



Metering Installation Security and Sealing Requirements

Report Recommendation

INTRODUCTION

BACKGROUND

- Hydro One's position is that when the Market Design committee was determining metering requirements in preparation for market opening, the committee had never intended or envisioned a requirement for a 'seal within a seal' approach to the security of the metering installation, including components within the meter enclosure.
- The submission of documentation by Hydro One failed to provide the IESO with compelling evidence supporting Hydro One's position.
- The IESO's position therefore remained unchanged, specifically that the requirements as stated under section 10.1.2 (a), (d) and (e) of the Hardware Standard are considered mutually exclusive, and therefore the meter enclosure and all components within the meter enclosure must be sealed.
- Recognizing the need to continually look for efficiencies within the operation of the market, the IESO would, however, consider supporting a proposal brought forward by Hydro One providing that the fundamentals of security for a metering installation are maintained.
- As a result, a Hydro One proposal¹ was reviewed and stakeholdered at the RMSC meeting of October 27, 2011.

IESO ACTIONS

IESO committed to perform a review of the market rules, and associated metering standard and policies, specifically related to the security and sealing of metering installations. IESO will provide an interpretation together, with supplemental recommendations as required, for meeting the fundamental requirements pertaining to security and sealing of metering installations. Specifically, IESO will:

- Adopt a holistic approach in conducting a review of the overall metering installation security and sealing requirements.
- Systematically search, reference, and provide interpretations for the 'Market Rules Chapter 6' and 'Wholesale Revenue Metering Standard – Hardware' requirements for metering installations security and 'circuit access point' sealing.
- Clarify the minimum security and sealing requirements for meter enclosures and internal metering components, for metering installations registered under DOC (Declaration of Compliance) and AMIS (Alternative Metering Installation Standard) status.
- Review MSP (Metering Service Provider) remedial actions and requirements when metering installation security and sealing is compromised or breached.
- Stakeholder proposed recommendations forthcoming for sealing only at the meter enclosure door and not the components within the meter enclosure; and to define sealing requirements for meter room² and meter shed² enclosure variants.

SCOPE OF REVIEW

- The common 'Circuit Access Point' (CAP) areas for metering installation security and sealing review include:
 - CT terminal box and VT/CVT terminal box which contains IT terminal connection points;
 - MEC (junction) box or Marshalling box which contains CT terminal strip and VT fuse links;
 - Metalclad switchgear which contains CT and VT revenue metering cells or compartments, and related VT fuse panels;
 - Meter cabinet enclosure which contains meters, meter test links (test blocks), meter adapter bases, IT terminal strips and associated equipment;
 - Meter room/meter shed enclosure which contains meters, meter test links, meter adapter bases, IT terminal strips and associated equipment;
 - Conduit runs and LB fittings
 - Separate locked communications equipment enclosure where applicable.
- Revenue meter and associated metering components sealing requirements when multiple meters are housed in a non-standard meter enclosure, such as a dedicated meter room or a meter shed.
- MSP security controls required for authorized access to a metering installation.
- MSP actions to be taken when: (i) meter installation security is breached; (ii) metering installation seals are found broken or missing at CAP points; and (iii) meter seal log records are found inaccurate or are not up-to-date.

FINDINGS

CURRENT PRACTICE

- IESO meter audits performed since 2003 enforced the security and sealing requirements as documented in the Wholesale Revenue Metering Standard – Hardware: Section 6 – Instrument Transformers, Section 7 – Secondary Cabling for Instrument Transformers and Section 10 – Metering Installation Enclosure
- The current interpretation for CT and VT/CVT terminal strip housed within a terminal box is to treat it as an 'extension to the secondary cabling'. The CT and VT/CVT terminal strip do not need a seal; only the terminal box cover is required to be sealed and documented in the seal log.
- The current interpretation for a CT terminal strip and VT fuse link housed within a MEC box or Marshalling box is to treat it as an 'extension to the secondary cabling'. The CT terminal strip and VT fuse link do not need a seal; only the MEC box cover or Marshalling box cover is required to be sealed and documented in the seal log.
- The current 'extension to the secondary cabling' interpretation also applies to a CT terminal strip and VT fuse block housed within the meter enclosure. The CT terminal strip and VT fuse

block do not need a seal; however the meter and meter components including meter sealing ring, meter adapter base, meter test block cover contained within the meter enclosure are required to be sealed and documented in the seal log. Finally, the meter enclosure is to be secured by lock and seal.

- The conduit couplings and LB fittings which contain CT and VT/CVT secondary cabling are required to be sealed and documented in the seal log.
- MSP's are known to delegate their MMP (Metered Market Participant) authorized access for meter CAP points under MTR failure or isolation & work protection scenarios.

