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

Date: December 17, 2015
Time: 10:00 am – 3:00 pm
Location: AltaLink Main Office – 2611 3 Ave SE, Calgary

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

1. Welcome and finalization of November 19 meeting minutes
   - WG agreed to finalize the Nov 19 meeting minutes as presented. [AESO] will send out the finalized meeting minutes to WG members

2. Action items from the November 19 meeting:

   BIL Levels for Indoor 25 kV Switchgear in Substations

   Some WG members shared their design standards. AltaLink requires a BIL level of 150 kV for outdoor 25 kV switchgear, and 125 kV for indoor switchgear. ATCO requires 150 kV BIL for both indoor and outdoor.

   The WG agreed to specify 125 kV as the minimum BIL requirement for indoor switchgear.

   BIL Levels for MV/LV Equipment in Substations for Insulation Coordination Purposes

   [AESO] presented the following recommended minimum BIL levels for MV/LV voltage levels.

   Discussions were around the proposed BIL levels for transformers and shunt reactors, particularly on the differentiation between bushing and winding. CANA commented that the insulation requirement associated with the winding is normally deliberately made lower than the bushing in a power transformer (see table below). The WG agreed to use the following BIL values for transformers and shunt reactors.

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

The WG agreed that the BIL levels for voltages below 13.8 kV should be dealt with on a case by case basis.

The WG agreed that the above table applies to both AIS and GIS equipment in a substation. WG agreed to use 125 kV as the minimum BIL for 25 kV indoor switchgear.

Snow, Icing and Wind Limits

- AESO – It appears that every TFO has differing values and methods in their design standards. Perhaps there is no need to include specific values for snow, icing and wind limits in the rule, other than stating that the substation owner shall consult with the incumbent TFO to use values consistent with the TFO's.
- CANA – The research that CANA did suggests that coordination be always required between the owner and the TFO. As far as the rule is concerned, this means that TFOs must share data with the market participant(s).
- AltaLink – We can't use the values for snow, icing and wind limits included in the 502.2 rule. For instance, the snow values in 502.2 are not applicable. AltaLink supports including this requirement in the Information Document, at least for Type 1 substations.
- ATCO – ATCO supports to include numbers in the rule or ID to ensure no under-build or over-build situations. ATCO is more concerned with over-build situations where facilities were built with unnecessarily too high standard.
- Fortis – This requirement would imply that TFOs are obligated to share data with the designer on behalf of an ISD.
- AltaLink – Perhaps we all send our design parameters and recommendations to the AESO to be included in the ID document. The parameters don't have to be identical for all TFOs.

Action Item for All – Send the AESO with design parameters that may be included in the ID.

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

Bus Layout

The AESO [redacted] provided a PowerPoint presentation which presents typical bus layouts with questionnaire associated with each layout type. Discussions were carried out as the presentation went on. The agreements or suggestions by the WG are provided below in bullet form.

WG members generally commented that 502.11 should be focused primarily on the system reliability and functionality requirement, instead of nitty-gritty details (such as specific bus layout).

The AESO is responsible for identifying the ultimate functionality requirements, and the owners are then required to figure out the best alternative(s) to meet these long term requirements.

All WG members agreed on the general principles defining a good bus layout:

- support and promote safety and reliability of the AIES system;
- provide maximum maintenance and operating flexibility; and
- be cost effective for current needs and future expansions.

WG members agreed that for all substations (including Type 1 and other substations), the following requirements apply. Note that the "element" refers to a breaker, transmission line, or a power transformer (excluding SS transformer).

- A faulted element must not result in the loss of an additional transformer element
- No additional elements be taken out of service to accommodate the maintenance of an element
- The ampacity of the terminal components connecting a transmission line or a transformer shall be no less than the rating of the line or the transformer
- The bus layout will be such that breaker failure should not trip all the circuits terminating at the same remote substation, or the same generating station
- When constructing an incomplete breaker-and-half or breaker-and-third diameter, disconnect switches should be installed to minimize outage time during the installation of the remaining breakers
- A ring configuration is acceptable with up to six (6) nodes.
- A disconnect device at the line side must be installed for each transmission line, power transformer and/or generator connection
- Whereas an autotransformer is present to bridge two or more transmission voltage levels (500, 240 or 138 kV), failure of the autotransformer shall not result in the tripping of more than 4 circuit breakers. This determines if a breaker in series of the autotransformers is required. If a breaker is required but not installed initially, provision for a future breaker must be made
- The following minimum bus continuous current ratings (A) be required

Component	**138/144 kV**	**240/260 kV**	**500 kV**
Main bus[1]	1,200	3,000	4,000
Cross Bus[2]	600	2,000	3,000
Feeder[3] or Line terminal[4]	600	2,000	3,000

[1] includes all sections of a ring bus scheme, or each bus section of a simple bus, a breaker-and-half or a breaker-and-third scheme
[2] includes diameter sections of breaker-and-half or breaker-and-third schemes
[3] includes all equipment from the connection at the low voltage bus to the riser pole
[4] includes all equipment and conductor from the transmission line to the line breakers

- WG members suggest that in the accompanying ID document, examples be included to show the typical bus layouts, including simple bus, double bus, ring bus, breaker-and-half and breaker-and-third configurations. The ID can also elaborate on the pros and cons of each bus configuration

- WG members had discussions on the use of a bus tie breaker vs. disconnect switch for simple bus configuration and concluded that this is primarily driven by maintenance requirement and reliability requirement. The reliability requirements mentioned above should determine if a bus sectionalizing device is required
- In the FS document, the AESO shall provide the ultimate number of terminations and voltage compensation devices

WG members agreed that for Type 1 substations, the following requirements apply.

- A faulted element (N-1 or Category B) must not result in the loss of any other elements
- Where a substation is initially designed with a simple bus or ring bus, but will ultimately be breaker-and-half or breaker-and-third, provisions in the initial design must be such that it can be converted into the ultimate layout without having to relocate any existing equipment
- In a ring bus configuration, equipment should be physically and electrically positioned so that lines are not terminated in positions which will ultimately be evolved into buses

Meeting adjourned at 3: 10 pm.

NEXT MEETING

- Thursday January 21, 2016 at the AESO office from 10:00 am to 3:00 pm