util-assist

utility strategic operational assistance

Cornerstone Hydro Electric Concepts

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Executive Summary

In June of 2004, the Minister of Energy issued a Directive under Section 27.1 of the *Ontario Energy Board Act,* 1998 which required the Board to develop and, upon approval by the Minister of Energy, implement a plan to achieve the government's objectives for the deployment of smart electricity meters. In conjunction with the development of its implementation plan, the Directive also required the Board to examine the need for and effectiveness of time of use rates for non-commodity charges - in addition to season/time-based standard supply service commodity rates the Board is already in a position to establish - to complement the implementation of and maximize the benefits of smart meters.

The provincial Smart Meter Initiative would stem from this Directive and all Local Distribution Companies (LDCs) in Ontario would be heavily involved in creating a conservation culture in Ontario and making the Province a North American leader in energy efficiency. Key initiatives included the introduction of flexible, time-of-use pricing for electricity, and a targeted reduction in Ontario's energy consumption of 5%.

The provincial initiative mandated the installation of a smart electricity meter in every Ontario home by December 31, 2010, with the interim goal of 800,000 meters being deployed by December 31, 2007. The underlying premise behind the mandate to install these meters was to educate customers on their consumption habits and to implement new rate structures that encouraged load shifting and conservation of energy, thereby reducing the requirement for increased power generation capabilities.

This was an enormous undertaking for all LDCs; a project that took months of planning and carefully managed execution. To accommodate the needs of the Ministry of Energy and Infrastructure, CHEC members installed approximately 110,000 meters to fulfill their requirements for the mandate. Combined with the magnitude of the metering project, members also had the challenge of choosing technologies and installation service providers that could accommodate the stated requirements within their diverse LDC service territories.

Other Ontario Regulations that applied to the initiative include:

Reg. 425/06 Criteria and Requirements For Meters and Metering Equipment, Systems and Technology
Reg. 426/06 Smart Meter: Costs Recovery
Reg. 427/06 Smart Meters: Discretionary Metering Activity and Procurement Principles
Reg. 235/08 Amending Reg. 427/06 Smart Meters: Discretionary Metering Activity and Procurement Principles Functional Specification for an Advanced Metering Infrastructure – July 5, 2007

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Education and Preparation for the Initiative

As indicated above, the SMI required preparation and execution for the selection and deployment of new technology on an unprecedented scale. As this initiative was new to Ontario utilities, the CHEC group members recognized that there was much to be learned about the new AMI technologies to ensure that the operational efficiencies that become available through AMI would be realized as part of the initiative.

CHEC member utilities had achieved great success when working together on previous initiatives and elected for a collaborative approach to the education required for a successful Smart Meter Implementation. In so doing, utilities were involved with the Ontario Utility Smart Metering (OUSM) working group starting with its inception in March of 2005. Through this involvement, much was learned regarding prominent AMI systems and the technologies associated with back office integration of meter data, as well as the vendors associated with the installation of these products.

OUSM Working Group Participation

To satisfy the due diligence requirements of a project of this magnitude, an all-inclusive process was undertaken. In order to become educated on all aspects of the AMI initiative, CHEC members maintained involvement in the Ontario Utilities Smart Meter (OUSM), a working group that consisted of over 50 utility members that came together in an educational effort.

CHEC members supported the concept of the OUSM from the outset, embracing the collaborative approach to acquiring the required education for a successful Smart Meter Implementation. Through their involvement much was learned regarding all prominent AMI technologies available to the North American marketplace by:

1. Sharing information on the success of AMI pilots installed in utilities across the province

2. Reporting on the testing of different AMI technologies and components related to the AMI initiative which was completed in 2005.

    a. Standard Test Scripts were created and used for testing all AMI technologies, helping to provide comfort and back-up documentation to justify future vendor selection to a utility's board members and the OEB.

    b. The testing of products ensured an understanding not only of the functionality of the products *available* in this market, but also to understand the functionality that would be *required* of the different components of the Smart Meter system in order to accomplish the needs of the regulators. Acquiring insight into how different products delivered such components as time stamping of intervals, synchronization of register reads, network diagnostic components, etc, ensured that the chosen products could deliver

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the requirements of the regulators as well as accomplish the unique requirements of individual members.

c. The following AMI Systems were part of the testing completed by the OUSM and detailed reports are available on the Util-Assist Web Portal which provides test results and detailed information regarding functionality.

OUSM Tested AMI Systems

Elster	**Tantalus**	**EKA Systems**	**Trilliant**	**Cellnet**
Sensus	**Itron**	**SilverSpring**	**Quadlogic**	**SmartSynch**

By acting collaboratively with the OUSM, CHEC members were able to gain an understanding of the base functionality and advanced feature sets of these installed products, as well as the other prominent technologies available to the North American market.

CHEC Strategy

To cost-effectively plan for the deployment, and ensure due diligence was accommodated, CHEC members came together, and through a concerted effort, examined the benefits of a collaborative approach to planning, as well as procurement of AMI and Installation services. As part of this plan, the CHEC member utilities retained the services of Util-Assist Inc., an Ontario consulting firm who would provide guidance and direction to the group to assist in the preparation, deployment and back office integration for the SMI.

Satisfying CHEC's due diligence requirements entailed an all-encompassing process, accounting for:

1. Planning
2. Implementation
3. Testing, and
4. Complete Back Office Integration.

CHEC members worked together throughout the initiative, taking full advantage of the benefits that collaboration brings. The SMI project would touch every department in the utility and would touch every residential and small commercial customer in each LDC's service territory. All tasks had to be considered, from the selection and installation of the AMI infrastructure right down to the disposal of the redundant meters and ensuring that the recycling vendors were engaged so as to divert the meters from landfills. Benefits were found in on-going operational costs. By working together, the CHEC members drastically reduced the labour components associated with maintaining the health of the installed network, as well as the daily data collection requirements for the deployed system (i.e. 3 employees to maintain a CHEC AMI system vs. 13 employees to maintain an AMI system for each individual CHEC member).

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By collaborating with Util-Assist to develop an extensive plan, CHEC Members were sufficiently prepared to accommodate the established timelines. A project of this magnitude is not without risk and within this document we have identified the potential problems and risks which may impede progress (Rate Recovery, Meter Base Repairs, etc).

