Date of Request for Comment: November 25, 2016	**Contact:** Cory Akins
Period of Comment: November 25, 2016 through January 6, 2017	**Phone:** 403-267-3435
Comments From: AltaLink	Email: Cory.akins@altalink.ca
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Please place your comments/reasons for position (if any), in response to the questions set out below, in the following matrix.

Questions	Stakeholder Comments and/or Alternate Proposal
The AESO is seeking comments from stakeholders with regard to the following matters: 1. Do you agree or disagree that proposals 1 through 13 presented in the Section 502.11 Discussion Paper represent the minimum technical requirements for substations? If you disagree, please provide comments. 2. Are any of the proposals in the Section 502.11 Discussion Paper unclear? If yes, please indicate the proposal number and describe how the clarity of the proposal could be improved.	*Comment General:* AltaLink has a few general comments regarding the rule: 1. AltaLink recommends that other categories of substations be added to the proposal as 2 categories of substation, as set out in the proposals do not adequately capture the range of requirements between critical and other substations. AltaLink notes that the majority of requirements identified in the proposals only apply to the Type 1 substations. See further our comments on Proposal #1. 2. AltaLink strongly believes it is very important that the AESO, facility owners, customers and other stakeholders are clear on the value and purpose of each requirement in the proposed Rule 502.11. To this end, AltaLink recommends the cost/benefit justification much more fulsomely be developed for each requirement and be included with the consultation materials. 3. The proposals appears to apply to "all greenfield transmission substation projects and to brownfield transmission substations with new equipment installed". AltaLink has some concerns with how the proposals would be applicable to new equipment additions as this is currently unclear. AltaLink wants to ensure that rule does not lead to the requirement to do major redesign to existing infrastructure in brownfield substations as this could lead to considerable extra costs. See comments on Proposal #2 for further detail of these concerns.

Proposal #1	Comment #1: AltaLink disagrees with proposal #1. The power system importance of each substation varies significantly depending on the application. Thus, it makes sense that the minimum requirements should substantially vary. AltaLink feels that 2 categories does not offer enough differentiation to adequately capture the range of requirements between the most and least critical ones. AltaLink strongly recommends that other categories be added and the majority of requirements identified in the Discussion paper only apply to the Type 1 substations. For example, even adding 1 additional category will provide a better fit-for-purpose match between requirements and specific applications. a. Type 1 Substation - Substations with significant impact to the broader Alberta Interconnected Electric System. These substations require the most comprehensive set of "system imposed" requirements. b. Bulk Electric System connected Substations – Substations with minimal impact to the broader Alberta Interconnected Electric System E.g. Substations interconnected via two or more Bulk transmission lines/ System transformers. These substations require a greatly reduced set of "system imposed" requirements. c. Radial Connected Stations – Substations with virtually no impact to the broader Alberta Interconnected Electric System E.g. POD or POS connections. These substations require no (or few) "system imposed" requirements.
Proposal #2 – Applicability	Comment #2: As per comment #1 a recommended wording may include " the legal owner of a transmission facility with at least two (2) existing or planned line/system transformers connections at rated voltage equal to or greater than one hundred (100) kV. Additionally, the wording in Proposal #2 is incomplete relative to how the elements of the rule will apply to existing substations. The clarification outlined in the first paragraph on page 8 is helpful but that paragraph leads to further questions for example: • What is "new equipment"? i.e. Is this only primary power system major equipment? (E.g. Circuit breakers, transformers, etc.) How does this relate to proposed requirements for supporting infrastructure like DC, station service, bus work, grounding, etc.? • Does this Rule only apply to Direct Assign projects? • If so, how does a few pieces of "new equipment" with increased capability have value in a

