ESIG panel session – Grid-forming Inverters

Jay Ramamurthy, AEMO

16-3-2026

We acknowledge the Traditional Custodians of the land, seas and waters across Australia. We honour the wisdom of Aboriginal and Torres Strait Islander Elders past and present and embrace future generations.

We acknowledge that, wherever we work, we do so on Aboriginal and Torres Strait Islander lands. We pay respect to the world's oldest continuing culture and First Nations peoples' deep and continuing connection to Country, and hope that our work can benefit both people and Country.

'Journey of unity: AEMO's Reconciliation Path' by Lani Balzan

AEMO is proud to have launched its first Reconciliation Action Plan in May 2024. 'Journey of unity: AEMO's Reconciliation Path' was created by Wiradjuri artist Lani Balzan to visually narrate our ongoing journey towards reconciliation – a collaborative endeavour that honours First Nations cultures, fosters mutual understanding, and paves the way for a brighter, more inclusive future.

Read our RAP

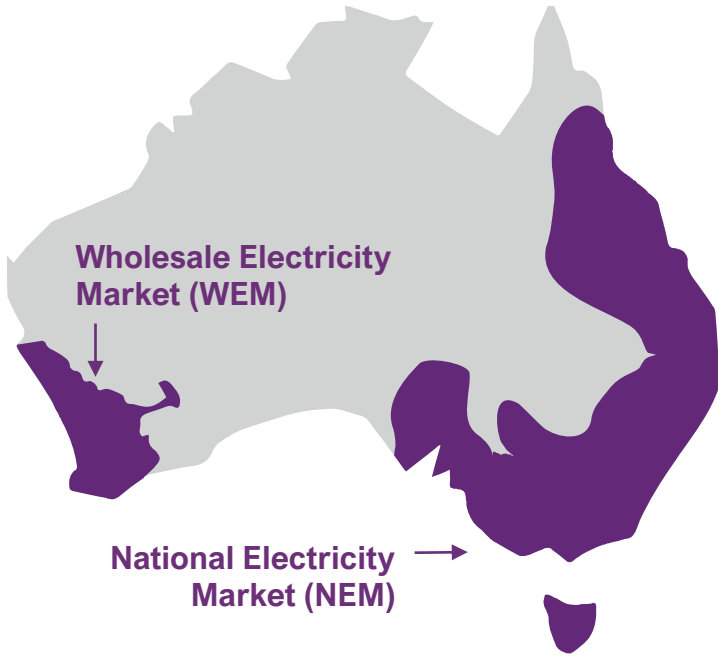
About AEMO

- AEMO is a member-based, not-for-profit organisation.
- We are the independent energy market and system operator for the National Electricity Market (NEM) and the WA Wholesale Electricity Market (WEM), and system planner for the NEM.
- We also operate retail and wholesale gas markets across south-eastern Australia and Victoria's gas pipeline grid.

ASL

ASL is an independent subsidiary of AEMO, established in 2021 to enable the transparent provision of advisory and energy services to National Electricity Market jurisdictions.