All aspects of the deployment were considered, including:

1. Rate recovery,
2. Regulatory requirements regarding AMI functionality
3. Strategic planning to minimize costs for deployment
4. Audit tools during deployment
5. Back office integration
6. Meter disposal
7. AMI security
8. WEB presentment
9. Sub-metering
10. Coordination with local municipalities
11. Change management and
12. most importantly, the continued dedication to Health and Safety;

Throughout the initiative, CHEC members stayed focused on mitigating associated risks, thereby ensuring the successful implementation of the Smart Meter Initiative.

Following is a brief timeline demonstrating the order of events that the CHEC group followed:

Timeline

1. 2007: Participation in Ministry of Energy and Infrastructure authorized London Hydro AMI RFP process (establishing best practice procurement procedures).
2. Q4 2008: release of ODS provider RFP (December 12, 2008)
3. Q4 2008: vendor submittal due date for responses to ODS RFP
4. Q4 2008: release of WAN provider RFP
5. Q1 2009: release of Meter Disposal RFQ
6. Q1 2009: vendor submittal due date for responses to WAN RFP (January 2, 2009)
7. Q4 2008: release of Installation Service Provider RFP
8. Q4 2008: vendor submittal due date for responses to RFP (November 21, 2008)
9. Q4 2008: evaluation of Installation vendor submittals
10. Q1 2009: vendor negotiation (secure best pricing, discuss associated risk)
11. Q1 2009: commence deployment of residential Smart Meters

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AMI Selection Process

As mass deployment rapidly approached, the strategy of the CHEC group was to work together and create a process that accomplished the goals of the Smart Meter Initiative, while controlling the risks to customers and share holders.

The phase one approved processes included the Coalition of Large Distributors (CLD) RFPQ in conjunction with the MOE and the Hydro One procurement process, through this process, 13 utilities would be authorized to move forward with the procurement and installation of smart meters.

The remaining LDCs in Ontario would be part of the consortium of utilities working together as part of the authorized London Hydro AMI RFP process (phase two) that is summarized below.

London Hydro Phase Two AMI RFP Process Summary

- A Request for Proposal procurement transaction was conducted by London Hydro Inc., as the lead sponsoring Local Distribution Company (LDC) and with a consortia of another 63 LDCs, during the period August 2007 to July, 2008;

- The evaluation and selection phase of the RFP provided for the determination of the #1 and #2 ranked Proponents for each LDC;

- RFP Provision 7.5.141 provides the framework (principle) for negotiations and contracting based on the principle of “first right to negotiation and execution of a contract” being accorded to the ranked order of Proponents commencing with the highest ranked Proponent and proceeding in a consecutive order thereafter; and

- Each LDC was provided the evaluation results for their #1 and #2 ranked Proponents supported by the Attestation Letter of the Fairness Commissioner as to those rankings.

From a final contract negotiation perspective the CHEC LDCs each initiated good faith contract negotiations with their identified “best value” bidder. There were cases with some CHEC members where these negotiations stalled or failed with the “best value” bidder (Silver Spring), and the second best value bidder was invited to negotiate a procurement contract. For some CHEC members the second vendor was Elster and for others, Sensus.

Ultimately the result for CHEC member utilities was that 50% of the group was awarded Elster’s Energy Axis AMI system and 50% was awarded Sensus’ FlexNet™ AMI system. This evaluation process was termed as phase two in the Ontario market place and was the method by which AMI systems were selected for the vast majority of utilities in the province.

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Following the selection of an AMI provider, attention was turned to the selection of an Installation Vendor and WAN provider (for those using the Elster AMI network).

Install Vendor Selection Process

CHEC's involvement in the London Hydro Phase Two Procurement Process proved to be of great value as the experience formed a foundation that ensured a sound and prudent procurement path was followed. An Installation Services RFP was created and five (5) vendors from across North America were invited to respond.

The invited vendors included Corix, Honeywell, Olameter, PowerQuest, (Keywell), and Trilliant, representing both vendors with local representation as well as vendors with extensive experience in larger markets. CHEC was confident that the most qualified and successful vendors were given the opportunity to submit proposals in response to the RFP.

CHEC's clearly stated requirement for the highest possible standards with regards to Safety were evident in every stage of the procurement process. The Request for Proposal identified CHEC's stringent Safety requirements, and included a requirement for bidder's to state their ability to either meet or exceed CHEC's guidelines. In addition to comprehensive Safety policies and procedures, CHEC's preference for a turnkey solution with the successful vendor performing all site related services and workforce management (i.e. customer communication, installation and commissioning, scheduling, dispatch and integration to back office systems, etc) was expressed.

In total, the operational considerations accounted for 40% of weighting of the evaluation with the remaining 60% attributed to the pricing received. The weighting structure was chosen to closely match that used in the 2006 CLD RFPQ process which had been found to be prudent by the regulator.

At the close of financial and technology evaluations, it was determined that Trilliant most closely matched all of CHEC's requirements; providing clear and concise Safety protocols as well as strong managerial tools to ensure all communicated policies and procedures would be properly implemented by the staff utilized within each CHEC member's service territory. These strong functional components were to be provided at a highly competitive price, which in combination resulted in the best service package being provided at the best price. Shortly after Trilliant was selected as the winning proponent, the group received notice that Olameter had acquired Trilliant and thus Olameter would be providing the services to the group.

As many utilities had a relationship with Olameter for meter reading services and Olameter was quite active in the Ontario market, this worked in the group's favour. Olameter's operational score in the RFP evaluation was strong; however their pricing was not the most favourable which attributed to their ranking as number three in the evaluation model. Given the success being enjoyed by Olameter within Ontario, there was confidence that there was minimal risk in the decision to award Olameter with the installation of CHEC's residential Smart Meters.

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ODS Vendor Selection Process

CHEC member utilities recognized early on that an Operational Data Store (ODS) would be of value to support their needs for the introduction of efficiencies which would become possible through the use of the operational data available from the AMI system as the MDM/R didn't store operational data.

