

ISO Rule Section 502.11 (Substation) Workgroup meeting minutes –Finalized on February 18, 2016

Date: November 19, 2015

Time: 10:00 am – 3:00 pm

Location: EPCOR Office at 12116 107 St NW, Edmonton

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

1. Welcome and finalization of October 29th meeting minutes

- [AESO] welcomes [REDACTED] Fortis Alberta to the WG.
- [AESO] informed that the AESO has hired consultant from CANA to help development of the rule. CANA will attend future meetings.
- ATCO – Current design is 900kV BIL for bus for 240 kV AIS substations. There is no requirement of going to 1050kV for disconnect switches. AESO – Confirmed that disconnect switches are covered under “airbreaks” in the BIL table, and required a BIL of 900 kV.
- AltaLink – Correction factor for 1000m. Did we ever discuss this at the meeting? Did we say it needed to be in the rule? ATCO – Don’t remember we ever discussed at the last meeting. AESO – It was in the meeting material but might not have been a lengthy discussion. IEEE recommends that it be included for altitudes higher than 1000m. WG – Discussed and agreed to remove this reference to 1000m altitude factor from last meeting minutes and put in this meeting’s minutes.
- WG – Agreed that altitude factor be considered where altitude exceeds 1000m. However, it is noted that the altitude factor is a curve, and generally becomes more pronounced at an altitude at or above 1000m.
- AltaLink – Recommended that in the minutes, when talking about temperature zones, the 2010 study report be mentioned. AESO – Agree with adding that text to the minutes. In the final rule, a map will be included which shows -50C and -40C zones.
- AESO –Will finalize the minutes of Oct 29 meeting and send to group next week.

2. AESO’s update on the definition of critical substations for black start purposes

- AESO – Tabled a list of substations in the current AIES blackstart paths. There is no definition of “critical substation” in the blackstart plan as the plan is generally focused on the blackstart generators. However, many of the substations in the list would also be defined as “Type 1”

substations based on the proposed definition for the 50.11 rule. There seems to be a good match between the “Type 1” definition and the black start plan.

- Considerable discussions were made on the rationality of aligning “Type 1” substations with the substations in a blackstart cranking path. The 502.11 substation rule concerns about normal and emergency operations of the system, while a blackstart plan addresses extreme situations. Furthermore, a blackstart path is subject to change periodically if the contracting generator location is changed, but a “Type 1” substation in the substation rule will likely stay forever.
- WG – Agreed that the definition of “Type 1” substation should be separate from the blackstart plan.

3. Review of insulation levels for GIS equipment

- AESO – Recommend for GIS substations we should use the following table in the substation rule. These are based on recommendations from the consultant.

Nominal Voltage (kV rms)	138/144		240/260		500	
	BIL	SIL	BIL	SIL	BIL	SIL
Disconnect switches, switchgears, CT and PTs	750	N/A	1050	850	1550	1175

- Discussions were made on the necessity of including BIL levels for 25 kV and other MV/LV voltages in the rule. WG agreed that BIL levels for 13.8 kV, 25 kV and 69 kV voltages in a substation should be specified for coordination purposes because these equipment inside a substation fence are also called transmission assets. It was also noted that CIFO values for 25 kV distribution lines were also included in the 502.2 rule. WG members to check on their BIL levels for indoor 25 kV switchgear, being either 125 kV, 150 kV or other values. The AESO will then make recommendations on the minimum BIL values for 13.8, 25, 34.5 and 69 kV systems and present to the group.

4. Existing TFO’s snow, icing, and wind limits used in substation design

- ENMAX, ATCO and AltaLink tabled their design parameters on snow, icing and wind limits for substations. The design parameters are generally comparable. However, within AltaLink, there is no single set of parameters, as the substations span a wide geographical areas and temperature zones.
- AltaLink – There is no extra cost to have minimum wind requirement around 160-170 km/h. We do not apply this wind speed for icing. There are 3 categories: max wind, wet snow with wind, and glaze ice with wind.
- AltaLink - We should not need to define the minimum icing, snow and wind speed on the equipment. These parameters should be left with the facility owners to determine.
- AESO – We may need to use the same map as in the 502.2 rule for 502.11 purposes.
- Every WG member is required to send a summary table outlining the snow, icing and wind speed limits in their substation design to the AESO before the next meeting.

5. Discussions on what will be included in the substation rule 502.11

Station power supply & control building - AC system

- AESO – Do we need redundancy?
- AltaLink – Is there a need for two independent sources? For Type 1, yes, two independent sources that can fully supply the station.