Electricity



Gas

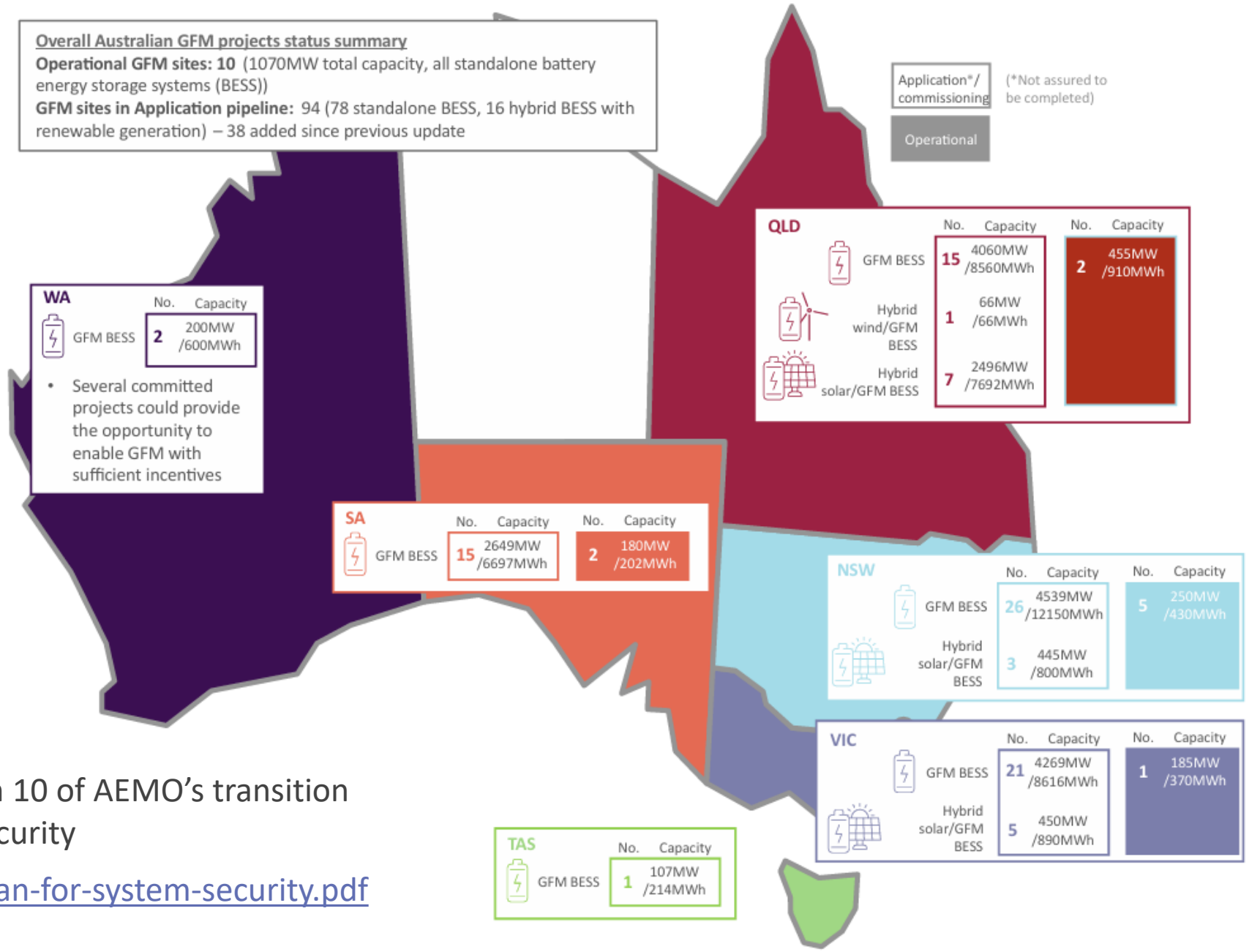
Declared Wholesale Gas Market (DWGM)

Short Term Trading Market (STTM)

and

Gas Supply Hub (GSH)

Figure 21 GFM projects in the NEM and WEM



Note: AEMO connections pipeline, as of July 2025.

Reference: Section 10 of AEMO's transition plan for system security

2025-transition-plan-for-system-security.pdf

Reference - Ekistica – ARENA Grid-Forming Battery Portfolio Series - Australian Renewable Energy Agency (ARENA)

Table 1: Operational ARENA Funded GFM Battery Project Details

	Hornsdale Power Reserve Expansion (HPRX)	Wallgrove Grid Battery (WGB)	Broken Hill Battery Energy Storage System (BHBESS)	Darling Point Energy Storage System (DPESS)
Key Objective	Demonstrate the provision of virtual inertia through Tesla's Virtual Machine Mode (VMM) capability.	To test the capability of VMM in providing inertia and compare with the equivalent response from synchronous machines.	Demonstrate the capability of grid-forming batteries to provide system strength in weak grid locations.	Demonstrate that a GFM BESS can offset the need for synchronous condensers to enable the connection of IBR to weaker parts of the grid.
Size	Increase existing capacity by 50 MW / 64.5 MWh to a total of 150 MW / 193.5 MWh.	50 MW / 75 MWh	50 MW / 50 MWh	25 MW / 50 MWh
Proponent	Neoen	Transgrid / Lumea	AGL	Edify Energy
Partners	Tesla (OEM)	Tesla (OEM), Iberdrola Australia (Operator)	Fluence Energy (EPC), Aurecon (modelling), UNSW (studies and simulations), Worley Consulting (Knowledge Sharing Partner)	Tesla (OEM)
Commercial Operations Date	Expansion operational September 2020. VMM implemented by 22 July 2022.	Commercial operations 22 December 2021. Synthetic inertia capabilities enabled 23 November 2022.	Approval for unrestricted commercial operation on 21 Aug 2024.	29 September 2023
ARENA Funding	$8 million committed on 19 November 2019	$11.5 million committed on 23 October 2020	$14.84 million committed on 25 March 2022	$6.6 million committed on 11 June 2022
Total Project Budget	$71 million	$61.9 million	$41 million	$32.34 million
Project Reports to Date	9	10	4	3

Table 1: Summary of GFM Battery Project Details under Discussion[1]