	substation comprised mainly of older equipment with reduced capability? Also, how does this rule have any impact on the vast majority of existing substations referenced on page 3 requiring retrofit or rebuild as most of this would be done through Maintenance and not Direct Assign projects?
Proposal #3	*Comment #4-1:* The typical equipment concerns are for the low temperature in Alberta and no outdoor equipment is designed below +40C ambient operating temperatures. There is no benefit (cost or operationally) to assessing different high temperature rating based on area. Recommend moving forward with +40 temperature for Alberta *Comment #4-2:* As there are economic benefits, AltaLink supports using design criteria that is not the absolute "worst case". The AESO, however, needs to define their required functionality when the design value is exceeded. E.g. For the 0.1% of the time when the temperature falls below -40C, how does the AESO expect a -40C rated circuit breaker to function (open or remain closed)? *Comment #4-3:* The wind requirements have already been outlined as per the AESO wind map. AltaLink recommends that the AESO require TFOs to design based upon local condition via environment profiles and / or based on experience in the area. This would also include the contamination requirements previously mentioned in the proposal.
Proposal #4	*No comments.*
Proposal #5	*Comment #5-1:* AltaLink disagrees with the Proposal #5 a. There is a potential conflict with specifying codes to be followed as some codes may be in direct conflict with each other for certain topics of grounding. For example, the CEC is prescriptive and provides methods in the application of grounding requirements for high voltage facilities, where the AEUC provides a set of requirements that are evaluated based on engineering results, which can differ significantly. In addition, the new version of AEUC, allows utilities to use the IEC method for grounding assessments. Engineering assessment and responsibility lies with the company responsible for constructing and operating the asset not the AESO. The AESO should not specify a methodology for grounding.

	Comment #5-2: AltaLink finds inclusion of the Proposal 5b unnecessary. Including the definition in Proposal 4 indirectly accomplishes the outlining of the consideration in grounding design. The consideration in the grounding design should be left to the TFO or builder as described in Comment #5-1. Comment #5-3: Proposal 5 c is unclear and could drive unnecessary costs. The reference to new equipment installation or additions is too broad and may require additional costs for unnecessary studies. For example, adding a bus tie breaker would not alter the fault contributions for a substation and therefore may not have an effect on the fault levels of station and therefore no study should be required. The requirement should be separated for new and old substations. Recommend changing the requirement to: “Substations shall have a grounding grid adequate to handle the specified short circuit levels”;
Proposal #6	*Comment #6-1:* AltaLink disagrees with the use of 1000 MTBF for all transformers as a minimum, as this can be difficult to accomplish in a cost effective manner for smaller substations. AltaLink recommends 1000 MTBF be used for System transformers as a minimum as defined for Type I substations and 500 MTBF for all other transformers as a minimum level.
Proposal #7	*Comment #7-1:* AltaLink disagrees with the AESO proposed definition of “a substation element” and the criteria in Proposal 7 a. In particular, by including a circuit breaker and instrument transformers as a substation element, it makes it nearly impossible to design a cost effective substation and does not align with the AESO planning criteria. Back-to-back breakers would be required to prevent a Category C event (breaker failure for faulted operating breaker) and switching devices on all instrument transformers to accommodate this definition. It was recommended in the working group sessions that the substation element definition include: Line, Power Transformer (Excluding SS transformers), Capacitor bank, Reactor bank or a reactive power compensator. The definition would then align with Category B and C events under the AESO planning.