- EPCOR – For diesel generators, you can't run them without load as it damages the engine. It is not guaranteed that they will work when needed, depending on the maintenance practice.
- AESO – Perhaps in the ID we will explain what constitutes "independent sources". For Type 1 we will need redundancy. We can also say if two substations are adjacent to each other, they are encouraged to share the power supply and if they do, the shared power supply can be classified as independent source for each individual substation.
- AESO – What kind of AC sources would we allow? Do we allow power PTs?
- AltaLink – Why would we need to define it? We don't think it's relevant if they are defined as independent sources.
- AESO – If we use tertiary power transformer, do we need any special requirement on grounding?
- ATCO – We don't think we want to be so prescriptive.
- AESO – Any other things you think are critical that you think we should include in the rule?
- AltaLink - On the medium voltage side, do we allow fuses? Protection on the primary side should be required such that it only takes out the transformer, not the bus.
- AESO – On 69kV or higher, fuses are generally not allowed.
- AltaLink – We are here talking about station service.
- EPCOR – In some cases it's practical to put a fuse.
- WG – It was agreed that for Type 1 substations, if station power supply is derived directly from the HV bus, protection should be such that it minimizes the impact of outages to the bus.
- WG – It was agreed that dual independent AC station power sources will be required for Type 1 substations, unless the AESO specifies otherwise.
- The AESO will need to explain what constitutes "independent sources" in the ID document. Examples will be given in the ID.

Station power supply & control building - DC systems

- Each WG member presented their DC power design requirements. Some members use 4/8 discharge hours for battery, while some use 4/6/8 discharge hours for battery depending on the location and ease of access.
- AltaLink – Trip and reclose is our most concern.
- WG had brief discussions on the incremental cost of upgrading battery from 4 hours to 8 hours.
- WG agreed that
 - For all substations
 - 8 hours discharge time be required for batteries, from loss of AC station service to restoration of service
 - The discharge time and calculation method for loading be as per IEEE definition
 - Clean rectifiers to limit ripple effect be used
 - Battery charger be sized to ensure 24 hours or less charge time
 - For Type 1 substations
 - Two battery banks, each having a discharge time of 4 hours of full load and 8 hours of independent connected load, be installed
 - An independent charging system for each battery bank be installed
 - The DC system shall be designed such that common mode failure be avoided
 - Manual transfer capability be provided between the two battery banks

Station power supply & control building – Control building

- WG agreed that

For Type 1 substations

- o A control building be installed to host P&C equipment and DC systems
- o The control building should have a temperature controlled area
- o The control building should have fire detection and remote alarm capability

Circuit breakers

- Discussions were on the following topics
 - o Point-on-wave requirement.
 - o Single pole tripping requirement.
 - o Breaker operating time. It was proposed that breaker operating time for MV breakers (34.5 kV and below) should also be specified.
 - o How should we allow GIS equipment to be used? Should we require an economic analysis from the facility owner? It was not recommended by the WG to require an NPV analysis for every project. The selection of GIS is up to the facility owners who will defend their decision if questions are asked.
 - o Should a breaker be installed at the HV side of a station service transformer connected to a 240/500 kV bus? It was agreed that this should be mandatory. However, the transmission owner should consider to limit the outage to the bus or the element due to SST failure.
 - o Breaker seasonal ratings and overloading capability requirement
 - o Type of breakers to be allowed in certain situations – MO, BO, circuit switcher.

• WG agreed that

For all substations

- o The following minimum operating time be required

	MV	138 kV	240 kV	500 kV
Operating time breakers or circuit switchers (cycles)	5.0	3.0	2.5	2.0

- o Point-on-wave is mandatory requirement for cap bank and shunt reactor switching, and HVDC systems. For other applications, the AESO should specify it in a functional spec. It should not be mandatory for the power transformers.
- o Single pole tripping should be required for 240 kV or higher voltages, unless the AESO specifies otherwise
- o Breaker seasonal rating and overloading capability should be based on IEEE or IEC standard and as per the manufacturers of equipment.
- o Circuit switchers should be allowed as long as they are suitable for the application and environment, and meet the operating time requirement.

ACTION ITEMS

- WG members to check on their BIL levels for indoor 25 kV switchgear, being either 125 kV, 150 kV or other values.
- WG to send a summarized page to the AESO respecting their snow, icing, and wind limits used in substation design.

Meeting adjourned at 3:05pm

NEXT MEETING

- Thursday December 17, 2015 at AltaLink office from 10:00 am to 3:00 pm