

**ISO Rule Section 502.11 (Substation) Workgroup meeting minutes ~~(Draft)~~ Final**

Date: October 29, 2015

Time: 10:00 am – 3:00 pm

Location: ENMAX Office at 141 50<sup>th</sup> Ave SE, Calgary

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
	[REDACTED]	EPCOR
X	[REDACTED]	ENMAX
X	[REDACTED]	ENMAX
	[REDACTED]	Fortis Alberta

Before the agenda, [AESO] reported that [REDACTED] TransAlta Corporation, will no longer be able to participate in future WG meetings. [REDACTED] FortisAlberta, expressed interest in joining the WG. [FortisAlberta] will try to attend future meetings starting in November 2015.

1. Welcome and finalization of September 17th meeting minutes
  - WG agreed everything is fine with meeting minutes they are finalized subject to comments from EPCOR.
2. Discussion on definition of “Major Substation”
  - WG interested in defining “major substation” in the rule but focused on what the criteria should be.
  - ENMAX – The level of the risk to the system should be the defining criteria.
  - AESO – Any substation designated as blackstart substations would have major impact on the system. 500kV is going to be classified as major substation do we agree?
  - AltaLink – Yes, if there is any 500kV voltage in the station.
  - ENMAX – Fine, but on the other hand, we thought that if it was 500kV, AESO would always issue a functional spec.
  - ATCO - In case of 500kV, the AESO rules are embedded in functional spec. The functional spec should just speak to the exceptions.
  - AltaLink - All justifiable requirements should not be cluttered with many exceptions. Is it easier to call substations – Type 1 or Type 2 depending on their criticality instead of calling “major substation”?

- AESO – Type 1 and Type 2 terms are fine as long as we define them consistently. Suggest to refer critical substations to “Type 1”, and other substations just be called substations without special term like “Type 2”.
- ENMAX – planning criteria which was based a RAS, could we include something like that in standard?
- AESO - From planning perspective we can apply it, but we also have to make decision on the ultimate system configuration. A substation, once built, can be in existence for 40-60 years.
- ENMAX - Can the AESO define Type 1 or Type 2 and specify the requirement on a project.
- AESO – we want to hard code into the rule and only deal with the exceptions if we leave it wide open we will have to have this discussion on every project.
- AltaLink - You’re not going to be able to lean on rule when it comes to cost monitoring committee.
- AESO – let’s start with threshold/baseline, go through requirements and come back and look at baseline again.
- AltaLink – For 240 kV, suggest using 6 source elements (lines, power transformers excluding SS transformers, bus sections) as the criteria.
- AESO – Can we just say transmission lines instead of source element?
- AltaLink – Maybe source line and transformers.
- WG – Agree with that any 500 kV substations be called “Type 1” substation, and any 240 kV substations with 6 or more transmission lines/transformers be called “Type 1” as well. However, the AESO’s has discretion to designate a substation a ‘Type 1’ substation at the creation of the functional spec, based on the long-term plan.

### 3. Discussions on AltaLink’s findings on “transmission element”

- AltaLink – Tabled NERC definition on “transmission Element” which includes generator, transformer, busbar, breaker, or transmission line.
- WG – Noticed this NERC definition. WG agrees to review the “Type 1” definition as to if we should use the “transmission Element” as defined by NERC in the 502.11 rule.
- AESO – Will check internally on the black start procedure and the definition of critical substations from a black start perspective. Will report back to WG in the future.

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

#### Grounding:

- AESO – Table a number of specific requirements as ask if they are fair requirements?
- ATCO – Some of them appear to be redundant and contradicting
- AESO - instead of specifying these grounding requirements we can just say a grounding study should be done for every substation.
- ENMAX - Why does AESO care about the specific grounding requirements?
- AESO – FAC-001 requires that a functional spec must address 14 items; one of them is grounding. As grounding studies look at ultimate fault levels so you prepare for the increased fault levels. Specify that you must at all times stay ahead of fault level.
- AltaLink – AML performs grounding study to determine grounding grid and other requirements on each and every transmission projects, using the 10-year future short circuit levels in the functional spec.
- ATCO – Use the same principle and methodology as AML for grounding studies.
- ENMAX – It is not clear what methodology is used in substation grounding studies.
- WG - Agreed to mention the following three items in the substation rule:

