

Sumitomo SHI FW,
Metsänneidonkuja 10,
Espoo 02130, Finland

29th September 2026

Subject: Response to the Power System Security and Reliability Standards Review Consultation Paper

Sumitomo SHI FW Energia Oy (SFW) welcomes the opportunity to provide Energy Policy WA with a response to the Power System Security and Reliability Standards Review Consultation Paper published in August 2026.

At Sumitomo SHI FW, we drive the decarbonization of energy with innovative technologies for long duration energy storage, sustainable fuels, carbon capture, energy generation and waste to energy. Our 1,800 experts across 20 locations in 14 countries deliver sustainable energy solutions for diverse industries, powering a decarbonized world for everyone. We are currently commercializing the liquid air energy storage (LAES) technology for long duration energy storage (LDES) applications in key markets across the globe.

For more details on this submission, please contact the undersigned at:
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Yours sincerely,

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Consultation Questions:

1(a) If stakeholders do not support mandating GFM inverter technical standards for new ESR in network locations identified as experiencing existing or forecast system strength shortfalls:

- What are the reasons for this position?
- What evidence or analysis supports the position?

1(b) If stakeholders do not support the proposed prioritisation framework as a mechanism to manage system strength conditions where existing ESR have not remediated their impacts:

- What are the reasons for this position?
- What evidence or analysis supports the position?

Response:

As the integration of inverter-based resources (IBRs) increases over time, more areas of the grid and the power system will experience a decline in system strength. Hence, we recommend that the GFM inverter technical standards be made mandatory not only for electric storage resources (ESRs) seeking connections in network regions identified in the System Strength Report as having low system strength, but also for all new ESRs connecting to the SWIS.

Although the grid-forming and grid-following terminologies apply strictly to inverter-based ESRs, the current proposals broadly use these terms while referring to all ESRs. We suggest using the term "inverter-based ESRs" throughout the proposal, as several mechanical energy storage technologies such as liquid air energy storage (LAES), compressed air energy storage (CAES), and liquid CO₂ energy storage (LCES) connect to the grid via synchronous machines.

With reference to Proposals 1:3 to 1:5, we suggest grouping ESRs based on how they integrate into power system (inverter-based and non-inverter-based) and applying the proposals appropriately. Inverter-based ESRs require a certain level of system strength to guarantee their synchronization with the grid. Furthermore, the contribution of inverter-based ESRs to the system strength is minimal. However, mechanical ESRs such as LAES do not require minimum system strength levels to maintain synchronization with the grid. Mechanical ESRs also provide crucial system strength services such as high fault current. Hence, we believe that there should be a distinction between different ESR technologies for applying limitations and constraints.

It is worth mentioning that while the GFM technology provides a more robust framework, it is still insufficient for resolving critical system strength issues such as low fault current levels. The GFM technology enables inverters to maintain synchronization with the grid in low SCR conditions and provides a fast response to events such as frequency events with high rate of change of frequency (RoCoF). However, due to their physical limitations, their contribution to critical grid strength issues such as fault current provision is highly constrained. This is unlike synchronous generators. Due to the thermal sensitivity of semiconductor switches, GFM inverters are typically limited to providing 1.2 pu of their nominal current ratings during fault scenarios. In other words, the output of GFM inverters in terms of fault current is not meaningfully different from GFLs. As such,

widespread reliance on GFM inverters can reduce the overall grid strength. A reduction in the available fault current can endanger the existing protection schemes in the grid.

The inertia provided by GFM inverters is synthesised by control systems. Due to the restricted ramp rates of battery energy storage systems (BESS), instantaneous inertia energy must be provided by the DC link capacitor. This severely limits the duration and power of the response. Semiconductor switches can only withstand transient current surges up to 1.5 pu. Therefore, an inverter's ability to provide inertia is highly dependent on its pre-fault operating point. If a GFM is operating near nominal capacity prior to a frequency disturbance, it cannot inject inertial power. Furthermore, triggering strict current-limiting protocols can result in component-level instability and loss of synchronisation. A BESS with a GFM inverter would operationally need to maintain some capacity headroom to provide inertia services.

Consultation Questions:

3(a) If stakeholders do not support requiring EMT models from existing facilities based on system strength risks and broader power system security considerations:

- What are the reasons for not supporting the proposal.
- What evidence, analysis or practical experience that justify this position.

3(b) If stakeholders do not support the proposed approach to introduce a cost compensation mechanism for EMT model development for existing facilities:

- What are the reasons for not supporting the proposal.
- What evidence, analysis or practical experience that justify this position.

3(c) If stakeholders do not support the use of curtailment, where practical, in accordance with the curtailment prioritisation framework (refer to Proposal 1.4), where a Market Participant is non-compliant with EMT model submission requirements:

- What are the reasons for not supporting the proposal.
- What evidence, analysis or practical experience that justify this position.

Response:

Enforcing Proposal 3 is essential due to the voltage and frequency stability issues introduced by the high levels of IBR-integration into the power system. However, it is recommended that the critical parts of inverter-based ESRs which need to be modelled in the EMT model be identified. In this context, it would be beneficial to highlight the following sub-systems:

- i) Outer control loop
- ii) Inner control loop
- iii) Switching control loop, switching devices and filters on the output side of the converter

This is important for inverters since it determines many critical stability and performance metrics such as harmonics.

- Any first order lag that has been implemented in the model should be consistent with the physical equipment.
- Any virtual impedance (first order lag) in the output of the inner and outer controlling loop should be consistent with the physical equipment.
- Any aggregation of small units should be justified and its effect on the model output should be clearly outlined.

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A12.9.B. Technical Requirement: Voltage Phase Angle Jump, Page 57

Comment:

Although $\pm 25^\circ$ phase angle jump withstand aligns with the IEEE 2800 standard, it should be considered that this standard is natively designed for massive interconnected North American networks. Smaller grids like the SWIS are more vulnerable to severe voltage phase angle jumps. Thus, to ensure reliable operation in a high-IBR future, other isolated networks have adopted much more robust withstand requirements. For example, Great Britain's NESO Grid Code sets a Phase Angle Jump Withstand Limit of $\pm 60^\circ$ for grid-forming technologies. Similarly, other international TSOs such as Fingrid have set withstand thresholds up to $\pm 30^\circ$. Setting the requirement at $\pm 25^\circ$ does not adequately reflect the physical realities of the SWIS or the proven capabilities of modern inverters. We recommend revising this threshold for future-proofing this amendment.