

**ISO Rule Section 502.11 (Substation) Workgroup meeting minutes – Final on June 14, 2016**

Date: March 31, 2016

Time: 10:00 am – 3:00 pm

Location: AESO Boardroom M2538 Calgary Place

Attended	Name	Company
X	[REDACTED]	AESO
X	[REDACTED]	Fortis Alberta
X	[REDACTED]	ATCO Electric
X	[REDACTED]	EPCOR
X	[REDACTED]	CANA
X	[REDACTED]	Altalink
X	[REDACTED]	Altalink
	[REDACTED]	ATCO Electric
	[REDACTED]	EPCOR
X	[REDACTED]	ENMAX
X	[REDACTED]	ENMAX

**1. Welcome**

- WG approved to finalize the revised January 21 meeting minutes, as revised on February 18, 2016. The revised January 21 meeting minutes are now finalized. Ligong to send out finalized January 21 meeting minutes to WG members.
- WG approved to finalize the draft February 18 meeting minutes, with a correction to Page 2 – “...AltaLink is to send to the AESO their BC Hydro’s loss evaluation methodology, and the AESO is to review the difference between AltaLink’s BC Hydro methodology and the IEEE C57.120 standard...”. [AESO] to send out finalized February 18 meeting minutes to WG members.

**2. Action Items from February 18 meeting**

[Action #1 for the AESO: Transformer overloading capability – appropriate wording in the substation rule respecting overloading capability of transformers](#)

It is noted that all the major TFOs currently require manufacturers to follow IEEE C57 standards in transformer design and testing. However, the load cycle specified in their procurement document varies from TFO to TFO.

The AESO does not intend to require a minimum overloading rating that every power transformer (either a system transformer or a load transformer) must be capable. If overloading rating is

necessary for certain transformers, the AESO will specify this requirement through the project's Functional Specifications.

WG agreed to the following:

- 502.11 rule will not set minimum overloading capabilities for each and every power transformer in the future
- If the AESO requires overloading capability of a system transformer, the AESO must
  - Use a Functional Spec to specify the requirement
  - Provide a load cycle in the Functional Spec to the TFO associated with the overloading ratings
- The WG agreed to using the following wording (or similar wording) in the rule:

***Any ratings beyond the nameplate rating, if specified by the ISO in a Functional Specification with a specified load cycle, shall be recorded and provided to the ISO.***

***Any load cycle test to meet above requirement or other requirements from the ISO shall be performed in accordance with IEEE Standard C57.119. The test report shall include, to the maximum extent possible, all information as specified in IEEE Standard C57.91.***

[Action #2 for the AESO: The AESO is to review the difference between BC Hydro's loss methodology and the IEEE C57.120 standard](#)

Discussions were held on the loss evaluation period. It is noted that beyond 20 years, the effect of the cost of loss on the NPV value is likely very small. It is also noted that loss evaluation is for relative comparisons and does not need to be of overexerting accuracy. However, consistent cost parameters must be provided by the AESO to the owners for their loss evaluation.

WG agreed to the following:

- Loss evaluation would be required for only certain system transformers, (normally) not for load transformers at the PODs
- The AESO will use a project's Functional Spec to require that cost of loss be evaluated
- The AESO will provide the same data for transformer loss evaluation as for line optimization studies, i.e., 20 year average loading levels and 20 year projected pool price
- TFOs are required to use the loading and cost parameters as presented in the Functional Spec for transformer procurement, even if it may take considerable time between when the Functional Spec is issued and when the procurement is ever done. If AESO thinks it is necessary to revise the numbers, it should revise and re-issue the Functional Spec. **Action Item for the AESO: The AESO to discuss internally on the time period in which the price projections would stay valid.** Update from the AESO: Traditionally the AESO provided 20-year average line loading and 15-year pool price projection with yearly implicit price deflator for post 15-years, for line optimization studies. The AESO will use the same practice for transformer loss studies. The TFOs and other owners are required to use whatever data included in Functional Spec document for the transformer loss study.