According to the Ministry of Energy's Functional Specification, the Advanced Metering Control Computer (AMCC – AMI network server) is limited to a maximum of 60 days for the storage of AMI data. Whereas ODS systems act as a repository to store unlimited data and have the architecture with the mechanisms in place to retain and archive data for analysis by the utility.

Many benefits can be realized through the use of an ODS system, one of which is to use the ODS to audit the mass meter installation to prevent the situation of deploying the AMI network "blind". The AMI systems traditionally will indicate that the meters are communicating but the ODS will verify the quality of the data coming from the AMI system.

Other examples of the available functionality in ODS systems include verification of all data fields being transmitted from AMI, such as:

- Readings (kWh, kW)
- Alarm Filtering (Tamper, Outage)
- Power Quality Data (Voltage)
- Perform Data Gap Analysis
- SLA management of AMI system

Due to the possibility that the provincial centralized Meter Data Management and Repository (MDM/R) would one day accommodate operational needs in addition to the billing requirements, and in keeping with the desire to minimize duplication in utility infrastructure, the utilities chose to procure a system that was an Application Service Provider (ASP) model, allowing the system to grow with the needs of each utility, and also provide flexibility with regards to contract term.

To be prepared for the deployment of residential smart meters in each utility's service territory, the ODS RFP was developed focusing on data management functionality which would definitively determine a utility's compliance with the requirements of the Ministry of Energy's Functional Specification. Additionally, the ODS system would be required to store operational data which will allow utilities to implement operational efficiencies in the immediate future.

The ODS Request for Proposal (RFP) was distributed to selected vendors in North America with fourteen (14) vendors invited to respond. These vendors included local representation as well as vendors with extensive experience in larger markets. CHEC was confident that the most qualified and successful vendors were given the opportunity to submit proposals in response to the RFP.

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The evaluation team consisted of representatives from four utilities in the CHEC group with resources from Centre Wellington Hydro Ltd., Innisfil Hydro Distribution Systems Limited, Lakeland Power Distribution Ltd. and Wellington North Power Inc. volunteering to be part of the committee. This committee provided for a mixture of Elster and Sensus AMI users and a wealth of both technical and operational knowledge.

The evaluation criteria and scoring documents were prepared in advance of the release of the RFP to support a prudent process and identify scoring criteria that ensured a consistent and fair approach in the evaluation of the bids. Many of the ODS systems were considered new technology and to ensure that the written responses and functionality descriptions in the RFP matched the state of the actual technology released, vendor demonstrations were held allowing utilities the opportunity to see the actual software.

The team evaluated Bidders objectively with the end goal of selecting the best-fit service provider for an ODS solution, thereby allowing utilities to achieve their internal goals of maximizing the value from the assets in the field, while ensuring that the requirements of the provincial government are met. With financial and technology evaluations completed, it was determined that the Kinetiq ODS proposal most closely matched all of the requirements; providing strong support for the functionality requirements expressed through the RFP, as well as project management support tailored to the needs of each utility to ensure project success.

Given the experience of Kinetiq with Ontario utilities, there was confidence that there was minimal risk in the decision to award Kinetiq with the ODS component of their Smart Meter Network infrastructure. After further discussion amongst the member utilities and a review of the evaluation documents, vendors were notified of the award of the bid and Kinetiq was engaged to move forward with the contract negotiations process.

Supplied documentation reflects the analysis that went into this important decision by noting the functionality provided by the bidders as well as the pricing and associated risk of the different vendors. The decision making process regarding ODS solutions has been well documented and conclusive, to provide each utility's Executive Management team with the confidence to support the decision made by the committee. The well organized approach has ensured that the proper decisions have been made and documented with the end goal of achieving all SMI related timelines.

WAN Vendor Selection Process

CHEC members utilizing the Elster Energy Axis AMI network would be required to select a Wide Area Network (WAN) vendor to provide the communications backhaul for their AMI networks. CHEC members moved forward initiating a process for the procurement of a WAN solution in Q4 of 2008. The WAN RFP was designed with the intention of procuring a solution which would allow increased flexibility and functionality in the long term. The RFP development process included flexibility, allowing vendors to provide solutions of a wired and/or wireless nature, satisfying immediate requirements with options to expand the proposed solution, as well as ancillary services to allow savings through potential synergies. As part of the procurement process the components of service that were required were:

1. Hardware Procurement
2. Installation and Commissioning
3. Ongoing Maintenance

During every stage of the procurement process it was CHEC member's clearly stated objective that the selected WAN solution would provide a method to enable the AMI to meet the Ministry of Energy and Infrastructure's Functional Specification for the timely delivery and reliable transmission of meter data. The WAN RFP "weighting" followed a format that was found to be prudent by the regulator; in total, the operational considerations would account for 40% of the evaluation, with the remaining 60% attributed to the pricing received.

The RFP was released by CHEC on December 5, 2008 and a decision was made to select Bell/National Wireless as the provider in Q1 of 2009.

MDM/R Integration Process Project planning

Ontario Regulation 393/07: Designation of Smart Metering Entity would authorize the Independent Electricity System Operator (IESO) as the Smart Metering Entity responsible for processing all meter read interval data to provide billing quantity data to all LDCs in Ontario. This centralized system is termed as the Provincial Centralized MDM/R (MDM/R).

Having made such tremendous progress in the acquisition and implementation of systems, CHEC recognized the value in collaboration and continued to work together with Util-Assist to complete the necessary steps required to integrate their systems into the MDM/R.

As part of this strategy, Util-Assist developed and presented a series of MDM/R Education Sessions in which the CHEC members were educated about the MDM/R and the Business Process changes that would be required to effectively integrate and interact with the MDM/R on an enduring basis.

Standard processes were provided to members allowing them to tailor the processes for their own situations. Several members elected to have Util-Assist provide a more in-depth analysis of their processes and ultimately assist the LDCs in the design and development of specific processes unique to their utility.

Successfully integrating to the MDM/R would require months of education to prepare for the formalized enrolment testing run by the IESO. Dedicated resources would be required from each utility to be the test lead and engage with the IESO during the 8 week enrolment timeframe leading up to the cutover to the MDM/R (flowing all meter data). The flowing of all residential and small commercial customers'

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meter data to the MDM/R would be required in order for utilities to successfully implement the new time-of-use rate structures.

