## Stakeholder Comment Form

**Project Title: AESO Generation and Load Standard Rev 0A**
**Date of Comment Form posting: June 26, 2006**

| Stakeholder Question/Comment | AESO Response |
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| **Enmax Comments** | |
| 1. The definition of POC should be expanded to be clear just where this point is for a DFO POD. i.e. Is it on the secondary bus side of the substation transformers or the primary? | The AESO agrees with this recommendation and has updated the standard. Point of Common Coupling is now being used and further clarity has been provided. |
| 2. Similarly, for the flicker and unbalance criteria sections, the point of measurement should be defined. | The AESO agrees with this recommendation and has updated the standard for the above item. See item 25 for further changes that have been made to flicker requirements. |
| 3. In section 2.0 add the phrase "connected to the ATS" to the end of the first sentence to make if very clear that this applies to connections to the transmission system. | The AESO agrees with this recommendation and has updated the standard. |
| 4. In section 4.2, why are you specifying the transformer connection provided to industrial and distribution loads? The Y-Y configuration preferred loads may be Altalink's configuration but it is not Enmax's. Why can you not say both configuration are available? | The AESO's preference is to have a Y-Y configuration such that each load substation provides a source for ground faults to the transmission system. In strong areas of the system this is not of great concern as the system provides adequate ground fault current. In weaker areas such as remote rural substations the Y-Y configuration provides a substantial amount of current to transmission line ground faults and allows protective relays to operate. The AESO is open to review this on a project by project basis. |
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| ATCO Power Comments | |
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| 5. I thought that I understood the policy direction after reviewing OPP 702 (Voltage Control). However, there appear to be a number of inconsistencies between the draft Standard and the OPP that raised a significant flag. I have summarized some issues below in the hope that you can provide clarification. At this time, all of the comments are related to the provision of VARs.<br><br>1 – The OPP states that: "Generators must be capable of operating continuously in automatic voltage regulation mode between 0.9 power factor lagging to 0.95 power factor leading at nominal output. See Figure 2."<br><br>2 - The Standard states that: "all generating units, whether synchronous or not, must at a minimum be dispatchable and capable of supplying continuous reactive power at any point within the limits of 0.9 power factor over-excited (lagging) and 0.95 power factor under-excited(leading) as measured at the generator unit terminals. The FULL range of the reactive power capability must be available over the entire MW operating range of the generator at rated generator terminal voltage as shown by the shaded area in Figure 3-1:"<br><br>1 and 2 are fundamentally different. 1 is close to what was expected, if we understood your intent. 2 puts us in violation of our PPA Agreements, which is a significant issue. | As per the AESO's January 26, 2006 letter regarding reactive power the AESO's intention is to ensure the system has adequate reactive power available to maintain system reliability. The revised Generation and Load standard and particularly Figure 3-1: are intended to provide the minimal generating capabilities. The actual operation of the facility will be per OPP 702. OPP 702 will be reviewed and updated to ensure that the OPP is consistent with the new standard.<br><br>Further, the previous version of the Generation and Load standard stated:<br><br>"All generators, whether synchronous, induction or inverter type must be capable of operating continuously in voltage regulation mode within the +-0.9 power factor range at nominal power output. The TA will dispatch all generators in this range."<br><br>The new standard calls for a 0.9/0.95 power factor which is less stringent that the old version. If you have an existing machine that is not capable of meeting this new requirement please contact John Kehler (539-2622) to discuss this further.<br><br>The AESO will take into consideration the requirements in the PPAs. |

