

Smart Grid Technology

Emerging technologies that integrate communications and control technology on our increasingly complex power system hold the potential to help integrate renewable energy, enhance system reliability and allow consumers to make more informed and timely choices about how they use electricity.

What is smart grid?

Smart grid generally refers to modernization of the electrical system that supports the introduction of new products and services and enhances communication between the system controller, participants and customers. These increased communication capabilities are designed to support reliability standards, provide enhanced metering, and enhance the operation of the market.

Benefits of smart grid technology

A type of smart grid technology called advanced metering infrastructure (AMI) enables consumers to control how much electricity they use by adjusting their consumption in response to changes in the price of electricity. In this way, AMI technology has the potential to affect the way consumers use electricity by shifting demand for electricity from higher cost, peak times to periods when demand, and therefore electricity prices, is lower. Other benefits include:

Changing consumption patterns - In the long term, the real-time benefits of smart grid technology could influence a shift of our electricity consumption patterns and have the potential to increase how efficiently we produce and transmit electricity in the province. By helping consumers better understand their power consumption patterns, and rewarding consumers for using power at times outside the dinner hour or peak, smart grid technologies could help lower the peak power requirements of our grid, making the power consumption of the grid more balanced over a 24-hour period. For example, consumers could save money by running their dishwashers at 10:00 p.m. This could be beneficial in jurisdictions where the electric system has a lower load factor, has high average electricity prices, and residential loads make up a significant part of the system load.

Delivering greener power options - Smart grid technology has the potential to enhance our ability to deliver greener power options from areas in the province with an abundance of solar or wind power and to pull energy from micro-generators like solar panels and small wind turbines on rooftops. By providing a better means to measure and monitor power delivered to the grid from micro-generators, including wind and solar generation, system operators are better equipped to operate the grid reliably and efficiently while accommodating an increased number of new participants in the energy market. In the same way, smart grid technologies could enhance abilities to accommodate energy storage options (storing power when it is cheap to generate and releasing it when it is needed so demand is more uniform). A plug-in electric vehicle in your garage could actually serve as a reservoir of power for the electricity grid, with your smart meter monitoring the power delivered back to the utility.

Managing the grid more efficiently - Smart grid technology could enhance the Alberta Electric System Operator (AESO)'s ability to more rapidly analyze disturbances on the grid, reduce power system losses, and increase the utilization of existing transmission equipment for power delivery. This would also improve our ability to manage outages, reducing customer impact and allowing speedier recovery from system problems.

What is the AESO doing to keep pace with the changing technology?

In Alberta, several electricity distribution companies have installed automated metering systems and initiated pilot projects to evaluate AMI and smart meters. In addition, reinforcements to the transmission grid are currently underway, incorporating aspects of smart grid technology: These include:

- Major alternating current (AC) expansions, which include application of Flexible AC Transmission (FACTS) technology, in southern Alberta to accommodate wind power interconnections.
- High voltage direct current (HVDC) transmission between Edmonton and Calgary. HVDC technology enables power to be transferred in either direction, increasing operating efficiency and providing the flexibility necessary to integrate variable generation sources like wind power.

The AESO, in coordination with Alberta's Transmission Facility Owners, has developed a long-range telecommunications plan, part of which has been included in the AESO's 2011 Long-term Transmission Plan. A key component of the telecommunications plan entails the application of fibre optic communication technology as part of major transmission line infrastructure. This change will position us well in the future to be able to accommodate the vast amounts of data exchange required as part of the evolution of a smart grid.

Recognizing the importance of this emerging technology, during 2010 the AESO participated in the Alberta Utilities Commission (AUC)'s inquiry to identify the current status, objectives, barriers and requirements related to smart grid. The AUC's report, ***Alberta Smart Grid Inquiry - January 31, 2011***, was released in June 2011.

The AESO will continue to monitor industry technological trends on an ongoing basis and to leverage new technologies such as smart grid to enhance system reliability, customer choice and overall efficiency for all Albertans.