AUC
Alberta Utilities Commission

Alberta Smart Grid Inquiry

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The Alberta Utilities Commission
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Introduction

This is the report of the Alberta Utilities Commission (AUC or Commission) in response to Order-in-Council 93/2010 in which the Lieutenant Governor in Council requires the Commission to inquire into and report to the Minister of Energy on the Alberta Smart Grid.[1] The purpose of the Inquiry is to provide information to the Government of Alberta so that it can consider implementing policies supporting the deployment of smart grid technology in support of achieving the goals of Alberta's Provincial Energy Strategy.[2] Those goals are clean energy production, wise energy use and sustained economic prosperity.

The Commission's role is not to make policy recommendations. Rather, the Commission provides the government with information necessary to make informed policy decisions and in this report the Commission has provided a cost-benefit methodology to assist the government in assessing some policy options. The Commission opened a proceeding to solicit submissions from the industry and the public. Fifty-eight participants registered in the proceeding. Thirty-eight participants answered the 67 written questions posed by the Commission at the start of the proceeding. Nine participants replied to the submissions of others. In October 2010, 19 participants took part in the oral proceedings that occurred over two days in Calgary, and 10 participants appeared in the proceedings held in Edmonton.

The Inquiry process allowed interested stakeholders in Alberta's electricity industry to share their experiences and ideas with the Commission on a number of complex issues including the pace and timing for deploying smart technologies, approaches for conducting cost-benefit analyses, standards regarding interoperability and security, customer data privacy and access and other issues. This stakeholder input provided helpful information that has been incorporated into this report. In the end, the information accumulated from the Inquiry should enhance the identification of any required policies and the development of the approach needed to support the policy goals set out in Alberta's Provincial Energy Strategy while maximizing the benefits of a modernized electricity grid.

What is smart grid?

Smart grid is a broad concept that describes the integration of hardware, software, computer monitoring and control technologies, and modern communications networks into an electricity grid. The attractiveness of the smart grid is its promise of helping electric utilities become more efficient and effective in operating generation, transmission and distribution networks, helping with the integration of more renewable and variable energy sources into the grid and empowering consumers with greater information and the capability to control their electricity consumption and costs.

In the Order-in-Council, the government characterized the smart grid as the modernization of Alberta's electricity system, through the application of advanced control and information technology, to meet the future needs of the province. The government stated that the characteristics of the smart grid include, but are not limited to:

[1] See Appendix 1 – Order-in-Council and Inquiry process.
[2] Exhibit 4.01, Alberta's Provincial Energy Strategy.

The societal benefit from smart meters and AMI is the more efficient use of resources as customers, faced with retail prices that more closely reflect changes in the Alberta power pool prices, adjust their use during various time periods so that the value to them of the electricity they use more closely reflects the resources used to supply that electricity. Additional societal benefits may result if, for example, there is a reduction in peak demand which curtails future expansion of transmission or distribution infrastructure, reduces peak wholesale electricity prices and/or reduces CO_2 or other emissions as consumers change their electricity use.

Many participants in the Inquiry expressed reservations about whether these potential consumer and societal benefits could actually be achieved in Alberta through the introduction of multi-period pricing plans because of the unique market and structural circumstances. In particular, participants pointed to Alberta's high load factor (average usage as a percentage of peak usage), the large portion of the residential customer's bill that does not vary with use, the competitive power pool, the types of generation (primarily coal-fired and natural gas-fired), peak demand periods that do not necessarily correspond to peak pricing events, and peak pricing events that do not necessarily correspond to peak demand periods, the small percentage of electrical energy usage by residential and small commercial customers (who do not currently have time-of-use meters or pricing available to them), the absence of significant residential air conditioning load (which results in high peak usage in summer months in some jurisdictions) and the operation of the competitive retail market, all as limiting the potential benefits from multi-period pricing and, therefore, from smart meters and AMI.