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| 6. 3- Two figures are provided in the documents. Figure 2 on page 11 of the OPP and Figure 3-1 on page 14 of the Standard. Figure 1 of the OPP is referenced on this issue, but not in the document. These Figures are fundamentally at odds. | Per the previous item the AESO will update OPP 702 to ensure consistency with the Generation and Load standard. |
| 7. Figure 2, I believe, follows historical practice and intent, although I'm not sure that it is consistent with where the AESO wants to go.<br><br>Figure 2 would best reconcile with the practice originally applied to the PPA units. However, I believe that the AESO intent (at least for all non-PPA units) is to draw a maximum output line at about 1.1 pu on this Figure. We do not understand the intent behind Figure 3-1. We believe that this would be a major departure from anything that has been discussed or practiced. | The AESO's intention with the revised Generation and Load Standard is to create greater clarity regarding the reactive power requirements. Figure 3-1 is intended to clearly show the minimum reactive power capabilities of a generator on the AIES. The normal dispatch range of the generator will be identified in OPP 702. Under emergency conditions the AESO may dispatch beyond the "V" but within the machines capabilities as identified in Figure 3-1 of the revised Generation and Load Standard. The AESO will be considering whether it is feasible and under what conditions it may be acceptable to raise the maximum gross MW limits, during periods of energy emergency shortfall. |
| 8. As an additional comment, it would be helpful if the standard referenced the willingness of the AESO to assist generators testing operational capabilities to achieve limit testing, where the grid itself precludes achieving a VAR limit. Perhaps this is in other documentation, but a reference would be helpful as testing practice, the standard and the OPP are related. | The AESO recognizes that testing a generator's capabilities may be difficult to arrange due to system conditions. The AESO is presently developing clear requirements respecting generator testing that will be posted on the AESO's website when completed. The AESO is committed to working with generators on their testing or retesting programs. Please contact John Kehler (539-2622) to discuss this further. |
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| **Kinder Morgan Canada Inc. part of the Power Pipeline Group and Associates (PPGA). Comments** | |
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| 9. In past KMC highlighted the fact that your standards did not clearly define how the standards would be implemented with new facilities. It appears clear now that the standards apply at the time of energization. This test may work for most standards, however if you are implementing a change that will impact a project that is just being constructed (not energized) you may bring a new standard that the facility was not originally designed to meet. KMC wants to highlight the possibility that this new standard could cause a delay to a customer's in service date. | For each project the AESO prepares a detailed Functional Specification which references all appropriate AESO standards including the standard revision date that need to be met. Any projects that are in execute utilizing the old standard will be managed against that standard. As part of this standard is retroactive those specific projects already in execute will need to meet the new standard. This change will be managed as a project specific scope change and will be initiated by the AESO's project manager. |
| Section 2.1.1 – Voltage Fluctuations (Flicker)<br><br>10. Terasen suggests that the AESO provide increased clarity in regards to system test methodology in regards to flicker limits. Flicker limit tests are completed based upon a number of assumptions. To ensure that all Utilities bring a common flicker limit study standard, Terasen suggests the following additions to the flicker limit standard: | Per item 25 the AESO has decided to remove method 1 for flicker limits. The methodology for preliminary design and further details on flicker measurement may be found in the IEC standard. |

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| 11. Load interconnection customers should independently determine the appropriate form of soft start mechanism for their particular interconnection. Terasen agrees with previous AESO standards that Customers should provide a soft start mechanism, but the particular form of soft start device should be left to the interconnection customer's discretion. | The AESO is supportive of customers independently determining the appropriate form of soft start mechanism.<br><br>For transmission customers, as part of the design of a new facility, the AESO intends to provide all customers system data such that they can determine the need for and type of motor starting such that flicker limits are not violated. |
| 12. To ensure fairness and consistency in evaluating different interconnection proposals, Terasen suggest that the AESO use a 2.5-3 times in-rush limit for the chosen customer soft start mechanism.<br><br>In our view, the flicker limit tests need clarity on the assumptions that they are based upon. The inclusion of these two additional clarifications will reinforce KMC's intention that the AESO not choose the customers form of soft start. | On strong parts of the system the AESO see's no reason to limit inrush to 3 times motor rating providing the flicker requirements are not exceeded. Further, on weak parts of the system, 3 times inrush may exceed the flicker limits. As this is very dependant upon motor size and system strength preliminary engineering will need to be conducted to determine if flicker limits will be exceeded. If they are exceeded then the customer will need to select a starting method that will keep them within the AESO's flicker limit criteria. |
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| ATCO Electric Comments | |
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| 13. Section 1.3, Paragraph 3 - I take that you are referring to continuous var regulations equipment such as SVCs. If so, the given definition does not distinguish the EDRS from fixed shunt reactor/capacitor devices. | This definition is intended to identify SVC's and statcoms not fixed shut reactors and capacitors. To add clarity the definition will be modified to the following:<br><br>"External Dynamic Reactive Source – A device that can quickly provide positive and negative VAr's <u>in a continuously variable manner</u> regardless of equipment terminal voltage." |
| 14. Section 1.3, Paragraph 5 - suggest changing "a 10 minute sample period" to "a 10 minute interval"; "10 minute sample period" sounds samples are taken in every 10 minute. | The AESO agrees with this recommendation and will update the standard. |
| 15. Table 2-1 - Clarify physical unit for the quantities of 0.9,0.8, 0.7, 0.6. | Per IEC 1000-3-7 these values are relative values and are without physical units. |
| 16. Section 2.1.3 - The text indicates the allowance for 3% voltage unbalance on the transmission voltage levels. AE only allows for a maximum of 2% transmission voltage unbalance; | The 3% requirement is in our existing standard and is based on the NEMA MG1-14.33. If ATCO Electric chooses to meet a 2% unbalance level this exceeds AESO's requirement. |
| 17. Section 3.0 - In Section 1.1, it stated particularly that this standard does not apply to distribution connected generators; the statement made under section 3.0 does not, however, exclude D generators explicitly. Does this imply the inclusive of D generators? If not, there is no need to re-state the coverage of this policy again here. | The AESO agrees with this recommendation and will update the standard to ensure distribution generators are excluded. |

