

Régie de l'énergie - Dossier R-3863-2013

Autorisation d'investissements - Projet Lecture à Distance (LAD) Phases 2 et 3 d'Hydro-Québec Distribution

CANADA

PROVINCE DE QUÉBEC
DISTRICT DE MONTRÉAL

DOSSIER R-3863-2013

RÉGIE DE L'ÉNERGIE

AUTORISATION D'INVESTISSEMENTS
RELATIFS AU
PROJET LECTURE À DISTANCE (LAD)
PHASES 2 ET 3
D'HYDRO-QUÉBEC DISTRIBUTION

HYDRO-QUÉBEC

En sa qualité de Distributeur

Demanderesse

-et-

STRATÉGIES ÉNERGÉTIQUES (S.É.)
ASSOCIATION QUÉBÉCOISE DE LUTTE
CONTRE LA POLLUTION ATMOSPHÉRIQUE
(AQLPA)

Demanderesse en Intervention

PIÈCE SÉ-AQLPA-3 - DOCUMENT 3

ONTARIO (GOVERNMENT), OFFICE OF THE FIRE MARSHAL, *Smart Meter Installations in Ontario May Pose a Potential Fire Hazard. Press release, October 5, 2012,*
http://www.mcscs.jus.gov.on.ca/english/FireMarshal/FireServiceResources/Communiques/OFM_Com_2012-15.html#

-et-

ONTARIO ASSOCIATION OF FIRE CHIEFS, *Unusual number of fires, smart meters linked - Ontario Fire Marshal says faulty base plates could be the cause, similar to Mission blaze,*
August 7, 2012
<http://www.oafc.on.ca/article/unusual-number-fires-smart-meters-linked-ontario-fire-marshal-says-faulty-base-plates-could>

-et-

ONTARIO (GOVERNMENT), OFFICE OF THE FIRE MARSHAL (Steven SILVER, B.Sc., P. Eng.), *Utility 'Smart Meters »*, June 15, 2012
http://www.stopsmartmetersbc.ca/html/wp-content/uploads/2013/02/Smart_Meter_Fires.pdf

Déposée par :
Stratégies Énergétiques (S.É.)
Association québécoise de lutte contre la pollution atmosphérique (AQLPA)
Le 22 novembre 2013

Régie de l'énergie - Dossier R-3863-2013

Autorisation d'investissements - Projet Lecture à Distance (LAD) Phases 2 et 3 d'Hydro-Québec Distribution

Pièce SÉ-AQLPA-3 - Document 3

**Rapport, communiqué et article des autorités d'incendie d'Ontario
Déposée par Stratégies Énergétiques (S.É.) et l'AQLPA**

ONTARIO



Smart Meter Installations in Ontario May Pose a Potential Fire Hazard

Communiqué 2012-15

October 5, 2012

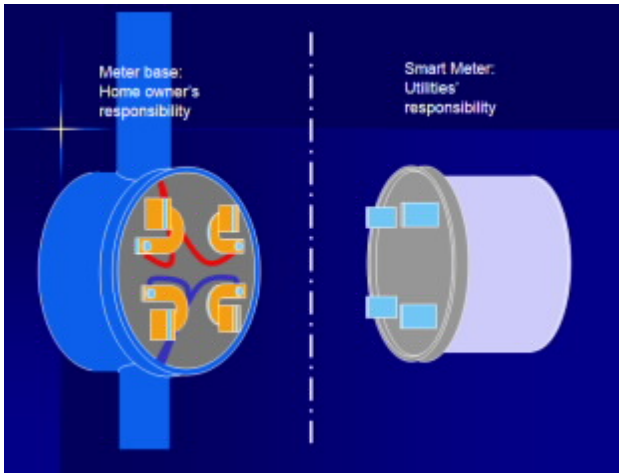
http://www.mcscs.jus.gov.on.ca/english/FireMarshal/FireServiceResources/Communiqués/OFM_Com_2012-15.html#

Ontario introduced smart meters, along with a “time-of-use” electricity price structure, to help consumers manage electricity costs. Over 4.5 million smart meters have been installed in residences and small businesses across Ontario since the start of the program in 2007.

The Office of the Fire Marshal (OFM) has been made aware of safety concerns relating to the installation of smart meters at residential and industrial occupancies in Ontario.

Since May 2011, there have been seven reported incidents of smouldering fires and/or explosions involving either the electrical smart meter or the meter base to which it is mounted. Anecdotal information indicates that these incidents resulted from a meter base problem, an installation problem or a failed meter. At this time, no injuries have been attributed to any of these incidents. In all but one case, the fire department was notified of the incident. The OFM is currently investigating four of the incidents.

The diagram below illustrates a typical installation at a residence:



In Ontario, the meter is the property of the utility company and the maintenance of the meter base is the responsibility of the property owner. Access to the meter base must be arranged through the utility.

The images below show two types of failures.



Meter explosion; base plate remained intact

Loose lug on base plate caused arcing

The OFM is aware that the installation of smart meters in other jurisdictions in Canada and the United States has resulted in incidents similar to the ones that occurred in Ontario. Although in Ontario, more information is needed to determine the scope and extent of the problem. There are a number of different meter bases and smart meters manufactured by various sources.