[Action #3 for the AESO:](#) The AESO is to review NERC's definition on CIP (5 source line terminations), and determine if the WG needs to review the "Type 1" substation definition

█████ tabled NERC CIP0014-2 (Physical Security) in which a CIP is defined as follows:

- Any 500 kV substations; or
- Any >200 kV substations having 5 or more bulk line terminations connected to at least 3 remote substations; or
- Any other substations designated by the authoritative entities

Upon discussions, WG agreed to the following:

- The 502.11 definition of "Type 1" substation stays as is. However, the word "source" will be changed to "bulk". The definition of Type 1 substation as agreed to at the October 29, 2015 meeting is repeated here
  - Any 500 kV substations; or
  - Any 240 kV substation having six (6) or more bulk transmission line terminations and power transformer terminations; or
  - Any substation designated by the AESO in its own discretion

[Action #4 for the AESO:](#) Consideration of contamination in insulation requirement

WG agreed to the following:

- Contamination is a factor that should be considered in substation design in insulation requirement
- Contamination is part of the environmental conditions and site specific. In the "service condition" section, contamination will be included as part of the environmental conditions to be considered in substation design

[Action #5 for the AESO:](#) Bus ampacity requirement for 240 kV cross bus – change from 2000A to 3000A

WG agreed to the following:

- It is unnecessary to require the minimum bus ampacity of the 240 kV cross bus be changed from 2000A to 3000A. The 2000A will stay as the minimum requirement
- The AESO has discretion to specify a different minimum ampacity for the 240 kV cross bus (or other equipment) in the project's Functional Spec

### 3. Review CANA's █████ Presentation at the February 18 WG Meeting

Discussions were made on CANA's █████ presentation on the minimum technical requirements for transmission substations of 50+ ISOs/RTOs/TFOs in USA and Canada, at the February 18 WG meeting.

## ATCO

- “Overhead shield wires can cross bus work” – WG agreed that for Type 1 substations, a shield wire should not cross more than one (1) main bus
- “20 yea batteries – not something we want to specify” – WG agreed
- “Line-dead end structures – rating these for line tension is expensive; rating them for the applied load (e.g. slack span) is more effective” – WG agreed
- “Acid spill containment is not a must have” – WG agreed
- “SF6 CB’s leakage rates – better than 0.2% per year is nice. This is not a standard or legal requirement” – WG agreed that specifying leakage rate is a TFO responsibility
- “Transformer cooling from two separate ACSS sources – yes for Type 1 sites” – WG agree
- “CT’s for relaying shall be C800? We should be silent here” – WG agreed

## AltaLink

- “Should we mandate that disconnect/isolate switches be manufactured and tested to meet IEEE C37-series of standards?” – WG agreed that “All disconnect/isolate switches shall be tested in accordance with IEEE C37 or IEC 62271 collection of standards
- “Should we require that arresters should be located on the line side of CBs to protect the gap in open CBs?” – WG agreed that “Surge arresters shall be installed at each transmission line entrance, and shall be placed on the line side of circuit breakers”
- “Do we need to include a minimum level of illumination for security and visibility for substations?” – WG agreed that this is a safety requirement, and will be included in the future AEUC code. There is no need in include this in 502.11 at this moment
- “The Protection Rule 502.3 says that a CT can’t be the limiting factor. In practice, it’s hard to pick a lower ratio as the rule implies to meet the ultimate load and fault levels” – the AESO agreed that this is something to be considered in future 502.3 discussions to provide necessary flexibility to the owners

## Miscellaneous

- “All outdoor control cables shall be properly shielded” – WG agreed
- “Weather related loads should be 100 years for Type 1 substations, 50 years for other substations” – WG agreed

## **4. Discussions on Shunt Capacitor Banks**

**[AESO]** tabled a PowerPoint presentation with questions to WG members. The following itemizes the questions and the agreements/recommendations from WG members.

- *Under what condition do we require a shunt capacitor to be connected to a diameter between buses?*

WG agreed that this is project specific, and 502.11 should not be prescriptive on this.

- *Shunt capacitor banks must be solidly grounded with the neutral grounded at a single point*

WG agreed that this requirement is project specific. 502.11 should not be so prescriptive as there are ungrounded cap banks.

- *For multiple parallel capacitor banks which are switched back-to-back, each bank shall have a circuit breaker*

WG agreed that this is project specific, and the AESO should use Functional Spec to specify this.

- *For multiple parallel capacitor banks which are switched back-to-back, a TRV study must be conducted to determine if a capacitor reactor is required*

WG agreed that a switching transient study is required. WG recommended wording similar to "For any capacitor bank additions, the legal owner shall review the switching transient over-voltages to determine if controlled energization is required".

- *H-coupled capacitor banks must have unbalance protection, both alarm and trip function*

WG agreed that this should be included in 502.11.

## 5. Nest Steps

The following actions are required of WG members and the AESO:

- WG members are required to review [AESO] Powerpoint presentation materials related to shunt reactors and CTs/PTs and provide their thoughts and comments to [AESO] by April 15
- AESO to proceed to draft the Recommendation Paper, and circulate to WG members for comments. A draft Recommendation Paper is expected to be circulated by May 15, 2016

Meeting adjourned at 3:00 pm