

ISO Rule Section 502.11 (Substation) Workgroup meeting minutes – Finalized on March 31, 2016

Date: January 21, 2016

Time: 10:00 am – 3:00 pm

Location: AESO Office Meeting Room #M2538

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

1. Finalizing November 19 meeting minutes

- WG accepted AltaLink’s proposed changes to the Nov 19, 2015 meeting minutes
- [AESO] to send out a revised final draft version of minutes to WG members

2. Review of December 17 draft meeting minutes

- Discussions on the following items occurred
 - a. BIL levels for transformer windings and bushings for 69 kV and lower voltages
 - b. Necessity of showing SIL levels for 138/144 kV and lower voltage equipment
 - c. Need to set 950 kV BIL for 240/260 kV transformer windings
 - d. Need to include equipment testing in 502.11 rule
 - e. Need to state “the bus layout should be such that breaker failure on a faulted transformer element does not result in the loss of a second transformer element” in the 502.11 rule
 - f. Need to install disconnect switch(es) on the bus side to minimize bus outages for accommodating installation of circuit breakers in a diameter
 - g. Need to include statement “a ring bus with more than six nodes will be approved on a case by case basis”
 - h. Need to include snow, icing and wind limits in the Information Document
- The following are WG’s recommendations on above items
 - a. Transformer windings could have lower BIL values than the bushings. The BIL table can have two lines, one for bushings and the other for windings, as shown below. There will also be a note under the table to require owners to make necessary considerations when dealing with delta primary windings (blue color denotes changes or additions)

Nominal Voltage Classification (kV rms)	13.8	25	34.5	69
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Circuit breakers	110	150	200	350
Indoor switchgear	95	125	170	350
Transformer and shunt reactors windings (with surge arresters)	95	125	170	350
Transformers, shunt reactors bushings (with surge arresters)	110	150	200	350
All other equipment (CTs, PTs, busbars, etc.)	110	150	200	350

- b. There is no need to specify SIL values for 138/144 kV and lower voltages, as shown below (blue color denotes changes)

Nominal Voltage Classification (kV rms)	138/144		240/260		500	
	BIL	SIL	BIL	SIL	BIL	SIL
Station Post Insulators and Airbreaks	550	450 NA	900	750	1550	1175
Circuit Breakers	650	540 NA	1050	850	1800	1425
Current and Potential Transformers	650	540 NA	1050	850	1800	1425
Transformer Windings (protected by surge arresters)	550	450 NA	850	750	1550	1175

- c. Use 850 kV as the minimum BIL for 240/260 kV transformer windings
- d. **Action: The AESO will discuss internally respecting the need to include transformer testing requirement in the rule**
- e. There is no need to specify “the bus layout should be such that breaker failure on a faulted transformer element does not result in the loss of a second transformer element” in the rule, as this is redundant to the requirement “a faulted element must not result in the loss of an additional transformer element”
- f. Wording in the rule should be flexible. WG favors statement like “considerations should be given to minimize future bus outages when installing breakers in the future”
- g. No need to include “a ring bus with more than six nodes will be approved on a case by case basis”
- h. WG agrees to take out any reference to require substation owners to consult with the incumbent TFO. **Action: AltaLink to review this, and bring to next meeting recommended wording for dealing with snow/icing/wind limits in the design of substations, to be potentially included in the Information Document**
- WG agreed to finalize the Dec 17, 2015 meeting minutes with above changes. [AESO] to send out the finalized draft meeting minutes to WG members

3. Discussion on what will be included in the substation rule 502.11

Power Transformers

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

- *All transformers should be designed for an in service operating life that is comparable to other electrical apparatus in the same substation. Should we specify minimum expected life of a transformer?*

WG suggests that transformer life is dependent largely on the design and daily usage. WG recommends NOT to include this statement, to the extent that transformer life expectancy depends on many factors, and should not be part of the rule.

- *Should we require single phase transformers for circumstances such as GSU units at very large base load power plants (>800 MW or other values), or 500/240 kV autotransformers with >800 MVA (or other values)?*

WG recognizes that the main drivers for single phase vs. three phase are transportation and spare (service restoration) issues. As such, WG recommends NOT to include this statement, and to leave the determination of single phase vs. three phase transformers with the TFO or the generation owner.

- *All power transformer terminals shall be protected with surge arresters with adequate protective margins and placed close to the transformer bushings considering arrester clearance requirements.*

WG concurs with that all power transformer terminals should be protected with surge arresters on both HV and LV sides, except for those with enclosed LV (or HV) cable termination boxes in which case surge arresters should be placed at the LV (or HV) switchgear end of feeders.