In order to deal with any potential public fire safety risks arising from smart meter installations, the OFM investigates fires and explosions involving smart meters and meter bases to determine the cause, and liaises with the Electrical Safety Authority (ESA), the agency responsible for electrical safety in the province.

The OFM is currently monitoring the situation with respect to smart meter and meter base incidents and asks fire departments to report any fire or explosion that involve electrical meters to the OFM for a six-month period, that is, until the end of March 2013.

At the scene of an incident, it is important that the meter and associated equipment not be removed or altered by local utilities, and that the scene be secured for the OFM and/or ESA field investigation. In addition, fire departments that become aware of any “pre-fire” incidents involving smoking, melting, charred or otherwise damaged meter bases or smart meters are asked to report them to the OFM. Reporting these incidents will assist the OFM in assessing whether concern is warranted and if the six-month reporting period should be extended.

To report an incident, fire departments should use the contact information below:

<i>During Weekday Office Hours (Monday to Friday, 8:30 a.m. to 3:30 p.m.)</i>	Duty Supervisor Fire Investigations Services, Midhurst Regional Office Office of the Fire Marshal 1-800-565-1842 (toll free)
<i>After hours (outside weekday office hours, and including weekends and holidays)</i>	Duty Officer Provincial Emergency Operations Centre Emergency Management Ontario 1-866-314-0472 (toll free)

Fire departments’ cooperation is much appreciated.

ONTARIO ASSOCIATION OF FIRE CHIEFS

Unusual number of fires, smart meters linked - Ontario Fire Marshal says faulty base plates could be the cause, similar to Mission blaze

<http://www.oafc.on.ca/article/unusual-number-fires-smart-meters-linked-ontario-fire-marshal-says-faulty-base-plates-could>

August 7, 2012



An example of a fire incident occurring around a hydro meter in Ontario. From a report done by the Office of the Fire Marshal Fire Investigation Services in Ontario

Smart meter installations are the suspected cause of an “unusual” number of fires similar to a recent electrical fire at a home in Mission, according to a recent investigation by the Ontario fire marshal’s office.

BC Hydro is in the process of a \$1-billion installation of the meters, which use wireless technology to transmit information about electricity consumption to power utilities, following the lead of provinces and states including Ontario and California.

There’s no evidence to suggest that the meters themselves are overheating and catching fire, but it appears from an Ontario fire marshal’s report, dated June 15, 2012,

that the base plates, or four-pronged sockets that meters plug into, can become compromised and start to burn if they're old or suffer rough handling during installation.

"It's like everything else, once it's installed and intact nothing usually happens," said Surrey electrical contractor Bill Strain, a former president of the Canadian Home Builders Association.

"A lot of times, when you pull something apart, if it's been there for 30 years it's probably going to be rusted in or hard in. So they have to give it a little bit of a jerk or a twist. That jerk or twist may be what sets the whole thing in motion," Strain said Friday. If there's a problem, he added, it's possible that a contractor without formal electrical training may miss it.

A resident of Mission, Trish Regan, recently lost her home in a fire that the district's fire department said appeared to originate from a broken base plate that became overheated and caught fire a few hours after an employee of Corix, the company contracted by BC Hydro to install the meters, plugged one in at her home.

Arkady Tsisserev, chair of the Canadian Electrical Code Committee, noted in an email that much of the work involved in smart meter installation falls outside the oversight of the Canadian Electrical (CE) Code.

"Revenue meters are covered by specific requirements of the power utilities which collect revenue from their customers for use of the electric energy.

"I'm aware of a number of fires that were supposedly attributed to installation and use of 'smart meters' in various jurisdictions throughout the country," Tsisserev wrote. "In fact, at the recent meeting of the CE Code committee, the members were presented with a comprehensive report produced by the Ontario Fire Marshal's Office."

According to the marshal's report, "During our initial research of the new meters we encountered an unusual amount of fire incidents involving smart meters. After discovering these incidents our main question was, were they one-off incidents or was there a similar systemic root cause

"Anecdotal information supported [the fact that] problems occurred after the old analog meters were updated to the new digital smart meters."

The report noted the possibility of a fire resulting from "a loose connection in the meter base."

"What could be the reason for this? The old meter base connections may not have been in a condition for seamless exchange to a new meter. New meters may have defects that cause electrical failures or misalignment with old meter base. Careless installation during changeover."

Meter changeovers are not unusual; before the smart meter project, Hydro was replacing about 40,000 old analogue meters per year with new ones.

In 0.5 per cent of cases, Hydro installers noted a faulty meter base and replaced it, according to smart meter deputy project officer Fiona Taylor.

That's more or less the same base plate replacement ratio that's arising from the smart meter installation, she said.

Cindy Verschoor, Hydro spokeswoman, said that unless a homeowner notices problems after the installation — such as lights flickering on and off, or dimming and brightening — there's no need to worry about a problem with the plate.

"If you notice anything unusual of course give us a call or arrange to have an electrician do an inspection," Verschoor said. "You can tell by your lights. That's the best indicator."

Verschoor said Corix installation supervisors are certified electricians and they're always on standby to effect any plate repairs noted by the installers.

Gwenne Farrell, vice-president of Hydro inside workers union COPE 378, said the union isn't prepared to blame installers for the Mission incident but they challenge the "dismissive" way Hydro has pushed the project along regardless of public objections to the meters and a lack of regulatory scrutiny of the costs associated with the program.