SEALING ISSUES

- The WRMS-Hardware at market opening prescribed a seal at the meter enclosure door, with an additional requirement to seal the revenue meter and the meter components inside the meter enclosure. Will adopting a 'seal at meter enclosure door' approach continue to meet the requirements to secure the metering installation, and to enable detection of any unauthorized access to the meters?
- A final outcome resulting from a 'seal at meter enclosure door' approach will permit closing of outstanding meter audits which have effectively been put on hold. Statistics for audit tracking revealed that sealing infractions were the leading area of concern for the IESO. IESO must be satisfied that: (i) the current level of metering installation security will not be compromised; and (ii) meter seal breaches will continue to be effectively detected and remediated.
- Can existing metering installations in the field remain sealed 'as-is' with only a single seal at the meter enclosure door? Moving forward, MMPs can benefit from reduced sealing costs in the market place today, and MSPs can benefit from the simplified sealing approach to CAP points with associated reduced maintenance of the seal log.

OTHER CONSIDERATIONS

Settlement and metering scenarios which challenge the proposed security and sealing practice must be addressed:

- Metering installation designs may include multiple meter points (2 or more) that are contained inside a dedicated meter enclosure. Individual and authorized access to the revenue meter and metering components, within such shared meter enclosure, must continue to be maintained by each MMP's respective MSP.
- Conversely, a single point metering installation may contribute to energy delivery points and transmission delivery points that are assigned to different Metered Market Participants.
- The requirement to permit delegation of MSP authorized access to a qualified Metered Market Participant in order to apply work protections, or otherwise to perform work of an urgent, emergency or unscheduled nature.

RECOMMENDATIONS

These recommendations do not affect any changes to Market Rules Chapter 6 Wholesale Metering, nor to Market Rules Chapter 6 Wholesale Metering – Appendices.

These recommendations, however, will trigger baseline revisions to the Wholesale Revenue Metering Standard – Hardware.

Recommendation #1:

- To stakeholder the Revenue Metering Standing Committee’s views for adopting a ‘seal at meter enclosure door’ approach to collectively meet all the requirements of WRMS-Hardware Section 10.1 Metering Installation Enclosure – New Installations and 10.2 Metering Installation Enclosure – Existing Installations. The revised Section 10.1 text to incorporate this approach would read as follows: (green text indicates changes to existing)

10.1 New Installations

10.1.1 Meter Enclosure

All *meters*, test links, and fuses shall be contained with a *meter* enclosure. The communication equipment, such as an external modem or a telephone line switcher, may be located in a separate locked enclosure under strict control of the *metered market participant* provided that the equipment is supplied from an external power source; otherwise the communication equipment shall be contained within the *meter* enclosure.

10.1.2 Meter Enclosure Requirements

The *meter* enclosure shall comply with the following requirements:

- a. the *meter* enclosure shall be secured by the *metering service provider*, in a manner approved by the *IESO*;
- b. the *metering service provider* shall have access to the *meter* enclosure at all times;
- c. access to the *meter* enclosure for purposes of isolation work protection or meter communications servicing by persons other than the *metering service provider* shall ~~not~~ only be given under metering service provider control; ~~access to the meter enclosure~~
- d. the *meter* enclosure shall be locked and sealed ~~as far as practicable~~ in a manner approved by the *IESO*; ~~seals shall be placed~~ to ensure the detection of unauthorized access to the *instrument transformer* connections, *meter*, test links, test link cover and fuses;
- e. the *meter* enclosure that contains multiple metering installations (2 or more) shall be locked and sealed in a manner approved by the *IESO*. Internal meter components including meter sealing ring, meter adapter base, meter test block cover contained within the meter enclosure shall additionally be sealed to ensure the detection of unauthorized access to the individual metering installation’s *instrument transformer* connections, *meter*, test links, test link cover and fuses.
- e. seals shall be individually numbered; and
- f. seals shall be traceable to the *metering service provider*.

10.1.3 Maintenance and On-site Audit

Each *meter point* named in the meter seal log shall identify all associated CAP points (circuit access point) with a record of the time, date, and seal serial number. ~~and meter point name for e~~Each seal that is removed and replaced during maintenance and on-site audit shall be recorded in the meter seal log for inspection by the IESO.

10.1.4 Test Blocks

Test blocks shall be installed inside the *meter* enclosure to allow the current and voltage from each *instrument transformer* and each *meter* to be individually determined.

10.2 Existing Installations

10.2.1 IESO Approval

Existing *metering installations* installed before May 17, 2000 shall be accepted into the IESO-administered market, subject to IESO approval.

10.2.2 Requirements for Approval

The requirements for security approval are:

- a. the *metering installation* shall be secure
- b. the *metering installation* shall comply with as many requirements of section 10.1 as practicable; and
- c. where the existing *metering installation* does not meet the requirements of section 10.1, variances shall be listed and submitted to the IESO for approval.