On June 24, 2010, the Board issued for comment a Proposed Determination (the "June Proposed Determination") to mandate time-of-use ("TOU") pricing for RPP consumers by establishing the "mandatory TOU date" for each electricity distributor as contemplated in section 1.2.1 of the Standard Supply Service Code (the "SSS Code"). In the June Proposed Determination, the Board proposed that a distributor's mandatory TOU date will be one of two dates, depending on the distributor's progress to date against the schedule set out in its baseline plan (updated to the date of the June Proposed Determination, where applicable).

This would require the CHEC member utilities to implement time-of-use rates in their service territory based on the dates provided in the OEB determination. As of the writing of this report, approximately 30% of the CHEC member utilities have implemented time-of-use pricing in their service territories while all other members are on a path to successfully fulfill their requirements to the regulator.

Conclusion

The CHEC group members are confident that a comprehensive process has been undertaken and successfully completed, and that the due diligence requirements for all decisions related to this initiative have been satisfied.

Through the process of working together with other LDCs, CHEC has realized the true value of collaboration, having received support as well as operational and pricing efficiencies that were not possible had each LDC gone through the process on their own.

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Appendix A

a) Ontario Regulation 425/06
b) Functional Specifications document

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Ontario

ServiceOntario
e-Laws

ONTARIO REGULATION 425/06

made under the

ELECTRICITY ACT, 1998

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CRITERIA AND REQUIREMENTS FOR METERS AND METERING EQUIPMENT, SYSTEMS AND TECHNOLOGY

Adoption of criteria and requirements

1. For residential and small general service consumers, the prescribed criteria and requirements for meters, metering equipment, systems and technology and any associated equipment, systems and technologies are the criteria and requirements specified in the document entitled "Functional Specification for Advanced Metering Infrastructure" dated July 14, 2006 and available at the Ministry of Energy, 4th Floor, Hearst Block, 900 Bay Street, Toronto, Ontario or at http://www.energy.gov.on.ca/english/pdf/electricity/smartmeters/Functional_Specification_for_Advanced_Metering_Infrastructure.pdf.

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FUNCTIONAL SPECIFICATION

FOR AN

ADVANCED METERING INFRASTRUCTURE

JULY 14, 2006

FUNCTIONAL SPECIFICATION

FOR AN ADVANCED METERING INFRASTRUCTURE

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FUNCTIONAL SPECIFICATION

FOR AN ADVANCED METERING INFRASTRUCTURE

1.0 APPLICATION OF SPECIFICATION

This Specification sets the required minimum level of functionality for AMI in the Province of Ontario for residential and small general service consumers where the metering of demand is not required. This Specification is not intended to apply to net metering applications.

2.0 FUNCTIONAL SPECIFICATION

2.1 Deployment

This Specification shall be met regardless of the size or scope of the AMI deployment by a distributor.

2.2 Minimum Functionality

2.2.1 As a minimum:

2.2.1.1 AMI shall collect Meter Reads on an hourly basis from all AMCDs deployed by a distributor and transmit these same Meter Reads to the AMCC and MDM/R, as required, in accordance with these Specifications; and

2.2.1.2 A Meter Read shall be collected, dated and time stamped at the end of each hour (i.e. midnight as represented by 24:00).

2.2.2 The date and time stamping of Meter Reads shall be recorded as year, month, day, hour, minute (i.e. YYYY-MM-DD hh:mm).

2.2.3 All meters shall have a meter multiplier of one (1).

2.2.4 Distributors shall provide the MDM/R with the service multiplier for transformer-type meters.

2.3 Performance Requirements

2.3.1 Collection and Transmission of Meter Reads:

2.3.1.1 AMI shall successfully collect and transmit to the AMCC and MDM/R at least 98.0% of the Meter Reads from all AMCDs deployed by a distributor in any Daily Read Period.

2.3.1.2 Meter Reads unsuccessfully collected or transmitted shall not be due to the same AMI component (including, without limitation, any AMCD) during any three (3) month consecutive time period.

2.3.1.3 AMI shall be able to collect and transmit Meter Reads during its operating life without requiring a field visit.

2.3.2 Transmission Accuracy: Over the Daily Read Period, 99.9% of the Meter Reads received by the AMCC shall contain the same information as that collected by all AMCDs deployed by the distributor.

2.3.3 AMI shall be capable of providing Meter Reads with a precision of at least 10 Watt-hours (0.01 kWh).

2.4 Technical Requirements

2.4.1 When an AMI includes AMRCs, the AMRCs shall have the ability to store meter data to accommodate the performance requirements in section 2.3.1.

2.4.2 Time Synchronization:

2.4.2.1 AMI shall be operated and synchronized to Official Time, as set by the National Research Council of Canada.

2.4.2.2 AMI shall have the capability of adjusting for changes due to local daylight savings time.

2.4.2.3 AMI installed within a distributor's service area shall have the capability of accommodating more than one (1) time zone.

2.4.2.4 Time synchronization shall be maintained in the AMI to the specified accuracy parameters set out in section 2.4.3.1 following a loss of power.

2.4.2.5 All Meter Reads shall adhere to accurate time synchronization processes to ensure an accurate accounting of electricity consumption at each meter.

2.4.3 Time Accuracy:

2.4.3.1 At all times, time accuracy in the AMI shall not exceed a ±1.5 minute variance from the time established in section 2.4.2.1.

2.4.3.2 AMI shall be able to prove that time accuracy does not exceed the permitted time variance identified in section 2.4.3.1.

2.4.4 Loss and Restoration of Power:

2.4.4.1 AMI shall detect and identify the interval in which a loss of power occurred during a Daily Read Period.

2.4.4.2 AMI shall detect and identify the interval in which power was restored following a loss of power.

2.4.5 Environmental Tolerances: All AMI components (except the AMCC) shall operate and meet the requirements in these Specifications within a temperature range of minus thirty degrees Celsius (–30° C) to positive sixty-five degrees Celsius (+65° C), and within a humidity range of zero percent (0%) to ninety-five percent (95%) non-condensing.