"They have been legislated to have these installations completed by Dec. 31 of this year and they're going forward with that, regardless," Farrell said. "There are people who have overall concerns about the smart meters, people who don't want them. They don't seem to even acknowledge that there is a lot of concern about these smart meters going in."

Jonathan Hodes, a lawyer with Miller Thomson LLP who is familiar with insurance claims, anticipates that Regan's insurance company will look to recover the cost of any payout it makes to the homeowner.

It's possible that Hydro could take similar action. "If Hydro does get sued at some point I would expect – it wouldn't surprise me at all – if they filed a defence or a response to the lawsuit blaming whoever they think they can blame to try to avoid liability," Hodes said.

- See more at: <http://www.oafc.on.ca/article/unusual-number-fires-smart-meters-linked-ontario-fire-marshalsays-faulty-base-plates-could#sthash.036O2GDR.dpuf>

UTILITY “SMART METERS”

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Fire Investigation Services
2284 Nursery Road, Midhurst L0L 1X0

Date: June 15 2012



[Outline]

- Background of Smart Meters
- Why the Office of the Ontario Fire Marshal (OFM) became interested
- Current Incidents
- Code Review
- Installation review



BACKGROUND

- Rolling out in 2009, local utilities started to install smart meters in every home and small business throughout Ontario
- Smart meters were a part of a new “Advanced Metering Infrastructure (AMI)” a part of the new electrical system in Ontario, which is anticipated to be completed by 2025.



Advanced Metering

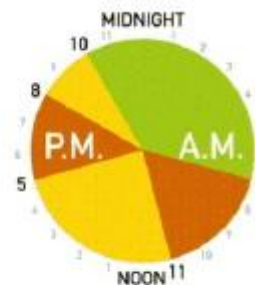
- Consists of two parts
 - “Smart Meters”
 - a “time-of-use” electricity price structure
 - Most recent update May 2012



The Summer weekdays



Weekends and Holidays



The Winter weekdays

On-peak (ccc)
– demand is highest

Mid-peak (cc)
– demand is moderate

Off-peak (c)
– demand is lowest



[Our Interests]

- The new Smart Meters, which are also referred to as watt/hour meters record electrical consumption data with reference to time.
- The new meters internally store data, using **E**lectrically **E**rasable **P**rogrammable **R**ead **O**nly **M**emory (EEPROM). As such if power is lost or cut (due to a fire or the meter being disengaged) the data would still be preserved.
- The OFM wanted to see how we could use this new recorded information for fire investigations and public safety.



[Our Interests]

- We were informed that the new meters were built with future technologies in mind. In addition to traditional watt hour metering, the new meters were designed to record other data in reference to time.
- Some of the capabilities include recording both voltage and current per separate leg.
- The OFM wants to explore the recording of both current and voltage readings in order to identify arc faults occurring before or during fire incidents



Current Technologies

- Currently we are aware of seven different AMI technologies being deployed in Ontario.
 - Elster's EnergyAxis AMI, which is a controlled mesh network system.
 - Trilliant meter, which also is based on controlled mesh technology
 - Sensus Metering Systems' AMI, which is a point-to-point long range radio system
 - Tantalus Systems' TUNet technology, which is a hybrid wireless communication system that operates on a variety of meter manufacturers device types and can be retrofitted to existing electromechanical meters.
 - GE Energy, Itron, Landis + Gyr, Schneider Electric USA Inc., Triacta Power Technologies



[Elster's EnergyAxis AMI]

- While there are many technologies we are going to discuss the Elster meter as an example
- 1. Elster's meters measure and store consumption data in the meter (registers and interval data) and make the data available to the Gatekeeper (GK) to which it is registered on request.
- 2. Based on a schedule configured in the GK, the GK retrieves data from the meters that are registered to it and stores the data.



Elster's EnergyAxis AMI

- 3. The EnergyAxis Management System (EA_MS) retrieves the data from the GKs based on schedules. EA_MS gives the customer flexibility as to what data is collected and when it is collected. EA_MS then exports the data in standard XML format with the files to be processed by downstream utility systems such as MDM, CIS, Outage Management Systems, etc.



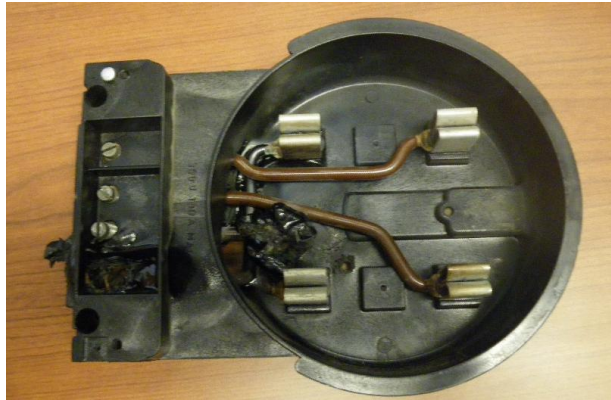
- During our initial research of the new meters we encountered an unusual amount of fire incidents involving smart meters
- After discovering these incidents our main question was;
 - were they one off incidents or was there a similar systemic root cause
- Anecdotal information supported problems occurred after the old analog meters were updated to the new digital Smart Meters