Other potential benefits from the deployment of smart meters and AMI have been claimed in other jurisdictions. For example, in Texas one of the benefits cited for the roll-out of AMI is that it will provide more choices for customers in the competitive retail market.[103] In Ontario and the United States, governments have embraced smart grid deployment, including smart meters, as a way to create jobs and stimulate economic recovery. None of the participants appearing at this Inquiry, however, argued that smart grid technologies should be deployed in Alberta for these reasons or that the Alberta government should fund this deployment.

Current smart meter deployment in Alberta

In Alberta, industrial and large commercial customers account for approximately 70 per cent of overall electricity consumption. These customers are generally already equipped with smart meters (referred to as interval meters) that allow for detailed multi-period pricing and real-time or near real-time meter reading.[104] Interval meters record the amount of energy used at a site as well as the peak usage (called demand) during a specified period of time. This information is recorded on separate registers within the meter in 15 minute intervals. Consumption is measured

[103] Texas House Bill 2129 (79R) Section 8. ~~I~~In recognition that …new metering and meter information technologies, have the potential to increase the reliability of the regional electrical network, encourage dynamic pricing and demand response, make better use of transmission and generation assets, and provide more choices for consumers, the legislature encourages the adoption of these technologies by electric utilities in this state."

[104] Currently there are approximately 7,000 interval meters installed in the province mainly at industrial and large commercial sites. The amount of electrical energy that these interval-metered sites are consuming on an annual basis represents approximately 60 per cent of the total electrical energy consumption in the province. Interval meters are not new, but they are similar to smart meters in the ability to record consumption data for multiple price periods. They are also connected to the distribution entities business offices by electronic communications. Many of the interval meters have direct real-time communications with the customers' operations. For the purposes of this report interval meters will be considered smart meters.

in kilowatt hours (kWh) or megawatt hours (MWh), while demand is measured in kilowatts (kW), megawatts (MW) or kilovolt amperes (kVA).

Since the introduction of competition in the retail market, a market rule has been in place that requires sites with a peak demand over two megawatts to have an interval meter. Each distribution entity, in its terms and conditions for service, can establish its own threshold for when an interval meter is required at a site. Sites that register demand as low as 150 kVA (which on a comparative basis is significantly less than two megawatts, essentially being 150 kW) are now being equipped with interval meters. The move to installing interval meters at a lower demand threshold level was due in part to distribution entities responding to customers' requests for more detailed information regarding electric energy usage and to the distribution entities' desire to operate their system more efficiently and bill more accurately.[105]

Interval meters can also be equipped with pulse outputs. Pulse outputs allow the customer to connect consumption monitoring and control equipment to the meter to obtain real-time data about various metered quantities, such as consumption and demand. Commercial and industrial customers can then use the data provided by the meter output pulses, in conjunction with pool price information, to make informed decisions regarding energy usage.

Distribution entities obtain interval meter pulse data through the use of a telecommunications system – typically by a telephone landline or by a wireless communications device. The data is collected on a daily basis by the distribution entity in its interval meter data collection system, validated by the distribution entity, converted from the pulse data into meter reads and then sent through electronic communications to the load settlement agent and retailers for their load calculation and billing processes.[106] The communications infrastructure, billing and settlement systems, as well as data storage systems sufficient to employ these meters are already in place for these customers.

Residential customers and small commercial customers account for approximately 30 per cent of overall electricity consumption in Alberta. Typically, they have cumulative meters that only measure how much electricity was used in total since the last time the meters were read. Readings are taken either visually or by radio frequency, and entered into a hand-held device for manual meter reading. At the end of the day, all meter information collected is downloaded into the meter data management system, in which the validation, edits, and estimation are performed in order to ensure the data accuracy. Some of these meters are electromechanical meters and some are capable of automatic meter reading. Even where smart meters capable of measuring electricity usage at multiple time periods are in place, however, the meters continue to be used in the same way cumulative meters are used. The price structures necessary to take advantage of those capabilities are not offered, and the communications infrastructure, billing systems, as well

