

Electrical Safety Authority

Meter Safety Due Diligence Review

Conclusions & Recommendations

July, 2015

Background

On August 6, 2014, the Electrical Safety Authority (ESA) launched a due diligence review of meter safety incidents after reports of meter fire incidents in Saskatchewan. The objective of the review was to determine whether there were potential electrical safety issues for Ontario relating to the events that had occurred in Saskatchewan.

For this review, safety issues were defined as noted below:

- Loss/Non-loss Fire (contained) potentially associated with/within smart meter/meter base;
- Loss/Non-loss Fire (extended) potentially associated with smart meter/meter base;
- Physical injury to humans potentially associated with smart meter/meter base (shock, burns, shrapnel, and exposed wires.)

Electromagnetic Fields (EMF)/Radio Frequency (RF), privacy, long term health or latent effects were excluded from this review.

ESA's due diligence review process included a review of Sensus meter implementation in 12 different jurisdictions, data review, direct analysis of Sensus smart meter models, information from the manufacturer, information from Ontario utilities, and most importantly, assessment of the third party engineer's report undertaken for Saskatchewan Crown Investment Corporation.

In January, 2015, while the review process was still underway, ESA staff reached the conclusion that there was a meter model in use in Ontario – the Sensus 3.2 with remote disconnect – which shared the same interior component design as the meter used in Saskatchewan. The independent engineer's report in Saskatchewan concluded that design made it susceptible to arcing if water or other contaminants got into the meter and this created a safety risk.

On January 22, 2015, ESA ordered Ontario's Local Distribution Companies (LDCs) to remove from service all Sensus 3.2 with remote disconnect meters. The LDCs completed those removals by May, 2015.

The due diligence review process continued to determine if there were any other implications or conclusions for Ontario. That review is now complete and the final conclusions reached.

Conclusions

ESA has completed its due diligence review and reached four conclusions:

- 1. The Sensus 3.2 with remote disconnect meter is susceptible to the same type of failures that were experienced with the 3.3 model in Saskatchewan and create a potential safety risk. The Sensus 3.2 with remote disconnect needed to be removed from service in Ontario.**

The meters used in Saskatchewan were Sensus 3.3 models. The report by Ritenburg & Associates for the Saskatchewan Crown Investment Corporation identified evidence of a pattern of arcing within the meter units that failed. Ritenburg identified evidence of arcing between the bus bars in failed meters. Further, Ritenburg determined that water or moisture and contaminants in the meters caused the arcing to occur.

Information from an Ontario LDC about a Sensus 3.2 with remote disconnect meter that failed was obtained by ESA. In this case, the meter had simply malfunctioned and stopped displaying information. Sensus was asked to assess the cause of the failure. When Sensus itself analyzed the meter, it concluded that water intrusion was the root cause of the failure.

Images from the Sensus report show the bus bars in the 3.2 with remote disconnect are in the same position as in the 3.3 version and the arcing pattern is similar. Having determined that the component design of the 3.3 and 3.2 with remote disconnect are the same, and having determined from the Ritenburg report and Sensus' own analysis that the design of the components contributes to the likelihood of arcing when water or other contaminants get into the meter, ESA concluded that the Sensus 3.2 with remote disconnect is susceptible to the same type of failures that were experienced with the 3.3 model in Saskatchewan and creates a potential safety risk.

As of January 22, 2015, there were 5,110 Sensus 3.2 with remote disconnect meters reported in service in Ontario. ESA ordered Ontario's LDCs to remove that meter model from service in Ontario and be replaced with a meter that did not share the same design. ESA issued its order in January, 2015 and Ontario's LDCs completed all removals from service in May, 2015.

- 2. This review has not identified a systemic safety risk with any other meter model or design currently in use in Ontario. Although this due diligence review is complete, ESA will continue to assess reports and information on any significant meter-related events on an ongoing basis.**

Assessment of fire incidents that have been reported in Ontario to date involving meters has indicated a variety of possible causes including improper installation of the meter, a defective meter, and/or problems with old meter bases where new meters are mounted.

The pattern of incidents to date does not indicate a prevalent problem with one cause of incident nor with any other particular meter model in use in Ontario.

- 3. The systems and processes for reporting and sharing of information about electrical safety incidents involving utility assets can be made more efficient and effective through some changes to processes and requirements.**

Electrical safety incident information is reported and gathered through a variety of means and among a number of regulators and oversight bodies. There are mandatory reporting requirements in regulation but also a significant amount of voluntary reporting and information sharing that occurs above and beyond those requirements. There is also sharing and collaboration among regulators and oversight bodies but there are limitations in regulation, privacy legislation and other rules that define what information can be shared. Different regulators have different powers to order information reported.