- One report in particular included a number of meters in the Cobdin area of Eastern Ontario where the meters had experienced overheating
- However prior to any proper investigation the utility company had removed and replaced the meters from the effected areas
- Other reports indicate problems with metal-oxide varistor (MOV) overheating and initiating fires



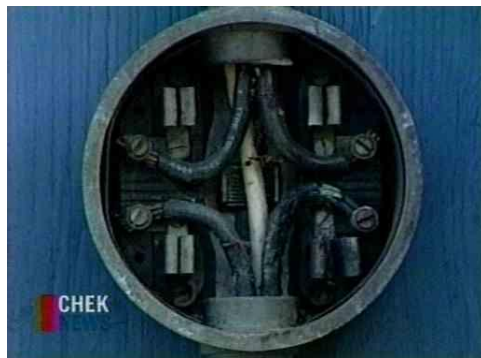
Fire Incidents Occurring around Hydro Meters



Deep River, ON



Pickering, ON



Nanaimo, BC



California



- The OFM has observed drastic differences to how meters and the meter bases react in a fire .



- Our first question was to identify the current safety standards for the meter bases and then the smart meters and see where they differed.
- First we needed to determine which part of the Electrical Code applied to each component
 - Part I is the safety standard for electrical installations.
 - Part II is a list of standards for the evaluation of electrical equipment or installations. (Part I requires that electrical products be approved to a Part II standard)
 - **Part III is the safety standard for power distribution and transmission circuits**
 - Part IV is set of objective-based standards that may be used in certain industrial or institutional installations.
 - Part V establishes standards for the inspection of electrical installation in residential buildings.



O Reg. 22/04 “Electrical Distribution Safety”

- O. Reg. 22/04 “Electrical Distribution Safety” establishes objective based electrical safety requirements for the design, construction, and maintenance of electrical distribution systems owned by licensed distributors. O. Reg. 22/04 was described by the ESA as an addition to part 3 of EC.

- O. Reg. 22/04 “Electrical Distribution Safety”
 - 2. Application
 - (3) This Regulation applies with respect to a distribution system as far as the **ownership demarcation point** and no further
 - (4) The ESC, and not this Regulation applies with respect to,
 - (a) electrical installations and electrical equipment located beyond the ownership demarcation point, **EXCEPT** for revenue metering equipment and associated equipment, current transformers, voltage transformers and remote terminal units;



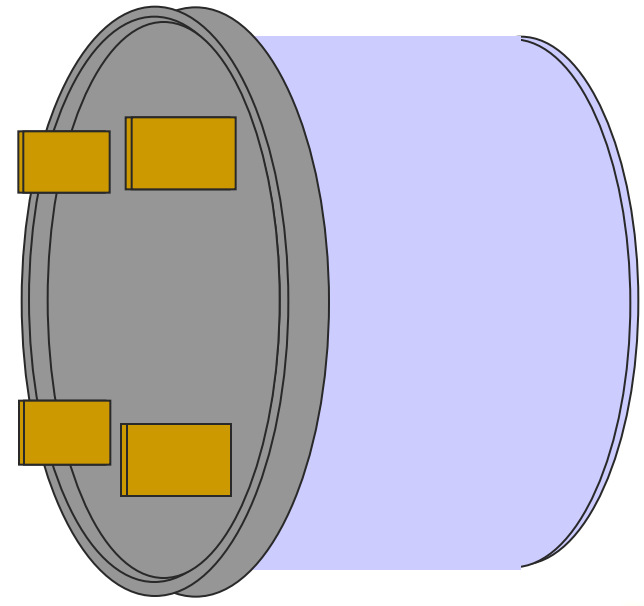
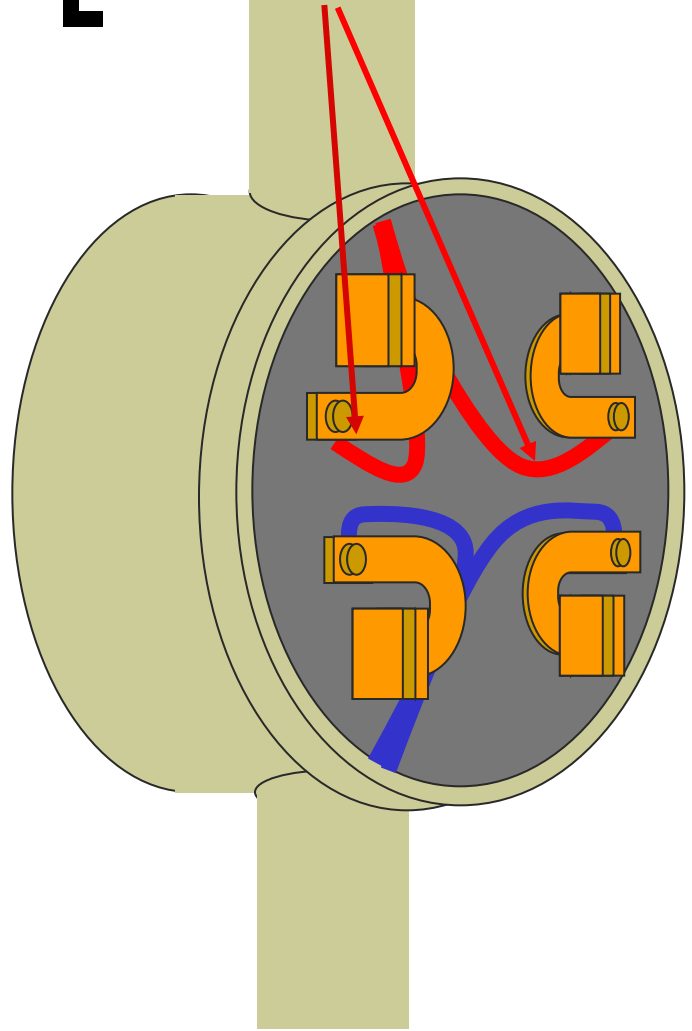
Demarcation Point