Recommendation #2:

1. Appendix 6.1 – Metering Obligations Section 1.3 - Metering Service Providers: 1.3.1: Section 1.3.2.7 obliges MSP's to “ensure, by means of the placement of sufficient seals on test links, fuses and the *meter* box or otherwise in accordance with any policy or standard established by the IESO pursuant to this Chapter, that access to the *metering installation* by a person not authorized by this Chapter to have such access can be detected;”
 2. Appendix 6.1 – Metering Obligations Section 1.3 - Metering Service Providers: 1.3.1: Section 1.3.2.23 obliges MSP's to “ensure that each *metering installation* is sealed with uniquely numbered seals and maintain a register of such numbers;”
- To call for MSP security investigation and remedial actions under the following metering installation security breach scenarios:
 - Discovery of seal log record discrepancy which may compromise metering installation security. Such seal log discrepancy may include: (i) no seal recorded at meter enclosure; (ii) no seal recorded at CAP point; (iii) no record of CAP point; (iv) reason for seal change not recorded; and (v) mismatch of seal log serial no. versus as found serial number
 - Detection of meter enclosure seal breach, lock breach or key breach

- Detection of metering installation CAP point (circuit access point) seal breach
- Implementation of remedial and preventive actions in resolving any security breach or unauthorized access incident

The MSP security investigation must describe or provide:

- √ The MSP's determination if any security breach may have compromised the metering data within the metering installation
- √ The metering data audit to be performed to ensure that integrity of the metering data was not breached for any such 'determined' security breach
- √ The immediate steps to be taken in the field to re-seal and re-secure the metering installation
- √ The corrective action steps to be taken with MSP staff to resolve seal log record discrepancies
- √ The MSP security review taken to account for and discharge any potential security breach when an unauthorized metering installation access is detected
- √ The meter data audit and security investigation report shall be provided to IESO upon request

Recommendation #3:

1. Appendix 6.1 – Metering Obligations Section 1.3 – Metering Service Providers: 1.3.2: Section 1.3.2.3 obliges MSP's to “conduct an annual review of all documentation pertaining to the metering installation;” IESO requires a security review be conducted annually for MMP access control procedures and MSP seal log integrity.
 - To call for MSP management of control procedures for qualified MMP access to meter enclosure and to CAP points.
 - Requirement to create a procedural document for qualified MMP access to meter enclosure and to CAP point
 - Requirement for MSP to record MMP access to meter enclosure and to CAP point in the seal log
 - Requirement for the MMP to request the MSP apply security seal and update seal log for meter enclosure and CAP point on the next business day or as soon as practicable
 - Requirement for MSP to conduct an annual security review of the seal log for all MMP metering installations. All meter points named in the seal log shall confirm that: (i) CAP points as listed are accurate and complete; and (ii) meter seals as listed are present and intact. (per Appendix 6.1, Section 1.3.2.3)

The MMP control procedure must describe how or provide:

- √ MMP stations/operations staff utilized for authorized access are qualified and recorded

- √ A meter enclosure which requires access for emergency servicing of meter communications or other authorized device, is identified, recorded and secured upon completion of work
- √ CAP point which requires access for isolation/work protections is identified, recorded and secured upon completion of work
- √ New seal request to replace MMP removed seals is made to the MSP on the next business day or as soon as practicable
- √ Removed seals are: (i) logged in the station log book; and (ii) stored to return to MSP at the next visit
- √ Information regarding any meter enclosure or CAP point access shall be provided to IESO upon request

CONCLUSIONS AND RECOMMENDATIONS

- The proposal to adopt a ‘seal at meter enclosure door’ approach can meet Market Rules Chapter 6 and Wholesale Revenue Metering Standard - Hardware security and sealing requirements for a single metering installation contained in a meter enclosure. However multiple metering installations (2 or more) contained within a single enclosure will require: (i) securing and sealing the meter enclosure door; and (ii) sealing the revenue meter and meter components inside the meter enclosure.
- The IESO will require formal MSP investigation and remedial actions following discoveries of security/seal breach, and incidents of unauthorized access.
- The IESO will permit MMP access to metering installation meter enclosure for emergency servicing scenarios, under the strict management by the MSP of the MMP’s documented control procedures.
- The IESO will permit MMP access to metering installation circuit access points for emergency and isolation/work protection scenarios, under the strict management by the MSP of the MMP’s documented control procedures.
- The Market Rules will direct that the meter enclosure and circuit access points be secured, locked and sealed by the MSP. MMP access to the meter enclosure or circuit access point will only be given under the MSP’s authorization and control.

GLOSSARY

IESO DEFINITIONS – Associated with terminology used in Market Rules Chapter 6 and Wholesale Revenue Metering Standard -Hardware

- **Associated link:** meter test block; meter terminal strip; current test link, fuse link
- **Box (meter):** See enclosure (meter)
- **Box (MEC, junction):** In specific reference to where the electrical enclosure is small and primarily intended to conceal electrical junctions from sight, or protect them from tampering
- **Circuits:** metering installation circuits including CT circuit; VT circuit; or auxiliary power supply circuit to the meter
- **Enclosure (meter):** is a cabinet for electrical or electronic equipment dedicated to contain revenue metering and communications equipment, and to prevent electrical contact/shock to equipment users and protect the contents from the environment
- **Information storage and processing systems:** In the Market Rules context, the list of conforming meters that are permitted to be used as the "main" or "alternate" meter in each metering installation. (Note: This is a Information Technology industry term being used in a metering context)
- **Other devices approved by the IESO:** Devices connected to instrument transformer associated links and circuits. For example, other devices may include such as kWh/kVarh transducer, electronic pulse duplicator, summator or transmitter
- **Practicable:** Only if sealing provisions exist

INDUSTRY TERMS/ACRONYMS – Associated with wholesale metering installations in IESO-administered market