[105] ENMAX: "The move to interval meters at the 150 kVA level will provide customers with enhanced information to make improved consumption decisions and have the potential for additional supply contract offerings from the retailer of their choice.", online: http://www.enmax.com/Power/Tariffs/Our+Tariffs/Interval+Meter+Threshold.htm.
FortisAlberta: "Interval metering measures the amount of energy used at a site and sends in the meter data to a recorder in 15-minute intervals. Interval meters and related equipment are installed for a customer who has a demand of 333 kW or greater. Newer electronic meters have a built in recorder that captures interval data", online: http://www.fortisalberta.com/Default.aspx?cid=70&lang=1.

[106] See Appendix 7 – Smart metering technologies and related matters for more information.

as data storage systems necessary to fully employ those functions, are not in place, although the existing settlement system is capable of hourly settlement.

Few residential and small commercial customers in Alberta have smart meters installed at their home or premises. However, FortisAlberta Inc.,[107] has installed meters for remote meter reading in its service area in order to reduce its meter reading costs. ATCO Electric Ltd.[108] has installed remote meter reading capability on electromechanical meters in its service area to reduce meter reading costs. Both of these companies serve primarily rural areas and employ power line carrier analog communications systems to carry the meter data back to the distribution company business office. The City of Lethbridge[109] electric utility has also deployed automatic meter reading in order to reduce meter reading costs. The SAREA recently replaced all of its meters with smart meters capable of providing remote meter reading functions[110] and also capable of providing multi-period usage information. However, the SAREA has chosen not to employ or even record the multi-period usage information at this time. It collects usage data and bills customers as though the meters were traditional cumulative meters.

EPCOR Distribution & Transmission Inc. recently applied to the Alberta Utilities Commission to remove 10,000 old cumulative meters and replace them with smart meters in order to realize operational benefits such as remote meter reading. The Commission denied the application for two reasons: that the business case for the project was not well founded and the absence of a provincial smart meter policy.[111]

Currently in Alberta, limited automatic meter reading is deployed. Other than the power line carrier communications links deployed by FortisAlberta Inc. and ATCO Electric Ltd., it appears from the record of the Inquiry that virtually none of the distribution entities have electronic communications systems in place that would allow the meter to communicate directly with the distribution entities‘ business office systems.[112]

Deployment of smart meters and advanced metering infrastructure (AMI)

The decision whether to deploy smart meters and AMI and, if so, how it might be deployed, depends on the unique characteristics of the jurisdiction in which the deployment is being considered and the unique circumstances of each distribution company. Not all of the potential benefits of smart meters and AMI can necessarily be realized in all jurisdictions or by all companies. In Alberta, there are a number of unique characteristics that must be addressed when considering mandated smart meter and AMI deployment with multi-period pricing plans for residential and small commercial customers.

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107 Exhibit 100.02, FortisAlberta Response to Commission Question 12.

108 Exhibit 91.01, ATCO Electric Response to Commission Question 12.

109 Exhibit 69.01, Cities of Red Deer and Lethbridge Response to Commission Question 12.

110 SAREA currently reads these meters monthly by arranging for a fly-over to collect meter data through a radio signal [Transcript, Volume 3, page 724]. The communications device in the meter used for remote meter reading is a transponder that emits radio waves that are picked up by an aircraft as it flies over the meter sites.

111 AUC Decision 2010-505: EPCOR Distribution & Transmission Inc., 2010-2011 Phase I Distribution Tariff, 2010-2011 Transmission Facility Owner Tariff, Application No. 1605759, Proceeding ID. 437, October 28, 2010, page 60.

112 Although all distribution entities do have electronic communications systems in place or through third party providers to provide the back office billing, settlement and data storage necessary to comply with the requirements of the competitive generation and retail markets.