- **“ownership demarcation point”** means the point,
 - (a) at which the distributor’s ownership of a distribution system, including connection assets, ends at the customer, and
 - (b) that is not located beyond,
 - i. the first set of terminals located on or in any building, or
 - ii. an electrical room or vault in a building where the electrical room or vault is of tamperproof construction, bears a sign to indicate that it is an electrical room or vault and is accessible only to authorized persons (Reg.22/04)

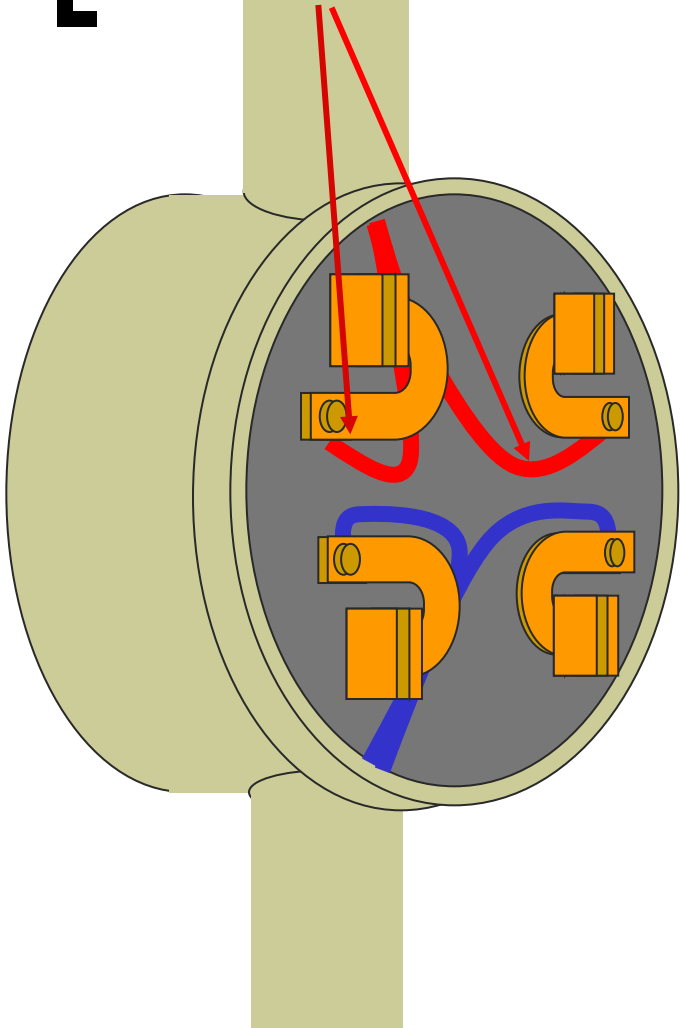




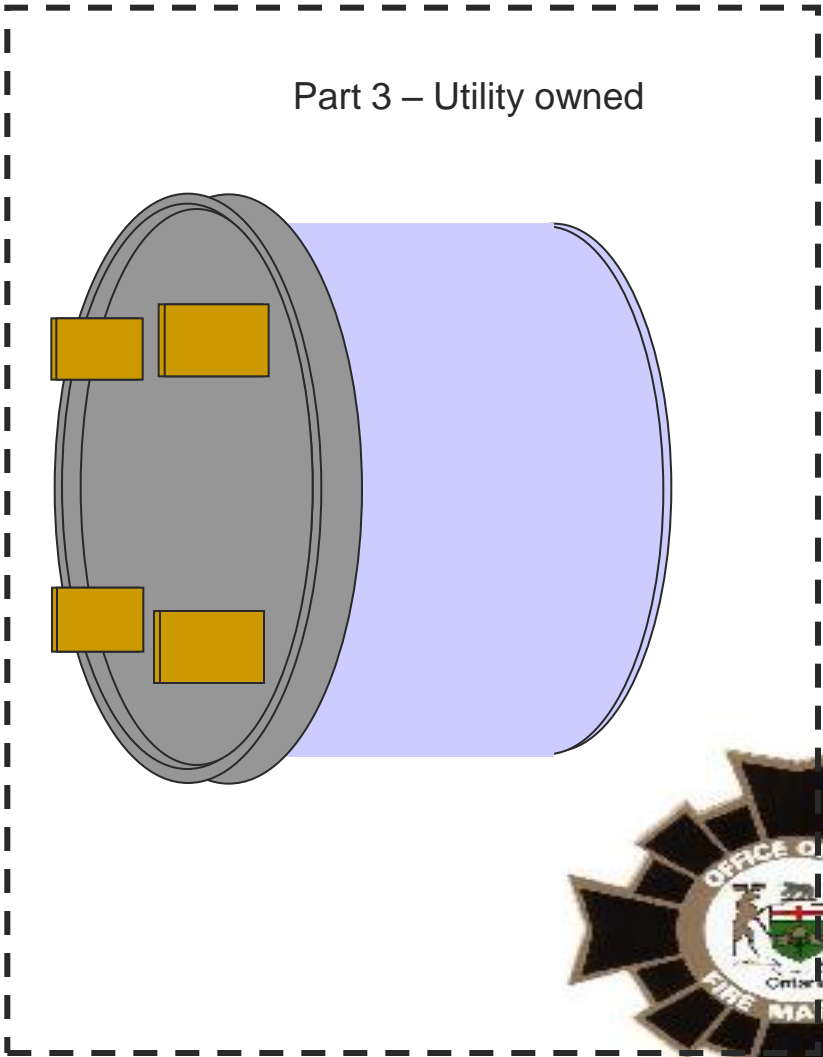
Ownership demarcation point



Part 3 utility owned

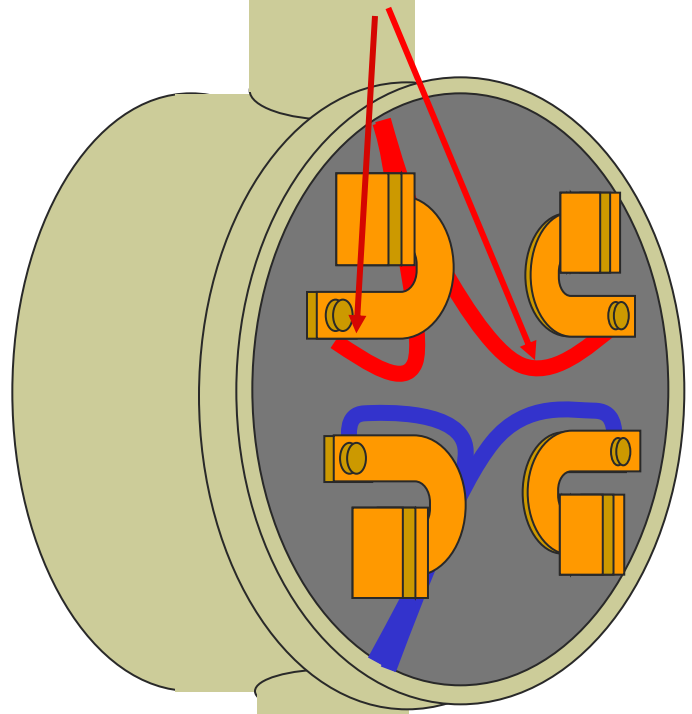


Part 3 – Utility owned



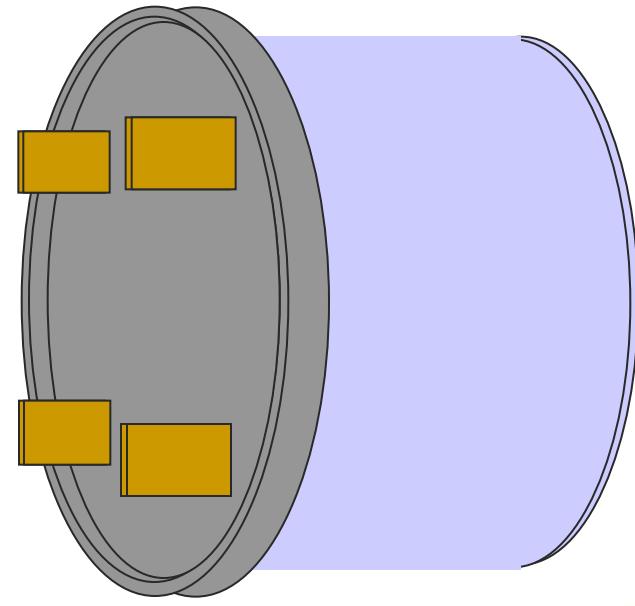


Part 3 – Utility owned inside of a Part 2



Part 2 – Approved Standard
Installed to Part 1

Part 3 – Utility owned



- Considering the meter base fell under part II of the EC we were easily able to find the CSA standard which applied, C22.2 No 115-M1989
- For the meters however it wasn't really obvious which construction standards applied to them
- Both CSA and ESA were uncertain as meters fell in Part 3



- The original design specification for Ontario was:
- Electricity Act
 - O Reg. 440/07 “Functional Specification for an advanced metering infrastructure”
 - Only specifies minimum functionality requirements
 - ie:
 - (YYYY-MM-DD hh:mm)
 - Meters must have the ability to store the data
 - Successfully transmit at least 98.0% of all meter reads in any daily period
 - O Reg. 425/06
 - Adoption of O Reg. 440/07



- Going back to O. Reg. 22/04 “Electrical Distribution Safety”
- 6. Approval of electrical equipment
 - (1) Electrical equipment that is part of a distribution system is approved if,
 - (a) its design and construction meet any of the standards for approval of equipment set out in Rule 2-024 of the EC; or
 - (b) its design and construction comply with a code or standard under a rule of the distributor that provides an assurance of safety of the equipment that is the equivalent of the assurance of safety provided by the standards referenced in clause (a).



