostats; and
- In-home two-way real-time energy monitors.



Other planned initiatives also include distribution system automation, outage management, theft detection, remote disconnect, and additional in-home energy management consumer tools.

## The Results to Date

Hydro One and its project partners continue to execute steadily against project objectives. Initial meter deployments began in late 2006 and, in December 2008, meter deployment surpassed the notable milestone of 700,000 meters installed. With the communication network now being aggressively rolled out across the province, automated meter reading for conventional billing began in June 2008 followed by integration testing with the provincial MDMR in advance of time-of-use billing expected in 2009.

In parallel with the core smart metering stream of work, other smart grid initiatives are being validated, assessing both basic functionality and effectiveness of key elements of the smart network. Today, a distribution station, previously not monitored due to prohibitive costs, is being monitored wirelessly through a remote terminal unit and security camera. Work previously requiring a physical visit to a field office is now being pushed wirelessly to

*Hydro One's Smart Meter Project was selected by an international panel of judges as the winner of the Utility Planning Network's "2007 Metering Award".*

the field and work accomplishment reported in real-time. And customers have begun to see the benefits of in-home automation through such devices as two-way, real-time energy monitors and automated thermostats. In a soon to be published study testing the effectiveness of time-of use rates and in-home real-time monitors, initial results show that customers shifted their load on average 5.5% and on hot days (above 30° C) a full 8.5%!

### Project Partners

Hydro One and its project partners are actively and progressively advancing its vision of the smart network of the future today to realize increases in system reliability, distribution system automation, enterprise-wide business efficiencies, and enhanced customer service.



Capgemini, an integral part of the project team, is responsible for new systems integration, field services, legacy systems management, integrated process design and operational services. With deep experience managing large-scale projects like smart meter deployments, Capgemini brings a clear, well-developed, practical approach to implementing this new generation AMI. They work closely with Hydro One, using a robust proven governance model which smoothly manages the 12 discrete work streams. [www.capgemini.com](http://www.capgemini.com)



GE Energy is supplying smart meters for Hydro One's smart network project. GE Energy is a Smart Grid solutions partner to the electrical distribution industry, enabling utilities to boost productivity and increase reliability while at the same time reducing their environment footprint. Integrating real-time data and information management systems, GE's grid intelligence solutions optimize enterprise management and asset performance and will empower consumers to control and monitor

their electricity spend and usage. GE's unique combination of revolutionary Smart Grid technology, vast resources and business partnerships enable utilities, businesses, and consumers to work together and overcome the energy and environmental challenges now facing our planet. [www.ge.com](http://www.ge.com)



Motorola is a long term supplier of wireless communication systems and services to Hydro One for its mission and business critical voice and data applications. Motorola provides industry leading broadband wireless communication solutions and services designed to support Hydro One's AMI and other Smart Network applications. Motorola, a fortune 100 company with global presence and impact, is a leading provider of utility and government mobility solutions including voice, mobile and fixed advanced data capture, RFID and private wireless local and wide area networks, creating a seamless flow of information — securely connecting the utility's critical infrastructure, customers and work teams in real-time to enable the creation of a truly Connected Utility. [www.motorola.com/utility](http://www.motorola.com/utility)



Trilliant Incorporated, Hydro One's AMI vendor partner, is providing the 2.4 GHz RF mesh intelligent communications infrastructure, head-end software applications and 1.3 million smart meters to be installed by Hydro One. Trilliant's solution is part of the central nervous system for the smart grid, providing intelligent communications that interconnect devices from a range of leading manufacturers supporting advanced metering, demand response and other smart grid solutions. Hydro One has already deployed meters from three major meter manufacturers as well as in-premise based smart thermostats and in-home displays all operating under a common communications network. [www.trilliantinc.com](http://www.trilliantinc.com)



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