- **CAP:** Circuit access point which allows controlled access to the instrument transformer secondary cabling
- **CT:** Current transformer
- **Current links and fuse links:** Current terminals used for testing or monitoring; Voltage terminals used for fuse link connections
- **Meter test link:** Used in context of 'meter test block' or 'meter blocking switch'
- **Flexitest switch:** Molded case test switch used for in-service testing, isolation, calibration of relays or meters without de-powering panels
- **IT:** Instrument transformer
- **MEC or MECH box:** A cabinet which serves as a junction box, or pullbox, for CT or VT secondary cabling
- **Marshalling box:** A cabinet which collects or 'marshals' the secondary cabling from all three phases of the instrument transformer
- **PME:** Pole mounted equipment
- **VT:** Voltage transformer

REFERENCES

1. "Meter Enclosure Requirements" – Hydro One Networks Inc. presentation to Revenue Metering Standing Committee, October 27, 2011
2. "Meter Enclosures" – IESO presentation to Revenue Metering Standing Committee, March 8, 2005 and to MSP User Group Committee, March 24, 2005

APPENDICES

1. Appendix I - Market Rules Chapter 6 Reference for 'SEAL', 'SECURITY', 'LOCK', 'ACCESS' and 'PRACTICABLE'
2. Appendix II - Market Rules Chapter 6 Appendix 6 Reference for 'SEAL', 'SECURITY', 'LOCK', 'ACCESS' and 'PRACTICABLE'
3. Appendix III - Wholesale Revenue Metering Standard - Hardware Reference for 'SEAL', 'SECURITY' (SECURE), 'LOCK', 'ACCESS' and 'PRACTICABLE'
4. Appendix IV – DOC Metering Installation CAP Sealing Points
5. Appendix V – DOC Metering Installation CAP Sealing Points – Multiple Meter Points

APPENDIX I

Market Rules Chapter 6 Reference for

'SEAL', 'SECURITY', 'LOCK', 'ACCESS' and 'PRACTICABLE'

1. **SEAL** (Note: Word search was retained in context of a security 'seal'; word search was discarded for hits in context of expiry date of 'seal' period of a meter)

Chapter 6 Sec 9.1 Security of Metering Equipment: 9.1.1 Each *metered market participant* shall ensure that:

- 9.1.1.2 all associated links, circuits and information storage and processing systems are secured by means of **seals** or other devices approved by the *IESO*;
- 9.1.1.3 the *meter* box is physically secure, locked and **sealed** by means of devices approved by the *IESO* so as to enable detection of access by persons other than the *IESO*, the person that acts as *metering service provider* in respect of such *metering installation* and, for the purposes of section 4.1A.1, the *metered market participant*;

[Reference only: 4.1A Metering Installations for Segregated Mode of Operation: 4.1A.1 Subject to section 4.4, no *metered market participant* may operate a *registered facility* in a *segregated mode of operation* unless the *metering installation* for that *registered facility* generates *metering data* that reads zero, or is capable of such adjustment as may be required to ensure that such *metering data* reads zero, when the *registered facility* is operating in a *segregated mode of operation*.]

- 2a. **SECURITY** (of metering installations); **SECURE**

Chapter 6 Sec 4.1 Metering Installation Standards: 4.1.1 Subject to sections 4.1.2, 4.4, and 4.6, each *metering installation* shall:

- 4.1.1.5 meet the **security** requirements set forth in this Chapter and in any policy or standard established by the *IESO* pursuant to this Chapter;

Chapter 6 Sec 9.1 Security of Metering Equipment: 9.1.1 Each *metered market participant* shall ensure that:

- 9.1.1.2 all associated links, circuits and information storage and processing systems are **secured** by means of seals or other devices approved by the *IESO*;
- 9.1.1.3 the *meter* box is physically **secure**, locked and sealed by means of devices approved by the *IESO* so as to enable detection of access by persons other than the *IESO*, the person that acts as *metering service provider* in respect of such *metering installation* and, for the purposes of section 4.1A.1, the *metered market participant*;
- 9.1.1.4 the data connections to the *meter's* communication ports are **secure** from access by persons other than persons authorized by it to have access to such data connections; and
- 9.1.1.5 the *metering installation* meets all of the requirements pertaining to the **security** of *metering installations* set forth in this Chapter and in any policy or standard established by the *IESO* pursuant to this Chapter.

Chapter 6 Sec 9.1.2 Subject to any limitations prescribed by *federal metering requirements*, the *IESO* may override any of the **security** devices fitted to a *metering installation* without prior notice to the *metered market participant* or the *metering service provider* for such *metering installation*.

Chapter 6 Sec 9.1.3 The *IESO* may audit the **security** measures applied to each registered *metering installation* from time to time as determined appropriate by the *IESO*.

Chapter 6 Sec 9.3 Changes to Metering Equipment, Parameters and Settings: 9.3.2A An adjustment required to be made to a *metering installation* to enable it to generate *metering data* that reads zero while the *registered facility* to which such *metering installation* relates is operating in a *segregated mode of operation* shall: 9.3.2A.2 shall be effected while at all times maintaining the **security** of the *metering installation* in accordance with the requirements pertaining to the **security** of *metering installations* set forth in this Chapter and in any policy or standard established by the *IESO* pursuant to this Chapter.

