ISO Rule Section 502.11 (Substation) Workgroup Meeting – Proposed Agenda

Meeting Date: September 17, 2015 from 10:00 am to 3:00 pm
Meeting Place: Room 1530 (15th floor), ATCO Office, 10035 – 105 St NW, Edmonton

Agenda Item	Time	Presenter
1. Welcome and finalization of Aug 27 meeting minutes	10:00	[AESO]
2. Comments on draft WG Terms of Reference and finalization of 502.11 T of R	10:00 – 10:30	[AESO] / All
3. Discussions on what will be included in the substation rule 502.11 • Applicability • Definition of transmission substation – major substation and "normal" substation • General requirement ▪ Reliability and availability ▪ Safety ▪ Grounding ▪ Insulation ▪ Station service ▪ Control building	10:30 – 12:00	All
4. Lunch break	12:00 – 1:00	All
5. Continue discussions on substation rule 502.11	1:00 – 2:45	All
6. Summarize and next meeting	2:45 – 3:00	[AESO]

Applicability of the rule – Proposed language

Section 502.11 applies to
(a) the **legal owner** of a **transmission facility** with at least one rated voltage equal to or greater than one hundred (100) kV;
(b) the **legal owner** of a **generating unit** or an **aggregated generating unit** directly connected to the **transmission system** through a substation owned by the **generating unit** with at least one rated voltage equal to or greater than one hundred (100) kV; and
(c) the **ISO**.

Questions:

(a) Do we need to specify the size of the generating unit, given TransAlta's comment?
(b) Should we include 69 kV substations in any fashion to deal with future upgrades?
(c) The above language appears to include HVDC substations. Do we want to include them?
(d) How do we deal with load customers owning large substations?

Transmission substation

A substation directly connected to the Alberta interconnected electric system with one or more voltage levels at one hundred (100) kV or higher.

Major substation (or key substation)

ISO New England Substation Design Guideline defines a Major Substation as "those substation that have a reasonable future potential for a total of (4) or more terminations of transmission lines, autotransformers or GSU transformer operating at 230 kV or higher voltage".

The AESO intends to introduce a Major Substation which is defined as

"a transmission substation with a voltage of 240 kV or higher with either of the following:

- total future terminations (lines/transformers) of 6 or higher; or
- transformation capacity of 400 MVA or higher".

Questions:

(a) Should any 500 kV substations be automatically classified as Major Substation?
(b) Should we prescribe the bus layout for Major Substations?
(c) Any other definitions?

Reliability & availability

Reliability and availability targets have direct impact on the substation layout, the level of equipment to be purchased and the spare parts to be carried.

Substation reliability measurement can be SAIFI and SAIDI. Availability may be defined as MTTF/(MTTF+MTTR) where MTTF is the mean time between total failures.

Questions:

(a) Should we define reliability target, such as SAIFI, SAIDI or others?
(b) Should we specify availability target?
(c) What are the existing reliability or availability targets in each TFO's design criteria?
(d) Should we require that substations are designed so that a single failure of any component does not take out redundant systems, and one component failure should not jeopardize the integrity of the substation?

Insulation Coordination

ISO rule 502.2 has mentioned IEEE, IEC and CSA standards in various places. Table 4 in 502.2 specifies insulation levels (CIFO) for transmission lines at 25, 138 and 240 kV voltages. For 500 kV systems, the insulation levels (CIFO, etc.) are up to each project.

Questions:

(a) Should we specify CSA C22.3 for the calculation of switching surge values?
(b) Should we include AEUC code (and CSA C22.3 No.1) for the calculation and determination of conductor clearances?
(c) Should we specify that every line entrance must be equipped with surge arrester?
(d) Should we specify that every transformer, including station service transformer, must be equipped with surge arresters on both sides?
(e) Should we specify a MCOV table for 138, 144, 240, 260 and 500 kV nominal voltages?

(f) Should we specify both BIL and BSL levels for each of 138, 144, 240, 260, 500 kV equipment?
(g) Should we require a higher BIL/BSL for GIS systems?
(h) Should we require 350 kV BIL level for 69/72 kV equipment for easier upgrade to 138 kV in the future?

Grounding

The AIES is an effectively grounded system for 240 kV and 500 kV systems. The 138 kV system is an effectively grounded system for wye connections.

At the grounding points, the **legal owner** of a **transmission facility**, a **generating unit** or an **aggregated generating unit** is required to perform routine check to ensure proper grounding is maintained for the safety and the facility and the AIES.

Questions:

(a) Should we specify that the maximum ratio of zero to positive sequence impedance ratio must be three (3) or less?
(b) Should we specify that any GSUs must have an effectively grounded wye winding on the HV side connecting to the AIES?

Station power supply & control building

Secondary AC system is usually used to supply power to transformer cooling, oil pump and tap changer, outdoor device heaters, lighting and control building lighting and HVAC.

The DC auxiliary system is generally used to supply power to the P&C relays, SCADA, breaker trip and close circuits and mechanism, and some emergency lighting.

Currently, most substations in the AIES have a control building, in pre-engineered trailer or building.

Questions:

(a) Should we require at least dual station service power supply for Major Substations?
(b) Should we prescribe the size of each station service for Major Substations?
(c) Should we require the maximum charge time from zero to full for battery chargers?
(d) Should we specify the minimum discharge time for batteries for any substation?
(e) Should we require that all secondary AC and DC boards must have automatic transfer switch?
(f) Should we specify that AC boards 1 and 2 must be on opposite sides of the building?
(g) Should we specify that DC boards 1 and 2 must be located in separate rooms and opposite sides of the building?
(h) Should we require a control building to be constructed in each and every transmission substation?
(i) Should we specify that all protective replaying panels and cabinets for alternative line equipment must be installed on alternative sides of the aisle/walkway?
(j) Should we require that sufficient space must be planned and designed for major substations for future expansion, in the first place?
(k) Should we require that control building must be with either a floating floor or trenches, or with a basement, and no other forms?