2.5 Advanced Metering Communication Device (AMCD)

2.5.1 Installation Within the Meter:

2.5.1.1 The AMCD shall not impair the ability of the meter to be visually read.

2.5.1.2 Meters in which an AMCD is installed shall be able to be installed in existing meter sockets or enclosures.

2.5.1.3 AMCD shall meet or exceed ANSI standards to withstand electrical surges and transients.

2.5.2 Labelling:

2.5.2.1 The AMCD shall be permanently labelled with:

(1) Legally required labelling;

(2) Manufacturer’s name;

(3) Model number;

(4) AMCD identification number;

(5) Input/output connections;

(6) Date of manufacture; and

(7) Bar code for tracking and inventory management.

2.5.3 When installed at a consumer’s location, the meter shall visibly display, as a minimum, the AMCD identification number, meter serial number and LDC badge number for the meter.

2.5.4 The AMCD shall be able to be initialized or programmed during, or prior to, field installation.

2.6 Transmission of Meter Reads

2.6.1 All Meter Reads collected during the Daily Read Period shall be received by the AMCC and transferred to the MDM/R no later than 5:00 a.m. local time following the Daily Read Period.

2.6.2 Meter Reads are not required to be transmitted in a single transmission and may be transmitted as frequently as necessary in order to meet the requirements in section 2.6.1.

2.6.3 AMCC shall transfer the information identified in section 2.6.1 using an approved protocol and file structure.

2.7 Advanced Metering Regional Collectors (AMRC)

2.7.1 LAN Communication Infrastructure:

2.7.1.1 The spectrum allocation and wattage of the radio signal used by an AMI shall not impede neighbouring frequencies.

2.7.2 When an AMI includes AMRCs:

2.7.2.1 The AMI shall provide for the continuous powering of AMRCs regardless of their location and placement.

2.7.2.2 All AMCDs shall be able to collect and transmit Meter Reads when one or more AMRC has a loss of power.

2.7.2.3 Memory and software parameters shall be maintained at all AMRC during a loss of power, whether by the provision of backup/alternate power or other solution.

2.8 Advanced Metering Control Computer (AMCC)

2.8.1 Each AMCC shall have the ability to store a rolling sixty (60) days of Meter Reads.

2.8.2 A distributor shall not aggregate Meter Reads into rate periods or calculate consumption data from the Meter Reads collected through its AMI either in its AMCC or any other component.

2.8.3 The AMCC shall be able to perform basic operational verification of Meter Reads received before transmitting these Meter Reads to the MDM/R.

2.9 Customer Account Information

2.9.1 Distributors shall provide initial information associated with customer accounts to the MDM/R on a date to be determined.

2.9.2 On an ongoing basis, distributors shall provide information associated with any change to the initial information identified in section 2.9.1 to the MDM/R at a frequency to be determined.

2.9.3 Information to be provided to the MDM//R pursuant to sections 2.9.1 and 2.9.2 is to be determined.

2.10 Monitoring & Reporting Capability

2.10.1 The AMI shall have non-critical reporting functionality and critical reporting functionality as required in this section 2.10. Information generated from this reporting functionality shall be available to the MDM/R.

2.10.2 Non-critical reporting:

2.10.2.1 At the completion of every Daily Read Period and following a transmission of Meter Reads, the AMCC shall generate a status report that includes information regarding anomalies and issues affecting the integrity of the AMI or any component of the AMI including information related to any foreseeable impact that such anomalies or issues might have on the AMI's ability to collect and transmit Meter Reads.

2.10.2.2 In addition to section 2.10.2.1, the AMCC shall generate reports:

(1) Confirming successful initialization of the AMCD's installed in the field;

(2) Confirming data linkages among an AMCD identification number, LDC badge number, serial number and customer account;

(3) Confirming that the MDM/R has successfully received notification of any changes to customer account information;

(4) Confirming that the AMCC has successfully made changes to customer account information following receipt of same from the MDM/R;

(5) Confirming the successful collection and transmission of Meter Reads or logging all unsuccessful attempts to collect and transmit Meter Reads, identifying the cause, and indicating the status of the unsuccessful attempt(s) pursuant to section 2.3.1;

(6) Confirming the accuracy of the Meter Reads received by the AMCC pursuant to section 2.3.2;

(7) Confirming that all Meter Reads have a precision of at least 10 Watt-hours (0.01 kWh) pursuant to section 2.3.3;

(8) Confirming whether the Meter Reads acquired within the Daily Read Period are in compliance with the time accuracy levels identified in section 2.4.3;

(9) Confirming whether time synchronization within the AMI or any components of the AMI has been reset within the Daily Read Period;

(10) Identifying the intervals in which a loss of power occurred and at which power was restored, following a loss of power;

(11) Addressing the functionality of the AMCD communication link, including status indicators related to the AMCD and AMRC;

(12) Identifying suspected instances of tampering, interference and theft;

(13) Flagging potential network, meter and AMCD issues; and

(14) Identifying any other instances that impact or could potentially impact the AMI's ability to collect and transmit Meter Reads to the AMCC and/or MDM/R on a daily basis.

2.10.2.3 Following a transmission of Meter Reads or at the completion of every Daily Read Period, the information in section 2.10.2.2 (5) shall be stored and used by the AMCC to assess compliance with the requirement specified in section 2.3.1.2.

2.10.2.4 The reports generated in sections 2.10.2.1 and 2.10.2.2 shall be made available to the MDM/R with a frequency to be determined.

2.10.3 Critical reporting:

Critical events are defined to include any AMI operational issue that could adversely impact the collection and transmission of Meter Reads during any Daily Read Period.

2.10.3.1 The AMI shall identify and report the following to the distributor:

(1) AMCD failures;

(2) AMRC failures;

(3) Issues related to the storage capacity of any component of the AMI;

(4) Communication links failures;

(5) Network failures; and

(6) Loss of power and restoration of power.

2.10.3.2 The reports generated in section 2.10.3.1 shall be made available to the MDM/R.

2.11 Security and Authentication:

2.11.1 The AMI shall have security features to prevent unauthorized access to the AMI and meter data and to ensure authentication to all AMI elements.

2.12 Proven Technology

2.12.1 No distributor shall install more than five hundred (500) units of a particular model of electricity AMCD if a minimum of five thousand (5,000) units of the same model of electricity AMCD that is to be installed by the distributor is not currently functioning in the field as part of one or more functioning AMI.

