

## G-PST/ESIG Webinar Series: Evaluating Major Contingencies and Conditions with the Potential to Cause Power System Disruptions

Question	Answer
Has AEMO looked at replacing the existing HV inter-connectors with HVDC - pros/cons ?	<ul style="list-style-type: none"><li>- Consideration of such options is generally part of network business options assessment under the regulatory investment test (RIT-T).</li><li>- A key factor in the feasibility is the distance between existing AC terminal stations, which add to the costs due to the number of AC/DC converter stations required.</li></ul>
Do you consider extreme weather events like widespread extreme heat in your risk assessment. If yes, how do you pick the scenarios?	<ul style="list-style-type: none"><li>- For the priority contingency events we consider a range of demand conditions from low to high demand.</li><li>- We also consider general risks associated with extreme weather events and mitigations in place, as part of the general risks.</li><li>- AEMO also develops a reliability outlook referred to as the Electricity Statement of Opportunities (available online).</li></ul>
Many countries have already considered about probabilistic transmission system planning. Which probabilistic conditions is the most important to analyze? why?	<ul style="list-style-type: none"><li>- Network businesses apply probabilistic planning methodologies.</li><li>- Suggest to refer to the AER regulatory investment test guidelines for more information (available online).</li></ul>
Considering the penetration of RES in grid v.s. the system inertia, is there a minimum system inertia standard to achieve a specific goal? (Not cause load shed)	<p>- While the current inertia framework does not recognise inertia requirements to manage RoCoF or transient stability, there is a potential rule change in progress to introduce a mainland Australia inertia floor to promote distributed and proactive inertia procurement. AEMO would set the inertia floor with regard to the RoCoF limit for credible contingency events in the Frequency Operating Standard, the level of inertia required to maintain security, and any other matters as required. If this progresses, the proposed changes would commence on 1 December 2024, meaning that binding procurement of the mainland inertia floor would commence from 1 December 2027.</p>
Would you review your blackstart plans to ensure they provide enough flexibility to restore the system given the risk associated with extreme weather events?	<ul style="list-style-type: none"><li>- Blackstart plans are reviewed on an ongoing basis, and it is important they adapt with the the changing energy mix.</li><li>- Extreme weather events can increase the likelihood that a system black event may occur and also contributes to the need to review blackstart plans to ensure AEMO continues to meet the system restart standard (available online).</li><li>- See also G-PST Research Agenda and CSIRO research roadmaps (available online) for more information in this area.</li></ul>

<p>How long does the EMT model take to achieve "initialization" conditions and how long does it take to run additional 10 seconds?</p>	<ul style="list-style-type: none"> <li>- The EMT model initialises in around 15 seconds of simulation time. We use a PSSE case as the load flow and import the load flow values into PSCAD. We start off with ideal sources for all the generators in PSCAD and then from 0 seconds to 15 seconds, we gradually switch out the ideal sources and switch in the dynamic models as they are brought up to their set points.</li> <li>- We generally run simulations for another 15 seconds of simulation time after applying the contingency. In terms of how long this process takes - it depends on the computing power, but on our high performance machines 30 seconds of simulation time can be completed in about 1.5 hours and we are actively working to improve this.</li> <li>- Often the most time consuming part of the process is setting up the case and troubleshooting issues such that the model initialises successfully, which we are also working at automating where possible.</li> </ul>
<p>What SPS was employed (or contemplated) to prevent the dbl 500kV contingency from cascading?</p>	<ul style="list-style-type: none"> <li>- We assume this question relates to the 13/2 event in Victoria, which is undergoing detailed review and we will report on operation of SPSs in the final report. There some initial information available in the preliminary report (available online).</li> </ul>
<p>To ensure that the dispatch in real-time is appropriate, when appropriate, do you include these critical contingencies in the market constraints?</p>	<ul style="list-style-type: none"> <li>- Answered on slide 7 of the presentation</li> <li>- Also refer to Operational Procedure 3715 (available online).</li> </ul>
<p>Do you also have the notion of extreme events?</p>	<ul style="list-style-type: none"> <li>- We do experience extreme events in the National Electricity Market such as extreme weather like destructive winds and bushfires for example.</li> <li>- These extreme events can increase the likelihood of double circuit outages (or other "non-credible" contingencies) and can mean that the likelihood of a double circuit outage could be reclassified as being more likely to occur.</li> <li>- This can mean that additional reserves could be brought online, or flows may be minimised to reduce the consequence of the extreme event occurring.</li> </ul>
<p>What are the issues that you see with concentrated FCAS in your system? How you evaluate the risks associated with this, if it is based on the market behaviour?</p>	<ul style="list-style-type: none"> <li>- Concentrated FCAS can cause issues in the NEM, as a non-credible contingency in one region, has the potential to result in fast acting BESS in another region overloading the double circuit interconnectors if they are already close to their limits.</li> <li>- This issue is expected to be less pronounced as more BESS is installed, and local BESS will generally be the most rapid response to frequency excursions within a region.</li> </ul>
<p>What is EMT &amp; RMS studies?</p>	<ul style="list-style-type: none"> <li>- RMS refers to root mean squared, which is used to model power system dynamics associated with excitation control systems etc, typically using software packages such as PSSE.</li> <li>- EMT refers to Electromagnetic Transients, used to model faster acting control system behaviour, such as associated with wind/solar inverter inner current control loops and phase locked loops, typically using software packages such as PSCAD.</li> </ul>

<p>Do you offer advice or recommendations related to design aspects for transmission plant - for example, in light of recent 500 kV tower failures in Feb 2024</p>	<ul style="list-style-type: none"> <li>- As a general rule, AEMO as the system and market operator does not provide advice or recommendations on equipment design.</li> <li>- For further info, please feel free to refer to detailed incident reports on other tower failure events, such as 31 January 2020 and 12 November 2022.</li> </ul>
<p>Can you elaborate on the “SCADA failure” focus for 2024 ?  What alternatives does/could AEMO use when this happens?  Are PMU/WAMS a possible alternative ?</p>	<ul style="list-style-type: none"> <li>- AEMO has published several market event reports into SCADA failure events (available online)</li> <li>- In light of recent events, and as mentioned in the webinar, AEMO is preparing a broader review into SCADA capability and performance, due to be published in the coming weeks. We have engaged with international SO's to inform the review.</li> <li>- Use of monitoring including through PMU/WAMS could help provide operational visibility - ability to provide adequate coverage for state estimation and online application to continue operating is not yet proven.</li> </ul>
<p>Is there any link between GPSRR and ISP? e.g. would ISP scenarios be investigated under GPSRR, etc?</p>	<ul style="list-style-type: none"> <li>- The ISP forecasting data is used by the GPSRR for future studies.</li> <li>- The scenarios outlined in the ISP, such as the Step Change scenario, forms the basis for dispatch and network augmentations considered in the future GPSRR studies.</li> </ul>