■ Rule 2-024

- 2-024 Approval of electrical equipment
 - (1) Electrical equipment shall be deemed to be approved if it has been approved according to the process set out in section 2 of Ontario regulation 438/07



■ O. Reg. 438/07

- 2. An electrical product or device that falls into one of the following categories is deemed to be approved:
 1. An electrical product or device for which a certification body has issued a report certifying that the electrical product or device conforms to the applicable standards for the electrical product or device
 2. An electrical product or device, if a field evaluation agency has examined the electrical product or device or a sample and issued a report confirming that product or device conforms to the applicable standards for the electrical product or device and presents no undue hazard to persons or property and,
 3. An electrical product or device, if Authority has examined or tested the electrical product or device or a sample and determines that it presents no undue hazard to persons or property

■ **Bottom line: Either there is a certified standard or an authority has performed a field evaluation**

■ During our discussions with Elster they informed us that they built to the Measurement Canada LMB – EG – 07 Specification of approval of type of electricity meters, instrument Transformers and Auxiliary Devices



- Measurement Canada LMB – EG – 07 Specification of approval of type of electricity meters, instrument Transformers and Auxiliary Devices
 - Dated 1986
- Amendments made in 2011 in S-E-06—Specification for the Approval of Type of Electricity Meters and Auxiliary Devices - Amendments to Measurement Canada Specification LMB-EG-07
- In reviewing LMB – EG – 07 we observed that the majority of the standard was designed to outline the requirements of meters accuracy. With only 2 real references to structural integrity.
 - The construction shall be mechanically and electrically sound, and materials, finish etc., shall be such as to provide assurance of long life and sustained accuracy
 - The meter or device shall be sufficiently shock proof



- The Measurement Canada LMB – EG – 07 specification used wording like **shall be mechanically and electrically sound, and sufficiently shock proof.**
- What does that mean?
- Compared to the C22.2 No 115-M1989 Meter-Mounting Devices it was extremely lacking in defining safety specific construction



- The following comes from the C22.2 No 115-M1989 Meter-Mounting Devices standard
 - Dated 1989
- Enclosures shall completely encase all current-carrying parts when meters or other devices of proper types are mounted in position. Enclosures shall be so formed and assembled that they will have the strength and rigidity to resist the normal abuses to which they may be subjected without increasing their fire or accidental hazard due to partial collapse with resultant reduction of spacings, Loosening or displacement of parts, or other serious defects.
- Enclosures shall be of metal or other suitable material which, by investigation, has found to be satisfactory for the conditions of use
- Further states materials thickness. Types of connections. Torques applied to connections
- Additionally there are outlined Mechanical Strength tests
 - Metering connections shall be capable of withstanding the application of torques....
- Humidity, corrosion and weather tests





- Both standards state the components must be able to withstand abuse, have performance requirement tests (accuracy tests), require current carrying parts be separated along with temperature rise tests.
- However the meter base standard has additional simulation tests to ensure the structural integrity of all components
- Why was that missing from the Measurement Canada LMB – EG – 07 specification.
- Well simply it was because the mandate of Measurement Canada was only to ensure accuracy.



- This was confirmed by the Measurement Canada Utility Metering Division Manager, who stated that Measurement Canada was only tasked with ensuring the accuracy of the meters.
- Further any references to the construction in the specification was only there to ensure accuracy over the life-span of the meter not to ensure that it operates safely during that life-span.
- During our discussion with the Metering Division Manager we asked him if he knew who was responsible for ensuring the safety of the meters and/or any standards which applied to the meters and he wasn't sure but indicated that only some had UL symbols on them



- Checking on the UL website we found that only two companies were listed which produced meters for the use in Canada
 - Schneider Electric USA Inc.
 - Triacta Power Technologies
 - **Where are GE, Sensus etc....?**
- On the UL website we found a whole division which is devoted to Global meter testing and performance.
- On their website they state: UL tests for electronic electricity meters and their smart features to the requirements of the United States, Asia, Australia, Europe and South Africa
- While they don't say Canada it would make sense that they are testing ours as well?



- From the UL website, UL evaluates meters to the following standards:
 - ANSI (American National Standards Institute)
 - As/NZS (Australian and New Zealand Standards)
 - IEC (International Electrotechnical Commission)
 - EN (European Standards)
 - UL Safety Standards
- Additionally UL has a summary of standards which specify exact:
 - General Mechanical requirements
 - Environmental protection
 - Resistance to heat and fire...



- So we found what we were looking for; that listed smart meters are being designed to specifications and tested to standards. Further, these tests and standards were very rigorous and thorough for each component of the meters
- But that doesn't change the fact that the meter bases and meters are reacting differently in fires.