- The AES is an effectively grounded system for 138 kV and up
- A grounding study shall be performed on each and every transmission substation project
- The AESO shall provide 10-year future short circuit levels in the functional spec document for each project

Insulation:

- AESO – Table several BIL tables and specific insulation requirements and asked the following questions:
  - Should we “split” BIL into LIL and SIL in the rule?
  - Should we specify higher BIL values for GIS substations because of their construction?
  - What is each utility’s insulation coordination standard?
- WG – Generally consent on splitting the current BIL levels into LIL (lightning impulse level) and SIL (switching impulse level)
- WG – Generally disagreed to specify a higher LIL/SIL levels for GIS substations because the manufacturers provide the same LIL/SIL levels as the AIS equipment, and it is very costly to go higher level
- AltaLink, ATCO, ENMAX and EPCOR are to ~~present~~provide their insulation coordination standard, if existed, to the AESO.
- Discussions were on the terms (extreme continuous minimum, normal continuous minimum, normal continuous maximum, extreme continuous maximum) used in the voltage table. The AESO explained that they are referring to Cat A/B/C events.
- AESO – Should we just specify an MTBF of 1000 years for transformers for Type 1 substation then up to the TFO to design?
- WG – Suggest that we use an MTBF of 1000 years for transformers, and 400 years for bus sections and others
- AESO – Is the LIL/SIL table fine as minimum standard? These are the values the AESO has generally been specifying in the functional spec in the past and at present.
- AltaLink – Line entrance arrestors aren’t high cost item and should be required.
- ENMAX – how did we come up with 1800 and 1050 kV suggested for 500/240 kV GIS systems?
- AESO – Nothing magical. We simply took the higher levels in the IEEE standards. These are just starting points for discussions.
- AltaLink – Instead of taking max take industry minimum of 1550
- WG – agreed to use same values but just use one line for all and any equipment in a GAS assembly. The following minimum values can be specified:

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

- WG agree that
  - Specify both LIL (or BIL) and SIL levels in the rule
  - Specify 150 kV as MCOV for 138 kV systems
  - Specify 155 kV (not 158 kV) as MCOV for 144 kV systems
  - Create a 260 kV classification for MCOV and other voltage purposes
  - Surge arrestors to be used for each and every line entrance

- Surge arresters to be installed on both sides of power transformers
- ~~Specify 1000m as threshold for the altitude factor in the rule~~

#### Service Conditions

- AESO – should we define the temperature ratings for equipment for certain regions (North vs South). Separate -40 degrees and -50 degrees? [Ligong tabled a study by Custom Climate Services Inc. in 2010 for the AESO.](#)
- WG agreed this would not only make it cheaper but also easier with vendors.
- AltaLink – In that temperature study, did the consultant look at wind velocity?
- AESO – No the study doesn't look at wind
- ATCO – why does wind matter at that temperature?
- AltaLink - Comes down to heat loss with wind. Do we need to include the rate of change of temperature? AltaLink used 15 degrees per hour.
- AESO - check with Jim on testing/reports?
- WG agree that
  - It is reasonable to define two temperature zones: -40C and -50C with Cold Lake/Edmonton as the demarcation line, [as recommended in the 2010 study](#)
  - Use the same wind map as that for the 502.2 rule
  - It is fine to specify that all equipment shall be able to withstand wind velocity of 160 km/hr
  - It is fine to specify that all equipment be able to withstand a temperature change rate of 15C per hour

#### ACTION ITEMS

- AESO to talk to the internal blackstart expert and to have discussions with WG to ensure what we have reasonable alignment of "Type 1" substation with the blackstart definition.
- AltaLink to send out the NERC definition of "transmission Element" to WG members
- ENMAX – send substation design principles respecting snow/icing/wind limits to [AESO].
- ATCO to check on snow/icing limits and send to [AESO].
- AESO to speak with consultant in regards to insulation and get back to WG on the recommended insulation levels for GIS substations

Meeting adjourned at 2:45pm

#### NEXT MEETING

- Thursday November 19, 2015 at EPCOR office from 10:00 am to 3:00 pm