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| 18. Section 3.1, paragraph 2 - The statement of "The voltage set point must be adjustable ... and dispatchable from the AESO... within +/-5% of the ..." leaves me the impression that an AVR with a setting range of 95%~105% of rated voltage meets your requirement. The fact is that a modern static AVR can be set at a much higher voltage (110% is common) than 105%. | As this standard is to be applied retroactively, the AESO considers that the +/-5% best matches what is already installed while providing the necessary AVR range.. |
| 19. Section 3.2, paragraph 1 - The statement of "Further, the generator must always be operated with the governor system free to respond to system frequency changes" is not clear to me. Do you mean "the generator governor must always be operated on droop mode"? | All generators must be in droop mode with no elements restricting the operation of the governor. |
| 20. Section 3.2, last paragraph - It is not clear the point that the statement is to deliver: If it aimed for co-gen units, then the statement is true. If, however, you are making a general statement, then a generator developer does not have the authority to curtail grid load - therefore, it should not be an interconnection requirement. It should be the AESO's responsibility to allocate the grid load for curtailment, not the GFO. | The intention of this paragraph is to provide generators that are unable to meet the frequency requirements an option such that they can still come on line and yet have no negative effect on system reliability. The onus is on the generator however to make these arrangements with a load customer. |
| 21. Section 3.4, Paragraph 1 - the statement of "Faults causing voltages as low as 0.15 per unit ... shall not cause or result in a generator trip" should read "Faults causing ... shall not cause or result in a generator trip within 625 ms". | The AESO agrees with this recommendation and will update the standard. |

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| 22. Section 3.4 - the statement of "Generating units shall at a minimum ... between 0.9 and 1.1 per unit" is controversy to the requirement stated under Section 3.1 (the +/-5% requirement), and it echoes my comment (7). | Section 3.4 is intended to provide continuous voltage withstand for a generator. Within 0.9/1.1 per unit voltage a generator is not to trip. This section will be reworded to add clarity. |
| 23. The definition of POC (point of connection for energy flow) is ambiguous. If it is the metering point, it could be either the secondary or primary of the transformer. For this reason the term PCC (Point of Common Coupling for customers) makes more sense when dealing with PQ issues. For transmission customers this would be the HV bus. When I see the term AIES, I think transmission with a POC or PCC referring to the HV system. | The AESO agrees with this recommendation and has updated the standard. Point of Common Coupling is now being used and further clarity has been provided. |
| 24. The flicker (section 2.2.1) proposes a choice between either the curve (a) or the IEC approach (b). The curve (a) applies to the POC which presumably is the HV system. Figure 2-1 typically applies to distribution systems and would be quite generous at the HV connection point. Is this the intention? Figure 2-1 should reference the applicable voltage levels. | After further review the AESO has decided to drop method (1) and utilize the IEC approach. The reason for this is as follows:<br>1) CSA has adopted the IEC standard.<br>2) IEEE Task Force (P1543) voted unanimously to adopt IEC flicker meter protocol for IEEE Recommended Practice.<br>3) The IEC approach provides a standardized flicker measurement method. |
| 25. Following the IEC method (b) is more rigorous and restrictive than method (a). Should not each approach lead to the same result? Why would any prospective load or generator want to follow method (b)? | Per the above item method (1) has been dropped. |