Chapter 6 Sec 13 Responsibilities of the IESO: 13.1.1 The IESO shall:

13.1.1.5 establish *metering*-related policies and standards including, but not limited to, policies or standards for *metering installations*; site specific loss adjustments; transfers of *metering data* to the *metering database*; *metering data* security requirements; and the inspection, testing and audit of *metering installations*; the **security** of *metering installations* and measurement error correction;

2b. **SECURITY** AND ACCURACY (of metering data)

Chapter 6 Sec 3 Metered Market Participants – 3.1 General Obligations: 3.1.4.4 the **security** and accuracy of all *metering data* recorded in each *metering installation* for which it is the *metered market participant* and the transfer of such *metering data* to the communication interface of the *metering database*;

Chapter 6 Sec 4.3 Use of Metering Data and Metering Data Collection: 4.3.1 *Metering data* shall be used by the *IESO* for *settlement* purposes following completion of the validation and, where applicable, substitution and estimation processes, in the manner set forth in Chapter 9.

- 4.3.4 Each *metered market participant* shall ensure that all *metering data* in each *metering installation* for which it is the *metered market participant* is transferred to the communication interface of the *metering database* in a manner that preserves the **security** from access and the accuracy of such *metering data* as described in this Chapter and in any policy or standard established by the *IESO* pursuant to this Chapter.

Chapter 6 Sec 9.2 **Security** Controls: 9.2.1 Each *metered market participant* shall ensure that the *metering data* recorded in each *metering installation* in respect of which it is the *metered market participant* is: 9.2.1.1 protected from direct local or remote electronic access, including during the transfer of such *metering data* to the communication interface of the *metering database*, by

persons other than itself and those persons described in sections 8.1.5.1 to 8.1.5.5, by ensuring that its *metering service provider* implements suitable password and other **security** controls in accordance with the requirements of this section 9.2;

Chapter 6 Sec 9.3 Changes to Metering Equipment, Parameters and Settings: 9.3.1 Each *metered market participant* shall ensure that changes to equipment, parameters or settings within a *metering installation* in respect of which it is the *metered market participant* that may affect the collection, **security** or accuracy of any *metering data* recorded in that *metering installation* shall be: See 9.3.1.1; 9.3.1.2 and 9.3.1.3

Chapter 6 Sec 13 Responsibilities of the IESO: 13.1.1 The IESO shall:

13.1.1.5 establish *metering*-related policies and standards including, but not limited to, policies or standards for *metering installations*; site specific loss adjustments; transfers of *metering data* to the *metering database*; *metering data* **security** requirements; and the inspection, testing and audit of *metering installations*; the security of *metering installations* and measurement error correction;

3. **LOCK**

Chapter 6 Sec 9 Security of Metering Installations and Data - 9.1 Security of Metering Equipment: 9.1.1.3 the *meter* box is physically secure, **locked** and sealed by means of devices approved by the *IESO* so as to enable detection of access by persons other than the *IESO*, the person that acts as *metering service provider* in respect of such *metering installation* and, for the purposes of section 4.1A.1, the *metered market participant*;

4. **ACCESS** (the metering installation)

Chapter 6 Sec 3 Metered Market Participants – 3.1 General Obligations: 3.1.1.3 coordinate electronic access, by persons other than the *IESO*, to each *metering installation* in respect of which it is the *metered market participant* so as to prevent such persons from **accessing** the *metering installation* at a time or in a manner that may adversely affect the ability of the *IESO* to **access** the *metering data* in that *metering installation* in accordance with the notice given pursuant to section 8.1.7.

5. **PRACTICABLE** (in reference to sealing)

No reference was found for 'practicable' in a sealing context in the search of Market Rules Chapter 6.

APPENDIX II

Market Rules Chapter 6 Appendix 6 Reference for 'SEAL', 'SECURITY', 'LOCK', 'ACCESS' and 'PRACTICABLE'

2. SEAL

Appendix 6.1 – Metering Obligations Sec 1.3 - Metering Service Providers: 1.3.1 The following activities shall be performed by registered *metering service providers* in accordance with the requirements of this Chapter and with any policy or standard established by the *IESO* pursuant to this Chapter:

- 1.3.2.7 - ensure, by means of the placement of sufficient seals on test links, fuses and the *meter* box or otherwise in accordance with any policy or standard established by the *IESO* pursuant to this Chapter, that access to the *metering installation* by a person not authorized by this Chapter to have such access can be detected;
- 1.3.2.23 - ensure that each *metering installation* is sealed with uniquely numbered seals and maintain a register of such numbers;

3a. SECURITY (of metering installations); SECURE

Appendix 6.2 – Alternative Metering Installation Standards Sec 1.7 – Instrument Transformers – Accuracy Requirements: 1.7.1 Subject to section 1.7.1A, each *metering installation* for which registration is being sought under Chapter 6, section 4.4.2 that does not comply with the 0.3% accuracy requirements of ANSI standard C57.13, as evidenced by factory test cards complete with serial numbers, for *instrument transformers* set forth in this Chapter and in any policy or standard established by the *IESO* pursuant to this Chapter shall meet the following conditions:

- 1.7.1.3 - the *instrument transformer* complies with the security requirements set forth in this Chapter and in any policy or standard established by the *IESO* pursuant to this Chapter.