2.13 Regulatory Requirements

2.13.1 The AMI shall meet all applicable federal, provincial and municipal laws, codes, rules, directions, guidelines, regulations and statutes (including any requirements of any applicable regulatory authority, agency, board, or department including Industry Canada, the Canadian Standards Association, the Ontario Energy Board and the Electrical Safety Authority) (collectively, "**Laws**"). For greater certainty, the AMI shall meet all applicable Laws that are necessary for the measurement of data and/or the transmission of data to and from the consumers within the Province of Ontario, including Laws applicable to metering, safety and telecommunications.

2.14 Water or Natural Gas Meter Reads

2.14.1 The AMI should be capable of supporting an increased number of Meter Reads associated with the reading and transmission of water and/or natural gas meters through additional ports on the AMCD, through optionally available multi-port AMCDs, or through additional AMCD/AMRC devices that are compatible with operating on the AMI. When procuring AMI, distributors shall obtain an indication of the capabilities of the proposed AMI to read water and natural gas meters, indicating the makes and models of such meters that can be read, and any requirements for retrofitting them.

3.0 DEFINITIONS

Within this Specification the following words and phrases have the following meanings:

"AMCC" is an advanced metering control computer that is used to retrieve or receive and temporarily store Meter Reads before or as they are being transmitted to the MDM/R. The information stored in the AMCC is available to log maintenance and transmission faults and issue reports on the overall health of the AMI to the distributor.

"AMCD" is an advanced metering communication device that is housed either under the meter's glass or outside the meter. It transmits Meter Reads from the meter directly or indirectly to the AMCC.

"AMI" means an advanced metering infrastructure. It includes the meter, AMCD, LAN, AMRC, AMCC, WAN and related hardware, software and connectivity required for a fully functioning system that complies with this Specification. With some technologies, an AMI does not include AMRCs. An AMI does not include the MDM/R.

"AMRC" is an advanced metering regional collector that collects Meter Reads over the LAN from the AMCD and transmits these Meter Reads to the AMCC.

"consumer" or "customer" means a person who uses, for the person's own consumption, electricity that the person did not generate.

"distributor" has the meaning provided in the *Ontario Energy Board Act, 1998*.

"Daily Read Period" means the 24-hour period for collecting Meter Reads, subject to the two periods annually during which changes to and from daylight savings time take place. The Daily Read Period ends at 12:00 midnight of each day.

“LAN” means a local area network, the communication network that transmits Meter Reads from the AMCD to the AMRC.

“meter multiplier” is the factor by which the register reading must be multiplied to obtain the registration in the stated units.

“Meter Read” is a number generated by a meter that reflects cumulative electricity consumption at a specific point in time.

“MDM/R” means the meter data management and meter data repository functions within which Meter Reads are processed to produce rate-ready data and are stored for future use.

“Specification” means these functional specifications.

“transformer-type meter” means a meter designed to be used with instrument transformers.

“WAN” means a wide area network, the communication network that transmits Meter Reads from the AMRC to the AMCC or, in some systems from the AMCD directly to the AMCC, and from the AMCC to the MDM/R.

Appendix B

a) Ontario Regulation 426/06

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Ontario Energy Board Act, 1998
Loi de 1998 sur la commission de l'énergie de l'Ontario

ONTARIO REGULATION 426/06

SMART METERS: COST RECOVERY

Consolidation Period: From June 25, 2008 to the e-Laws currency date.

Last amendment: O. Reg. 234/08.

This Regulation is made in English only.

Cost recovery, general

1. (1) In relation to the acquisition of smart meters, a distributor may recover its costs relating to functionality that does not exceed the minimum functionality adopted in Ontario Regulation 425/06 (Criteria and Requirements for Meters and Metering Equipment, Systems and Technology) made under the *Electricity Act, 1998,* subject to final approval by the Board and the Board's review and determination that the agreement entered into for the acquisition is economically prudent and cost effective. O. Reg. 234/08, s. 1 (1).

(1.01) In determining whether an agreement referred to in subsection (1) is economically prudent and cost effective, the Board's review shall take into consideration, but not be limited to,

(a) all costs associated with the agreement; and

(b) the costs of the agreement relative to any agreements entered into by the distributor and other distributors for comparable acquisitions. O. Reg. 234/08, s. 1 (1).

(1.1) Subject to final approval of the Board, a distributor may recover the costs it prudently incurred to comply with the enrolment requirements and technical interface requirements of the Smart Metering Entity. O. Reg. 441/07, s. 1; O. Reg. 234/08, s. 1 (2).

(2) In relation to the acquisition of smart meters, a distributor may not recover its costs relating to functionality that exceeds the minimum functionality adopted in Ontario Regulation 425/06 (Criteria and Requirements for Meters and Metering Equipment, Systems and Technology) made under the *Electricity Act, 1998* unless the costs are approved by the Board. O. Reg. 426/06, s. 1 (2); O. Reg. 234/08, s. 1 (3).

(3) In reaching a decision under subsection (2), the Board may consider the matters that it considers appropriate, including evidence that the functionality that exceeds the minimum functionality adopted in Ontario Regulation 425/06 (Criteria and Requirements for Meters and Metering Equipment, Systems and Technology) made under the *Electricity Act, 1998* benefits the distributor's consumers. O. Reg. 426/06, s. 1 (3).

(4) In this section,

"smart meters" includes smart meters, metering equipment, systems and technology and any associated equipment, systems and technologies. O. Reg. 234/08, s. 1 (4).

Cost recovery, meter data functions

2. (1) No distributor shall recover any costs associated with meter data functions to be performed by the Smart Metering Entity. O. Reg. 426/06, s. 2 (1).

(2) Despite subsection (1), distributors may recover costs associated with functions related to meter data that are contemplated to be performed by distributors by the criteria and requirements adopted in Ontario Regulation 425/06 (Criteria and Requirements for Meters and Metering Equipment, Systems and Technology) made under the *Electricity Act, 1998*. O. Reg. 426/06, s. 2 (2).

(3) Subsection (1) does not prevent distributors from recovering costs that are approved by the Board pursuant to section 1 that are associated with functions related to meter data that relate to a distributor's operation of its distribution system, but only if those functions are not meter data functions to be performed by the Smart Metering Entity. O. Reg. 426/06, s. 2 (3).