ESA's powers and responsibilities related to utility assets are defined in the *Electricity Act* and Ontario Regulation 22/04 Electrical Distribution Safety. Regulation 22/04 states that LDCs must report 'serious electrical incidents' to ESA and defines 'serious electrical incidents' according to the occurrence or potential for occurrence of death or critical injury, any fire or explosion on specific parts of the distribution system operating at 750 volts and above. Some LDCs report incidents to ESA beyond those definitions but it is not mandatory, therefore reporting is not consistent.

The Ontario Energy Board (OEB) has a separate scope of responsibility for utility oversight, which does not include electrical safety, and its powers and responsibilities are defined in the *Ontario Energy Board Act*, the *Electricity Act*, the *Statutory Powers Procedure Act* and the *Energy Consumer Protection Act*. The OEB has certain powers to require reporting of information from LDCs.

The Office of the Fire Marshal (OFM) is responsible for administration of *the Fire Protection and Prevention Act*, and the Fire Code. The OFM will investigate fires reported to them by local fire departments according to its investigation criteria which include: all fatal fires or critical injury incidents; explosions; suspected incendiary fires; large loss fires; fires of unusual origin or circumstance or involving circumstances that may result in widespread public concern; and multiunit residential occupancies where fire spread is beyond unit of origin (further information is provided on the OFM web site.)

Among those systems and processes a significant amount of information is or can be collected and analyzed. However it requires careful co-ordination among multiple bodies to get a fulsome picture of all incidents and even that does not produce a complete picture.

An adjustment to the mandatory LDC incident reporting requirements to ESA and the establishment of formal information sharing protocols among ESA and the OEB, and ESA and the OFM would make incident analysis more effective.

4. Canadian electrical meter standards need to continue to evolve to keep pace with changing technology and in-use experience.

All electrical equipment that is part of a distribution system in Ontario must comply with a code or standard selected by the LDC. All meters in use in Ontario have met the American National Standard for Electricity Meters standard (ANSI C12) which was first established in 2008 and has been up-dated a number of times since.

All electrical product standards must evolve to address technology changes in product design, purpose or use, and to account for experience with the product in market use.

ESA believes that electrical meter standards need to account for electrical safety testing in specific areas including dielectric (an electrical test performed on a component or product to determine the effectiveness of its insulation), leakage, flammability, over-temperature, and over-voltage, among other factors.

There is one standard already published in the U.S. in 2014 by Underwriters' Laboratories (UL) that addresses these factors and that has been submitted to the Standards Council of Canada for adoption in Canada.

Recommendations & Next Steps

In response to these conclusions, ESA is moving forward with the following actions.

Conclusion #1: The Sensus 3.2 with remote disconnect meter is susceptible to the same type of failures that were experienced with the 3.3 model in Saskatchewan and create a potential safety risk. The Sensus 3.2 with remote disconnect needed to be removed from service in Ontario.

Actions: The Director's Order to Ontario LDCs for the removal of the Sensus 3.2 with remote disconnect meter was issued in January, 2015 and the LDCs reported completion of all removals from service in May, 2015. These actions are now considered completed.

Conclusion #2: This review has not identified a systemic safety risk with any other meter model or design currently in use in Ontario. Although this due diligence review is complete, ESA will continue to assess reports and information on any significant meter-related events on an ongoing basis.

Actions: Although this review has not identified any other systemic issues with meters currently in use in Ontario, as any piece of electrical infrastructure ages, the risk of a safety incident increases. ESA will continue to monitor and assess incidents involving meters and related equipment.

In addition, ESA will work with industry to capture and share best practices around meter installations so that those incidents that are related to installation problems can be reduced or eliminated.

Conclusion #3: The systems and processes for reporting and sharing of information about electrical safety incidents involving utility assets can be made more efficient and effective through some changes to processes and requirements.

Actions: ESA will seek to adjust mandatory reporting requirements for LDCs to include all electrical safety incidents involving meters. ESA will work with government and industry stakeholders to define these expanded reporting requirements.

In the meantime, ESA will work with LDCs to obtain voluntarily, reports of incidents involving meters.

In addition, ESA is currently seeking to formalize data sharing agreements with the OEB and OFM through the establishment of Memorandums of Understanding.

Conclusion #4: Canadian electrical meter standards need to continue to evolve to keep pace with changing technology and in-use experience.

Actions: ESA will support the completion of Canadian electrical meter standard(s) that account for electrical safety testing in specific areas including dielectric, leakage, flammability, over-temperature, and over-voltage, among other factors.

About the Electrical Safety Authority

The Electrical Safety Authority's role is to enhance public electrical safety in Ontario. As an administrative authority acting on behalf of the Government of Ontario, ESA is responsible for administering specific regulations related to the Ontario Electrical Safety Code, the licensing of Electrical Contractors and Master Electricians, electricity distribution system safety, and electrical product safety.

ESA works extensively with stakeholders throughout the province on education, training and promotion to foster electrical safety across the province.

More information on the Electrical Safety Authority can be found at www.esasafe.com.

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