- *Should we specify how transformer rating is determined for normal operation?*

WG agrees that it is necessary to specify how transformer rating is determined, and further recommends to use CSA C88 M90 (R2014) or later versions as the standard.

- *Should we specify overloading capability for large power transformers (e.g., >1000 MVA) (note: AESO has been specifying 30-min and 3.5-hrs overloading capability for some large transformers with >1,000 MVA for certain projects)?*

WG generally agrees that overloading capability for large power transformers with normal loss of life can be specified. However, the required overloading capability can be specified on a project-by-project basis. WG further recommends to use IEEE C57.91 as the standard. **Action: The AESO is to discuss internally about the appropriate wording.**

- *Should we require 55°C temperature rise (instead of 55/65°C or 65°C) for certain sized transformers?*

WG agrees that 65°C (not 55°C) average temperature rise should be the minimum requirement. This does not prohibit low temperature rise (55°C liquid-filled) transformers to be installed for special applications. It's up to the TFO or the owner of transformer to use high efficiency low temperature rise (such as 55°C) transformer and to defend on their decision.

- *Should we require FCBN (Full Capacity Below Nominal) for all 240/138 and 500/240 kV autotransformers?*

WG agrees with this requirement for all power transformers.

- *Should we require LTC on every power transformer?*

WG agrees to this requirement, with the exception shown in the bullet below

- *Should we allow the use of De-Energized Tap Changing for certain transformers (e.g., 500 kV and other)?*

WG agrees to this for 500 kV autotransformers and the GSU units.

- *Should we require LTC be always placed at the primary winding (or the wye winding)?*

WG recommends NOT to include this, as the rule should not be too prescriptive and too detailed. Although tap points are usually placed on the HV side, a transformer may have a tap changer on the LV winding if advantageous to do so.

- *Tap range – should we require minimum number of steps or the range, or power factor range?*

WG recognizes benefits with specifying minimum voltage ranges. **Action: The AESO to check with G/L standard and 502.1 rule and other rules for the minimum voltage range requirements.**

- *Should we require transformer loss evaluation (no-load loss and load loss) be conducted for all voltage level transformers (AESO to provide loading levels data & economic factors)?*

WG generally agrees to this, and recommends to investigate into using IEEE C57.120 as the standard. It is recognized that some TFO uses a different standard than IEEE C57.120 in evaluating losses. To meet this requirement, the AESO is obligated to provide long term loading levels and economic factors to the TFO and customers.

- *Should we specify an acceptable range of impedance?*

WG agrees that the requirement for high/low impedance transformers is a system requirement and is therefore FS specific, and it is the AESO's responsibility to specify the impedance in a functional spec document.

- *Should we require that no-load loss, load loss and auxiliary loss must be all considered when conducting loss evaluation?*

WG recommends NOT to include this, as it is already included in any loss evaluation.

- *Should we mention IEEE Standard C57.120 as the transformer loss evaluation method? If not, what other standard?*

WG agrees NOT to include this, because it is already covered previously.

- *Should we specify that “transformers shall withstand, without damage, the mechanical and thermal stresses by external faults”?*

WG agrees NOT to include this, as it is always good utility practice to ensure transformers are able to withstand, without damage, the mechanical and thermal stresses by external faults.

- *Should we specify at least 2 seconds for short circuit duration?*

WG agrees NOT to include this, because it has been industry and manufacturer standard to use 2 seconds as the short circuit duration.

- *Under what conditions do we allow parallel operation of transformers in a substation?*

WG agrees to the wording “for system transformers, consideration be given to the design and control such that parallel operation is capable. For load transformers, parallel operation is up to the TFO and load customers”.

- *Do we need any special requirements for geomagnetic disturbance (e.g., TPL-007 and EOP-010 standards)?*

WG agrees NOT to specify this in the rule. WG feels it is too early to set any specific requirements in the rule before the TPL-007 and EOP-010 standards are developed, and we should wait to see how TPL-007 and EOP-010 will be adopted in Alberta.

- *Do we need to require minimum monitoring system for power transformers?*

Action: The AESO is to discuss internally about need for monitoring equipment (such as online DGA analyzer, mechanical monitoring equipment, etc.).

- *Do we need to set minimum noise level for power transformers?*

WG agrees NOT to specify this in the rule, as AUC Rule 012 has specific requirements for noise levels.

Meeting adjourned at 3: 07 pm.

NEXT MEETING

- Thursday February 18, 2016 at the AESO office from 10:00 am to 3:00 pm.