(4) Subsection (1) does not apply to distributors with service areas identified as priority installations in Ontario Regulation 428/06 (Priority Installations) made under the *Electricity Act, 1998*. O. Reg. 426/06, s. 2 (4).

(4.1) Subsection (1) does not prevent a distributor from recovering costs, if approved by the Board, that the distributor incurred as a result of supporting the IESO with finalizing the design of the requirements and processes for the interface and integration of the Smart Metering Entity's system with the distributor's billing and metering systems. O. Reg. 392/07, s. 1.

(4.2) The distributor's cost recovery under subsection (4.1) is subject to the Board receiving confirmation from the IESO that the distributor supported the IESO as described in subsection (4.1) and that the distributor was one of the first five distributors whose billing and metering systems were integrated with the Smart Metering Entity's system. O. Reg. 392/07, s. 1.

(5) In this section,

"meter data functions" means those functions for which the Smart Metering Entity has the exclusive authority to carry out pursuant to Ontario Regulation 393/07 (Smart Metering Entity) made under the *Electricity Act, 1998*. O. Reg. 426/06, s. 2 (5); O. Reg. 234/08, s. 2.

Cost recovery, replaced meter assets

3. (1) Subject to Board order, to ensure that distributors are not financially disadvantaged by the implementation of the smart metering initiative, distributors may recover the costs associated with meters owned before, on or after January 1, 2006 being replaced because of the smart metering initiative if,

(a) the meter being replaced was not acquired in contravention of section 53.18 of the *Electricity Act, 1998*; and

(b) the meter is replaced with a smart meter authorized for installation under the *Electricity Act, 1998*. O. Reg. 441/07, s. 2.

(2) The Board shall determine the period of time over which the costs referred to in subsection (1) may be recovered, in order to protect the interests of consumers with respect

to prices. O. Reg. 441/07, s. 2.

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Appendix C

a) Ontario Regulation 427/06
b) Ontario Regulation 235/08

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ONTARIO REGULATION 427/06

SMART METERS: DISCRETIONARY METERING ACTIVITY AND PROCUREMENT PRINCIPLES

Consolidation Period: From June 25, 2008 to the e-Laws currency date.

Last amendment: O. Reg. 235/08.

This Regulation is made in English only.

Definition

0.1 In this Regulation,

"smart meters" includes smart meters, metering equipment, systems and technology and any associated equipment, systems and technologies. O. Reg. 235/08, s. 1.

Authorized discretionary metering activity

1. (1) The following activities are authorized discretionary metering activities for the purposes of section 53.18 of the Act:

1. Metering activities conducted pursuant to the distributor's Conservation and Demand Management Plan approved by a Board order referenced as RP - 2004 - 0203, including pursuant to a reallocation of funds within an approved Conservation and Demand Management Plan as authorized by the Board order approving the Conservation and Demand Management Plan or that is otherwise approved by the Board.

2. If not otherwise authorized by this subsection, a distributor may utilize funds to conduct metering activities that are for the purpose of testing smart meter technology if,

   i. the distributor has the prior approval of the Board, and

   ii. the funds that are utilized were collected pursuant to the Board's approval to include capital and operating costs related to smart meters in distributors' revenue requirements for 2006, as set out in the Board's Generic Issues decision, dated March 21, 2006 and referenced as RP - 2005 - 0020, as is incorporated into each distributor's 2006 electricity distribution rate order provided by the Board pursuant to section 78 of the *Ontario Energy Board Act, 1998*.

3. Metering activities conducted by Enersource Corporation, Powerstream Inc., Hydro Ottawa Limited, Horizon Utilities Corporation, Toronto Hydro-Electric System

Limited and Veridian Connections Inc. pursuant to the process initiated in the Request for Pre-Qualification for Advanced Metering Infrastructure Procurement and Installation issued by Enersource Corporation on behalf of itself and the other referenced utilities and dated May 2, 2006.

3.1 Metering activities conducted by a distributor listed in paragraph 3, if the smart meters were procured subsequent to the process referred to in paragraph 3.

4. Metering activities conducted by a distributor that has had its smart meters procured on its behalf by one or more of Enersource Corporation, Powerstream Inc., Hydro Ottawa Limited, Horizon Utilities Corporation, Toronto Hydro-Electric System Limited or Veridian Connections Inc. pursuant to the process referred to in paragraph 3.

5. Metering activities conducted pursuant to the Request for Proposal for Smart Metering Services issued by Hydro One Networks Inc. and dated March 4, 2005.

6. Metering activities conducted by a distributor that has had its smart meters procured on its behalf by Hydro One Networks Inc. pursuant to the process referred to in paragraph 5.

7. Metering activities conducted by distributors if the activities meet the following criteria:

   i. the activities are for service areas identified as priority installations by Ontario Regulation 428/06 (Priority Installations) made under the Act, and

   ii. smart meter deployment plans have been filed with the Minister by the distributor.

8. Metering activities conducted by a distributor that has procured its smart meters pursuant to and in compliance with the parameters and process established by the Request for Proposal for Advanced Metering Infrastructure (AMI) – Phase 1 Smartmeter Deployment dated August 14, 2007, together with any amendments to it, issued by London Hydro Inc. O. Reg. 427/06, s. 1 (1); O. Reg. 153/07, s. 1 (1); O. Reg. 235/08, s. 2 (1-4).

(2) The smart meters used in relation to activities authorized as discretionary metering activities in subsection (1) shall comply with the criteria and requirements adopted in Ontario Regulation 425/06 (Criteria and Requirements for Meters and Metering Equipment, Systems and Technology) made under the Act. O. Reg. 427/06, s. 1 (2); O. Reg. 153/07, s. 1 (2); O. Reg. 235/08, s. 2 (5).

(2.1) Despite subsection (2), the smart meters used in relation to activities authorized as discretionary metering activities in paragraph 1 of subsection (1) that were conducted before the day this subsection comes into force are not required to comply with the criteria and requirements adopted in Ontario Regulation 425/06 (Criteria and Requirements for Meters and Metering Equipment, Systems and Technology) made under the Act. O. Reg. 153/07, s. 1 (3); O. Reg. 235/08, s. 2 (6).

