



# Uniform GFM Performance Metrics

A Discussion for WECC MVS Input

January 30, 2025

# What is the need?

- Transmission owners (TOs) have large generation interconnection queues containing large amounts of inverter-based resources (IBRs).
- TOs are looking for the best practices in interconnection requirements for IBRs.
- Grid Forming (GFM) IBRs appear to provide the most robust performance.
- Is it the correct approach to make GFM capability an interconnection requirement?
- What is needed to allow a GFM capability requirement?

# What is the need?

- One of the challenges in requiring GFM or the capability to switch to GFM at little or no cost is lack of clear GFM specifications.
- This has been noted in different publications such as the Australian Energy Market Operator (AEMO) May 2023 Voluntary Specification for Grid-forming Inverters.
- ***Ultimately, clear GFM specifications will allow developers to specify requirements from Original Equipment Manufacturers (OEMs), and for OEMs to design their GFM offerings.***

# WECC Collaboration for Regional Uniformity

- A WECC level effort to define minimum requirements for GFM capability will provide regional uniformity – which is expected to be a benefit for TOs, developers, and OEMs.
- Leverage exiting working groups underway to establish IBRs performance characteristics, for example:
  - ERCOT Inverter-Based Resource Task Force
  - Energy Systems Integration Group (ESIG) Task Forces (Reliability TF, GFM Testing Project Team TF)
  - The Universal Interoperability for Grid-Forming Inverters (unifi)

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# End Product: WECC White Paper defining GFM Minimum Performance Requirements

- Provide an issue paper further defining the need (this can be skipped if the need is well understood).
- Draft a GFM performance requirements white paper.
  - Outlines performance requirements from the TOs perspective – What are GFM minimum performance requirements for maintain a reliable system?
  - Provide supporting study results, as needed.
  - Provide suggested commissioning tests for validating GFM minimum performance. Tests possible on the real system vs. model environment.
  - Involve OEMs to ensure the performance requirements are achievable.
- **Finalize a white paper.**

# Example GFM Requirement Specifics

- Current overload capability and power buffer capability (inject/absorb) needed for voltage and frequency control during abnormal events.
- Voltage angle step change response
  - AEMO/ERCOT example: for each 10-degree voltage phase angle jump a plant's power change of at least 0.2 pu on rated active powerbase with a response time of 15 ms (AEMO) or 1 cycle (ERCOT).
- Equivalent Inertia Response
  - ERCOT example: equivalent inertia constant greater than 2.5 s
- Weak System Operation, e.g. down to a SCR of 1.2 (ERCOT)
- Small Voltage Disturbance (capability to resist change in voltage magnitude)
- Loss of last Synchronous Machine
- Expectations at current limits