Appendix 6.2 – Alternative Metering Installation Standards Sec 1.10 – Meter Installation Enclosures:

1.10.1 Each *metering installation* for which registration is being sought under Chapter 6, section 4.4.2 that does not comply with the enclosure requirements for *metering installations* set forth in this Chapter and in any policy or standard established by the *IESO* pursuant to this Chapter shall meet the following conditions:

- 1.10.1.1 the *metering installation* is, in the *IESO's* opinion, secure;

3b. SECURITY AND ACCURACY (of metering data)

Appendix 6.1 – Metering Obligations Sec 1.3 - Metering Service Providers: 1.3.1 The following activities shall be performed by registered *metering service providers* in accordance with the requirements of this Chapter and with any policy or standard established by the *IESO* pursuant to this Chapter:

- 1.3.2.10 - maintain such records of all inspections, tests, audits and activities that may affect the collection, security or accuracy of *metering data* contained in, and of any changes made to, the *metering installation* and provide such records to the *IESO* as may be requested by the *IESO* or

required pursuant to this Chapter or any policy or standard established by the *IESO* pursuant to this Chapter;

- 1.3.2.22 - obtain the prior approval of the *IESO* prior to carrying out procedures or effecting any changes to the equipment, parameters or settings of a *metering installation* that may affect the collection, **security** or accuracy of any *metering data* stored in the *metering installation*;

Appendix 6.4 – Metering Service Provider Qualifications Sec 1.1 – Qualifications

- 1.1.1.7 personnel that has demonstrated experience with procedures for maintaining the **security**, validity and integrity of *metering data*, including the collection of static and dynamic *metering data* and the reading of *metering data* prior to and after the repair or replacement of *metering installations*;

3. **LOCK** – No references for ‘lock’ was found in the search of Market Rules Appendix 6.

4. **ACCESS** (Note: The word search was made for ‘access to the *metering installation*’; the word search was not made for [remote] ‘access to *metering data*’)

Appendix 6.2 – Alternative Metering Installation Standards Sec 1.3 Metering Service Providers 1.3.1
The following activities shall be performed by registered *metering service providers* in accordance with the requirements of this Chapter and with any policy or standard established by the *IESO* pursuant to this Chapter:

- 1.3.2.7 ensure, by means of the placement of sufficient seals on test links, fuses and the *meter* box or otherwise in accordance with any policy or standard established by the *IESO* pursuant to this Chapter, that **access** to the *metering installation* by a person not authorized by this Chapter to have such **access** can be detected;

Appendix 6.2 – Alternative Metering Installation Standards Sec 1.8 – Instrument Transformers – Secondary Cabling: 1.8.1 Each *metering installation* for which registration is being sought under Chapter 6, section 4.4.2 that does not comply with the secondary cabling requirements for *instrument transformers* set forth in this Chapter and in any policy or standard established by the *IESO* pursuant to this Chapter shall meet the following conditions:

- 1.8.1.2 fixtures, including but not limited to AC outlets and voltage test points, that may allow **access** to the *instrument transformer* secondaries by persons not authorized by this Chapter to have such **access** shall be removed, if possible, or disabled or made **inaccessible** by a sealed cover;

5. **PRACTICABLE**

Appendix 6.2 – Alternative Metering Installation Standards Sec 1.10 – Meter Installation Enclosures: 1.10.1 Each *metering installation* for which registration is being sought under Chapter 6, section 4.4.2 that does not comply with the enclosure requirements for *metering installations* set forth in this Chapter and in any policy or standard established by the *IESO* pursuant to this Chapter shall meet the following conditions:

- 1.10.1.2 the *metering installation* complies with as many of the enclosure requirements described in this Chapter and in any policy or standard established by the *IESO* pursuant to this Chapter as is practicable and any requirements not so complied with have been identified to the *IESO*.

APPENDIX III

Wholesale Revenue Metering Standard - Hardware Reference for

'SEAL', 'SECURITY' (SECURE), 'LOCK', 'ACCESS' and 'PRACTICABLE'