	AltaLink recommends that the criteria proposed in 7 (a) be modified to apply only to *system* power transformers. i.e. We recommend that it should read: *A faulted substation element must not result in the loss of ~~another~~ bus-connected system power transformer element in the same transmission substation. This basically means that if a transmission substation is designed to accommodate more than one system power transformer, each system power transformer should be connected to a separate bus section. A transmission substation is often initially constructed with one system power transformer, and expanded with more system power transformers in the future. In this case, the design should provide space for a bus tie breaker bay for future expansion.* Without this clarification, the rule may drive unnecessary costs when elevated reliability performance is not required by the customers connected through non-system power transformers. *Comment #7-2*: AltaLink understands the design principles trying to be achieved in Proposal 7d, but recommends not making it applicable to double circuit lines because the AESO Reliability Standard defines breaker failure and loss of a common structure as similar Category C contingencies. Thus, if the system is planned for loss of both circuits (due to loss of a common tower), the system is not impacted any more negatively by the failure of the common breaker. Also, this requirement, if kept, should be limited to Type 1 Substations only. For general substations this could drive significant cost, by having to add bus tie breaker, completely reroute a line for a ring bus termination *Comment #7-3*: AltaLink finds Proposal 7 h to be unnecessary if the substation element definition is changed as per AltaLink's recommendation. AltaLink recommends removing this clause if the substation element definition is changed. This scenario will be covered by the Proposal 7 a, as a system element fault (An Auto transformer) would not be allowed to result in the loss of another bus connected transformer. *Comment #7-4:* Proposal 7 j would be clearer if it read: “The AESO shall specify the total number and type of Substation Elements for a planned ultimate substation.”

	This would help link the various requirements. *Comment #7-5:* AltaLink disagrees with the over specification of development choice for Proposal 7 l and m. The requirements set previously should work for this requirement. It should not be assumed for a particular initial development versus an ultimate configuration. If the ultimate plan for number of system elements is provided than the ultimate layout can be planned to meet all the requirements above. (Type 1, Number of Lines, number of transformer etc.). AltaLink recommends requirements l and m be combined to read: "Initial design layout of a substation shall be such that it provides provision for the completion of the ultimate configuration. This provision should minimize the re-distribution of equipment, line moves and outages." The intention of the suggested change is to provide for a cost effect transition to the ultimate configuration while addressing the initial capital cost deployment. There has to be an evaluation of initial versus final deployment costs to find the best value deployment. AltaLink also suggests making this requirement for Type 1 stations only, as the initial design layout would not be the expected final unless designed to meet future type 1 requirements. *Comment #7-5:* AltaLink believes the requirement for Type 1 substations only in Proposal #7 n is incomplete and missing requirements based upon the intent of what was discussed during the working group meetings for improved reliability of Type 1 substations. AltaLink recommends the following requirements for a Type 1 substation : • A faulted substation element must not result in the loss of any other substation element • A bus fault shall result in the loss of more than a single transmission line or system transformer. • A bus fault shall result in the loss of no more than two substation elements, including the previous requirement. • A breaker failure event shall result in no more than two substation elements being removed

	The intention of the expanded requirements is to have the requirements for a reliable Bulk electric System Type 1 substation. The design can then be evaluated against the requirements to find the most cost effective design, rather than assuming a design configuration.
Proposal #8	*Comment #8:* *AltaLink disagrees with the requirement in Proposal 8 b.* The expanded Type 1 requirements will address this scenario. Recommend removing this clause. The size of the station service transformer does not automatically dictate the need for an interrupting device as the station design may permit inclusion within an isolating zone, such that another element is not affected. This is a design / protection consideration in addition to an economic/risk evaluation.
Proposal #9	*Comment #9:* Proposal 9 a, IEEE 485 is a recommended practice with a few alternatives. To be clear IEEE 485 is not a standard.
Proposal #10	*Comment #10-1:* AltaLink disagrees with Proposal 10 i. Transformer impedance for system units is the responsibility of the system planner (AESO) to manage fault levels and load flows within the system. Transformer impedance for supply of loads is determined by the TFO and Market Participant. AltaLink recommends splitting the requirement for impedance into system transformers as per AESO and all others as per the TFO and Market Participant. *Comment #10-2:* To clarify proposal 10 k, it should be a system transformer requirement.
Proposal #11	*Comment #11* Proposal 11 e Should be clarified as operating times under standard testing conditions. The X/R levels and other system conditions may extend operating times beyond standard test values.

Proposal #12	*Comment #12-1:* As part of sizing line connected shunt reactors, the AESO should be responsible for determining the type of grounding for the bank. This applies to the line voltage rise and single pole arc extinguishing time, which are system attributes.