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| 26. Section 2.1.3 "Voltage Unbalance" is not an easy issue to deal with since it tends to be an overall system issue. The international consensus reached by CIGRE (the society that develops IEC standards) is 2% at the MV level, 1.5% at the HV level, and 1% at EHV levels. If we are dealing with the HV system here, why are we sticking to this Distribution system 3% limit based upon ANSI? It is generally believed that 3% is too high for power electronic devices (VFDs, doubly fed induction machines etc.). Our own in house standard is 2% for MV. | The DFO's presently have standards ranging from 2 to 4 % unbalance. The 3% is an existing requirement and is intended to be a maximum allowable value. The AESO accepts that it may be necessary to design and operate to a more stringent voltage unbalance standard where necessary for power electronic devices and suggests that such exceptions be addressed on a case by case basis. |
| 27. Further to the above on voltage unbalance, you cannot treat unbalance like a harmonics issue, for example letting each load be allocated a certain amount of "allowable" unbalance. This is because of the system nature of voltage unbalance. The load could be perfectly balanced but due to transmission line unbalance, it will increase the voltage unbalance at the PCC. This suggests the load must be unbalanced the right way to correct for the system unbalance. The fix is in the system not the customer. I would keep section 2.1.3 with revised limits and discard the premise that each customer be allowed to increase the unbalance by up to 1% (more than a 50% increase toward the limit). | The intention of specifying an absolute limit of 1% is to allow the AESO to take action with a customer that is non-compliant with the standard. As indicated, if the system voltage is imbalanced to start, a balanced load may end up with unbalanced voltages. This will be given consideration when applying this criteria. |
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| Altalink Comments | |
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| 28. Section 2.1.2. The location where harmonic limits apply needs to be defined (POC? Other customer? Etc?) | The AESO agrees with this recommendation and has updated the standard. Point of Common Coupling is now being used and further clarity has been provided. |
| 29. Section 2.1.2. The location where voltage imbalance limits apply needs to be defined (POC? Other customer? Etc?) | The AESO agrees with this recommendation and has updated the standard. Point of Common Coupling is now being used and further clarity has been provided. |
| 30. Section 2.4 How accessible does the AESO require relay disturbance records? i.e. Within an hour, within a day, within a week, within a month, etc. | The AESO's need would be for post event disturbance analysis and would expect to have these records the next business day. TFO's may have more stringent requirements in order to achieve appropriate restoration times. |
| 31. Section 2.6 The AESO has not been providing Maximum & Minimum voltages in functional specs. Are they going to start? If they do, it would be very valuable! Will the limits only apply to new additions? | The AESO's intention is to provide maximum voltage ratings in project specific Functional Specifications. OPP 702 will provide where we expect the normal operating voltage to be. |
| 32. Section 2.9 What is the mechanism for transmission customers to keep informed of fault level changes over time? Who is responsible for upgrades resulting from future projects? | The AESO chairs a committee with representatives from each TFO that ensures an accurate PTI system model is available. It is AESO's intention to start posting system fault levels on our website based on the PTI system model such that customers are aware of their fault levels. It is the customers responsibility to regularly review the adequacy of their facilities and undertake setting reviews and equipment upgrades as needed. |

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| 33. Section 2.10 What is the mechanism for transmission customers to keep informed of fault level changes over time? Who is responsible for upgrades resulting from future projects? | See above item. |
| 34. Section 3.0 Do all these requirements apply to the DFO that happens to have generators connected to their lines? Is islanding purposely not being addressed? If islanding is not disallowed, what are the obligations of generators with respect to operating in an island? | This standard specifically excludes distribution generation. At this time each DFO has their own generation interconnection requirements. This issue is presently being reviewed by the DOE.<br><br>Islanding of transmission connected generation is not specifically mentioned in this standard. However, if part of the system islands with load it is the AESO's expectation that providing all generator requirements are being met no immediate trip is required. Restoration and interconnection of the system may however require an outage.<br><br>Project specific details may drive the need for an anti islanding scheme and will be identified in the projects Functional Specification. |
| 35. Section 3.1 Do the limits apply to the generating unit or to the generator terminals? Also, will the AESO specify the neutral tap of the GSU txer that the +/- 5% applies in the FS? | The limits apply at the generating terminals and the AESO will supply the anticipated operating voltage as part of the Functional Specification. |

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| 36. Section 3.5 Why does the AESO have to specify a connection that prevents the transmission of harmonics? Is the Harmonics standard not adequate? Also, ground fault current on the MV side is the generators concern & has nothing to do with the system? The Wye-Delta connection is required, however, to keep the generating unit (as seen by the transmission system) effectively grounded. | The reference to reducing harmonics is a general statement as the harmonics requirements in section 2.1.2 are adequate. The fault level on the generator side is of limited system concern but the need for maintaining an effectively grounded system on the transmission system is of great importance. The standard will be modified to reflect this reason. |
| 37. Section 4.2 Why does the AESO have to specify a connection that prevents the transmission of harmonics? Is the Harmonics standard not adequate? Note: AltaLink supply transformers to DFOs is Wye-wye through a neutral grounding reactor. | The reference to reducing harmonics is a general statement as the harmonics requirements in section 2.1.2 are adequate. |
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| **Epcor Comments** | |

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| 38. All existing generation should be grandfathered and any upgrades required by the AESO for system security or reliability enhancements should be paid for by the AESO including direct and indirect costs(eg. lost revenue). Should the AESO identify specific problems with EPCOR units they would be assessed on an individual basis at that time. | All existing generating facilities are required to meet all NERC, WECC, and AESO requirements such that system reliability is maintained. The technical requirements apply to all generators and any direct or indirect costs to comply with the AESO interconnection standards and technical requirements are the responsibility of the generator. While it is intended that all generators meet the AESO standards and requirements, we recognize that some consideration of individual circumstances may be warranted (i.e. timing and nature of upgrades) and these issues will be addressed on a case-by base basis. The AESO will also engage generators in the development of standards where appropriate. Once a standard is finalized, the AESO will work with generators to verify compliance and deal with any deficiencies. If correcting the deficiencies is not practical or does not add to the system reliability then the AESO may choose to grant an exception. This will be determined on a case-by-case basis. |