(3) Any procurement associated with the activities authorized as discretionary metering activities under subsection (1), other than activities referenced in paragraphs 1 and 2 of subsection (1), shall comply with the procurement requirements set out in section 2. O. Reg. 427/06, s. 1 (3); O. Reg. 153/07, s. 1 (4).

(4) The activities authorized as discretionary metering activities in subsection (1) are subject to the cost recovery requirements set out in Ontario Regulation 426/06 (Smart

Meters: Cost Recovery) made under the *Ontario Energy Board Act, 1998*. O. Reg. 427/06, s. 1 (4).

Procurement

2. (1) When a distributor enters into a procurement process in relation to the smart metering initiative, the distributor shall ensure,

(a) that the procurement process complies with the principles set out in subsection (2); and

(b) that any agreement entered into as a result of the procurement is economically prudent and cost effective, taking into consideration, but not limited to,

(i) all costs associated with the agreement, and

(ii) the costs of the agreement relative to any prior agreement entered into by the distributor for comparable acquisitions. O. Reg. 427/06, s. 2 (1); O. Reg. 235/08, s. 3 (1).

(2) Distributors shall ensure that a procurement process in relation to the smart metering initiative complies with the following principles:

1. The procurement process, including the procedures used in the process and the selection criteria, must be fair, open and accessible to a range of interested bidders.
2. The procurement process must be competitive.
3. Conflicts of interest, both actual and potential, of bidders must be disclosed in the bidders' proposals and the process must ensure that,
   i. the selected bidder will not have a conflict of interest in respect of the deliverables under the agreement entered into as a result of the procurement, or
   ii. the selected bidder will be required to comply with requirements established by the distributor to address an actual or potential conflict of interest.
4. There must be no unfair advantage in the procurement process. O. Reg. 427/06, s. 2 (2).

(3) A distributor may only procure or utilize smart meters from an affiliate, if the affiliate is the selected bidder in a procurement process that satisfies the requirements of this section. O. Reg. 427/06, s. 2 (3); O. Reg. 235/08, s. 3 (2).

(4) The Minister or the Board may on notice require that a distributor provide to the Minister or the Board, as the case may be,

(a) information relating to the procurement or installation of smart meters including information concerning pricing, contractual arrangements, and status of installations; and

(b) information relating to a procurement, which information was obtained or developed during the procurement, including information concerning the selection of the successful bidder. O. Reg. 153/07, s. 2; O. Reg. 235/08, s. 3 (3).

(5) The notice in subsection (4),

(a) shall be in writing;

(b) shall set out a time frame in which the distributor must reply; and

(c) shall specify the information that the distributor must supply. O. Reg. 427/06, s. 2 (5).

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ONTARIO REGULATION 235/08

made under the

ELECTRICITY ACT, 1998

Made: June 17, 2008
Filed: June 25, 2008
Published on e-Laws: June 26, 2008
Printed in *The Ontario Gazette*: July 12, 2008

Amending O. Reg. 427/06

(Smart Meters: Discretionary Metering Activity and Procurement Principles)

Note: Ontario Regulation 427/06 has previously been amended. Those amendments are listed in the Table of Current Consolidated Regulations – Legislative History Overview which can be found at www.e-Laws.gov.on.ca.

1. Ontario Regulation 427/06 is amended by adding the following section:

Definition

0.1 In this Regulation,

"smart meters" includes smart meters, metering equipment, systems and technology and any associated equipment, systems and technologies.

2. (1) Subsection 1 (1) of the Regulation is amended by adding the following paragraph:

3.1 Metering activities conducted by a distributor listed in paragraph 3, if the smart meters were procured subsequent to the process referred to in paragraph 3.

(2) Paragraph 4 of subsection 1 (1) of the Regulation is amended by striking out "meters, metering equipment, systems and technology and any associated equipment, systems and technologies" and substituting "smart meters".

(3) Paragraph 6 of subsection 1 (1) of the Regulation is amended by striking out "meters, metering equipment, systems and technology and any associated equipment, systems and technologies" and substituting "smart meters".

(4) Subsection 1 (1) of the Regulation is amended by adding the following paragraph:

8. Metering activities conducted by a distributor that has procured its smart meters pursuant to and in compliance with the parameters and process established by the Request for Proposal for Advanced Metering Infrastructure (AMI) – Phase 1 Smartmeter Deployment dated August 14, 2007, together with any amendments to it, issued by London Hydro Inc.

(5) Subsection 1 (2) of the Regulation is amended by striking out "meters, metering equipment, systems and technology and any associated equipment, systems and technologies" and substituting "smart meters".

(6) Subsection 1 (2.1) of the Regulation is amended by striking out "meters, metering equipment, systems and technology and any associated equipment, systems and technologies" and substituting "smart meters".

3. (1) Clause 2 (1) (b) of the Regulation is revoked and the following substituted:

(b) that any agreement entered into as a result of the procurement is economically prudent and cost effective, taking into consideration, but not limited to,

(i) all costs associated with the agreement, and

(ii) the costs of the agreement relative to any prior agreement entered into by the distributor for comparable acquisitions.

(2) Subsection 2 (3) of the Regulation is amended by striking out "metering equipment, systems and technology and any associated equipment, systems and technologies".

(3) Clause 2 (4) (a) of the Regulation is amended by striking out "metering equipment, systems and technology and any associated equipment, systems and technologies".

4. This Regulation comes into force on the day it is filed.

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Appendix D

a) Ontario Regulation 393/07

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ONTARIO REGULATION 393/07

made under the

ELECTRICITY ACT, 1998

Made: March 28, 2007
Filed: July 26, 2007
Published on e-Laws: July 27, 2007
Printed in *The Ontario Gazette*: August 11, 2007

DESIGNATION OF SMART METERING ENTITY

Designation of IESO

1. The IESO is designated as the Smart Metering Entity.

Non-application of *Business Corporations Act*

2. Other than as prescribed in Ontario Regulation 610/98 (The IMO) made under the Act, the *Business Corporations Act* does not apply to the IESO.

Exemption, s. 53.10 of Act

3. The IESO is exempt from section 53.10 of the Act.

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