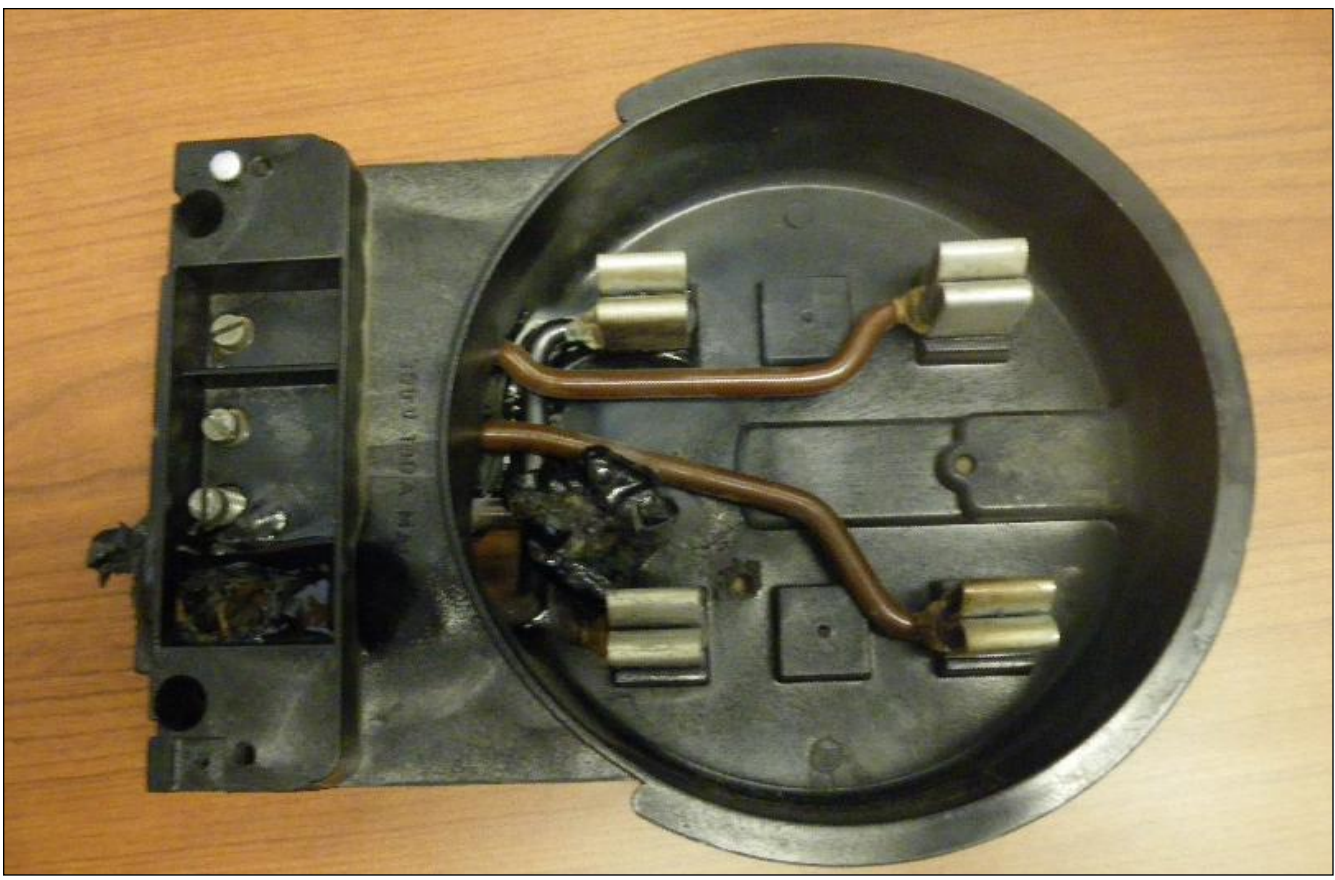


- Considering both the meter bases and meters are both current carrying components and literally plugged/meshed into one another shouldn't the way they react to heat in a fire be almost the same.
- In addition, we still have the anecdotal information supporting that the problems are occurring after the old analog meters are being updated to the new digital smart meters
- This would support that there is maybe something wrong with the installation





- Lets look at this meter base failure in Ontario again



Possible Causes

- This failure occurred (resulting in a fire) due to a loose connection in the meter base
- What could be the reasons for this?
 - The old meter base connections may not have been in a condition for seamless exchange to a new meter
 - New meters may have defects that cause electrical failures or misalignment with old meter base
 - Careless installation during change over



[Video]

<http://www.torontohydro.com/sites/electricsystem/residential/smartmeters/Pages/SmartMetersFAQs.aspx#whatisasmartmeter>



■ Lets analyze the reason again

- The old meter base connections may not have been in a condition for seamless exchange to a new meter
 - This should have been detected by the technician during the change over
 - Would installation guidelines help fix this?
- New meters may have defects that cause electrical failures or misalignment with old meter base
 - The meters are supposedly being designed and tested to specific standards to ensure safety
 - Do we have any policing bodies ensuring (like the CSA with Part II products) that the meters are designed correctly
- Careless installation during change over
 - Would installation guidelines help fix this?



- Considering the new smart meters fall under part 3 of the EC their installation has been left up to the utilities to determine. However they are directly plugged/meshing with a single component which falls under Part 2 which has to be installed in accordance with the requirements of part 1
- Therefore, when a utility owned (Part 3) component is directly meshed into a Part 2 component, would it make for more consistent connection, to have both components be scrutinized to the same standards and tested together and fall under the same installation guidelines



- For further detailed information call
- Steven Silver 705 818-1587
- Office of the Ontario Fire Marshal