1. **SEAL** (Note: Word search was retained in context of a security 'seal' or sealing action; word search was discarded for hits in context of: (i) meters sealed; and (ii) expiry date of 'seal' period of a meter)
 - Sec 6 Instrument Transformers 6.2 Security
 - 6.2.1 Security Requirements: *Instrument transformers* connections to cabling shall be secure and tamper proof.
 - 6.2.2 Seals: Sufficient **seals** shall be placed to ensure detection of unauthorized access to the *instrument transformer* secondary connections.
 - Sec 6 Instrument Transformers 6.2 Security 6.2.1 Security Requirements 6.2.3 **Seal** Requirements: The requirements for **sealing** are:
 - a. **seals** shall have unique serial numbers;
 - b. **seals** shall be traceable to the *metering service provider* that installed the **seals**; and
 - c. the *metering service provider* shall maintain a record of the **seal** serial numbers and log subsequent changes including reasons for the **seal** change.
 - Sec 6 Instrument Transformers 6.7 Power System Switching – New Installations 6.7.2 VT Primary Switching Devices and Rack-Out Mechanisms: Notwithstanding Section 6.7.1, the presence of switching devices on the primary connections of the VT's is permitted only under the following conditions:
 - c. sufficient **seals** shall be placed to ensure detection of unauthorized access to the VT switching device; (e.g. switching relay)
 - Sec 6 Instrument Transformers 7.5 Secondary Cabling – Existing Installations 7.5.2 Requirements: Existing secondary cabling shall comply with the following requirements:
 - b. fixtures (such as AC outlets and voltage test points) that may allow unauthorized access to the *instrument transformer* secondaries shall be removed, disabled, or made inaccessible by a **sealed** cover;
 - c. any remaining devices connected to the *instrument transformer* secondary cables shall be **sealed**;
 - Sec 10 Metering Installation Enclosure 10.1 New Installations 10.1.2 Meter Enclosure Requirements: The meter enclosure shall comply with the following requirements:
 - d. the *meter* enclosure shall be **sealed** as far as practicable in a manner approved by the *IESO*;
 - e. **seals** shall be placed to ensure the detection of unauthorized access to the *instrument transformer* connections, *meter*, test links, test-link cover and fuses;
 - f. **seals** shall be individually numbered; and
 - g. **seals** shall be traceable to the *metering service provider*.
 - Sec 10 Metering Installation Enclosure 10.1 New Installations 10.1.3 Maintenance and On-site Audit: The time, date, serial number, and *meter point* name for each **seal** removed and replaced during maintenance and on-site audit shall be recorded for inspection by the *IESO*.
 - Sec 11 Metering Installations 11.3 Metering Installations for Small or Minor Embedded Generation Facility 11.3.2 Instrument Transformers:

a. In accordance with Chapter 6, section 4.1.7.4 additional loads, such as control and protection devices, can be supplied from the revenue metering *instrument transformers*, subject to approval by the *IESO*.

b. Approval by the *IESO* under subsection (a) above will be subject to the following conditions being met:

- Security and sealing requirements shall comply with section 6.2 of this Standard.

2. SECURITY (of metering installations); SECURE

- Sec 6 Instrument Transformers 6.2 Security 6.2.1 Security Requirements
- Sec 6 Instrument Transformers 6.12 Instrument Transformers – Existing Installations 6.12.8 Security: *Instrument transformer* installations shall conform to the security requirements of section 6.2.

- Sec 10 Meter Installation Enclosure 10.2 Existing Installations 10.2.2 Requirements for Approval:

The requirements for security approval are:

a. the *metering installation* shall be secure;

- Sec 11 Metering Installations 11.3 Metering Installations for Small or Minor Embedded Generation Facility 11.3.2 Instrument Transformers:

b. Approval by the *IESO* under subsection (a) above will be subject to the following conditions being met:

- The burden limit of the *instrument transformers* must not be exceeded. See section 8.3 of this Standard for details.
- Security and sealing requirements shall comply with section 6.2 of this Standard.

6. LOCK

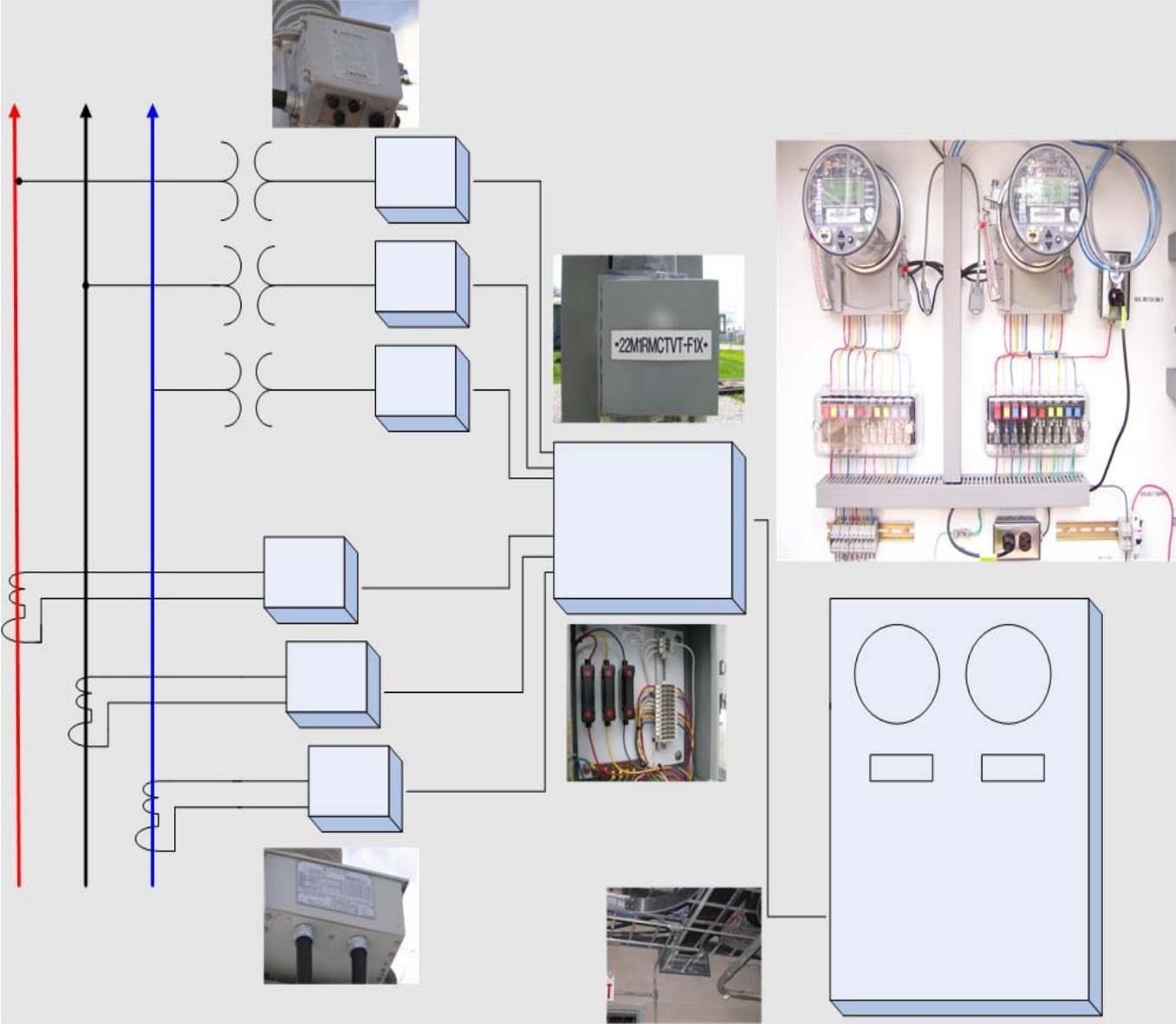
- Sec 10 Metering Installation Enclosure 10.1 New Installations 10.1.1 Meter Enclosure: All *meters*, test links, and fuses shall be contained within a *meter* enclosure. The communication equipment, such as an external modem or a telephone line switcher, may be located in a separate locked enclosure under strict control of the *metered market participant* provided that the equipment is supplied from an external power source; otherwise the communication equipment shall be contained in the *meter* enclosure.

7. ACCESS (the metering installation)

- Sec 6 Instrument Transformers 6.2 Security 6.2.1 Security Requirements 6.2.2 Seals: Sufficient seals shall be placed to ensure detection of unauthorized access to the *instrument transformer* secondary connections.
- Sec 6 Instrument Transformers 6.7 Power System Switching – New Installations 6.7.2 VT Primary Switching Devices and Rack-Out Mechanisms: Notwithstanding Section 6.7.1, the presence of switching devices on the primary connections of the VT's is permitted only under the following conditions:
 - c. sufficient seals shall be placed to ensure detection of unauthorized access to the VT switching device;

- Sec 6 Instrument Transformers 7.5 Secondary Cabling – Existing Installations 7.5.2
Requirements: Existing secondary cabling shall comply with the following requirements:
b. fixtures (such as AC outlets and voltage test points) that may allow unauthorized access to the *instrument transformer* secondaries shall be removed, disabled, or made inaccessible by a sealed cover;
 - Sec 10 Meter Installation Enclosure 10.1 New Installations 10.1.2 Meter Enclosure
Requirements: The *meter* enclosure shall comply with the following requirements:
b. the *metering service provider* shall have access to the meter enclosure at all times;
c. persons other than the *metering service provider* shall not be given access to the *meter* enclosure;
e. seals shall be placed to ensure the detection of unauthorized access to the *instrument transformer* connections, *meter*, test links, test-link cover and fuses;
 - Sec 11 Metering Installations 11.3 Metering Installations for Small or Minor Embedded Generation Facility 11.3.2 Instrument Transformers:
c. To ensure that the meter multiplier on a registered *metering installation* is not inadvertently changed without notification of the *IESO*, the *metered market participant* shall have in place either a satisfactory system to manage access to the *instrument transformer* taps or it will check the *meter* multiplier on a regular basis. As part of the *IESO* site audit, the *metered market participant* may be requested to prove that such management systems exist or prove that the *meter* multipliers have been checked periodically.
8. PRACTICABLE (in reference to security and sealing)
- Sec 10 Meter Installation Enclosure 10.1 New Installations 10.1.2 Meter Enclosure
Requirements: The *meter* enclosure shall comply with the following requirements:
d. the *meter* enclosure shall be sealed as far as practicable in a manner approved by the *IESO*;
 - Sec 10 Meter Installation Enclosure 10.2 Existing Installations 10.2.2 Requirements for Approval:
The requirements for security approval are:
b. the *metering installation* shall comply with as many requirements of section 10.1 as practicable;

Appendix IV – DOC Metering Installation CAP Sealing Points – Single Meter Point



Appendix IV – DOC Metering Installation CAP Sealing Points – Multiple Meter Points