	Victorian Big Battery (VBB)	Western Downs BESS (WDBESS)	Blyth BESS	Mortlake BESS	Liddell BESS	Mount Fox BESS
Size	300 MW / 450 MWh	255MW / 510MWh	200MW / 400MWh	300MW / 650MWh	500MW / 1000MWh	300 MW / 600 MWh
Proponent	Neoen	Neoen	Neoen	Origin	AGL	TagEnergy
Partners	Tesla (inverter, battery, O&M), UGL (BoP EPC), Aurecon (technical advisor, Owner's Engineer)	Tesla (inverter, battery, O&M), UGL (BoP EPC), Aurecon (Owner's Engineer)	Power Electronics (inverter), CATL (battery), Elecnor and NHOA consortium (EPC, O&M), GHD (Owner's Engineer)	Fluence Energy (EPC), SMA (inverter)	Fluence Energy (EPC), Power Electronics (inverter), Worley Consulting (knowledge sharing partner)	Tesla (inverter, battery), Aurecon (grid connection support)
ARENA Funding	$5.72 million	$21 million	$17 million	$24 million	$35 million	N/A[2]
Total Project Budget	$5.9 million (GFM retrofit)	$244 million	$338 million	$417 million	$695 million	TBD (pre-financial close)
Grid Connection Status	GFM connection approved	GFM connection approved	GFM connection application process ongoing	GFM connection application process ongoing	GFM connection approved	GFM connection approved
Project Reports	2	2	3	3	1	0

[1] The Gnarwarre BESS was awarded funding in the ARENA LSBS round but is not included in this report due its earlier stage of development.
[2] Mount Fox BESS was originally awarded ARENA funding before subsequently withdrawing from the LSBS round.

Table 19 AEMO publications related to GFM

Publication	Date	Achievements/objectives
Application of Advanced Grid-scale Inverters in the NEM[A]	Aug 2021	Identified the need for GFM inverter demonstration at scale.
Voluntary Specification for Grid-Forming Inverters[B]	May 2023	GFM inverter capabilities defined for power system security.
Testing Framework for Grid-Forming Inverters[C]	Jan 2024	Simulation test methods developed to determine whether GFM inverters will provide expected power system security benefits.
The Role and Need for Inertia in a NEM-Like System[D]	May 2024	Developed understanding of synthetic versus synchronous inertia in the NEM to guide regulatory change.
Quantifying Synthetic Inertia of a GFM BESS – Technical Note[E]	Sep 2024	Explored constraints of GFM inverter capability in providing synthetic inertia.
GFM Access Standards Technical Requirements Review[F]	Aug 2025	Review of NER technical requirements to facilitate the delivery of GFM inverter services and capabilities.
Type 2 Transitional Service Statements of Need	Oct 2025	Proposing trials of GFM protection-quality fault current[G], black start from GFM[H], and Zero Synchronous Generation[I].
GFM Protection Quality Fault Current – Independent Consultant Reports[108]	Nov 2025	Consultant reports providing detailed technical content on interaction between GFM and existing protection systems
Engineering Roadmap new technologies workstream[J]	Expected 2025-26	Analyse fault current performance from GFM. Quantify system strength support from GFM.

A. At https://aemo.com.au/-/media/files/initiatives/engineering-framework/2021/application-of-advanced-grid-scale-inverters-in-the-nem.pdf.
B. At https://aemo.com.au/-/media/files/initiatives/primary-frequency-response/2023/gfm-voluntary-spec.pdf.
C. At https://aemo.com.au/-/media/files/initiatives/engineering-framework/2023/grid-forming-inverters-jan-2024.pdf.
D. At https://aemo.com.au/-/media/files/initiatives/engineering-framework/2024/ao_geas-role-of-inertia-in-a-nem-like-system.pdf.
E. At https://aemo.com.au/-/media/files/initiatives/engineering-framework/2024/quantifying-synthetic-inertia-from-gfm-bess.pdf.
F. At https://www.aemo.com.au/consultations/current-and-closed-consultations/grid-forming-technology-access-standards-technical-requirements-review.
G. See https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/transition-planning/transitional-services---type-2-services/grid-forming-inverter-protection-quality-fault-current-trial.
H. See https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/transition-planning/transitional-services---type-2-services/black-start-capability-from-ibr.
I. See https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/transition-planning/transitional-services---type-2-services/zero-synchronous-generation-trial.
J. At https://www.aemo.com.au/-/media/files/initiatives/engineering-framework/2025/engineering-roadmap-fy2026-priority-actions-report.pdf.

Reference: Section 10 of AEMO's transition plan for system security

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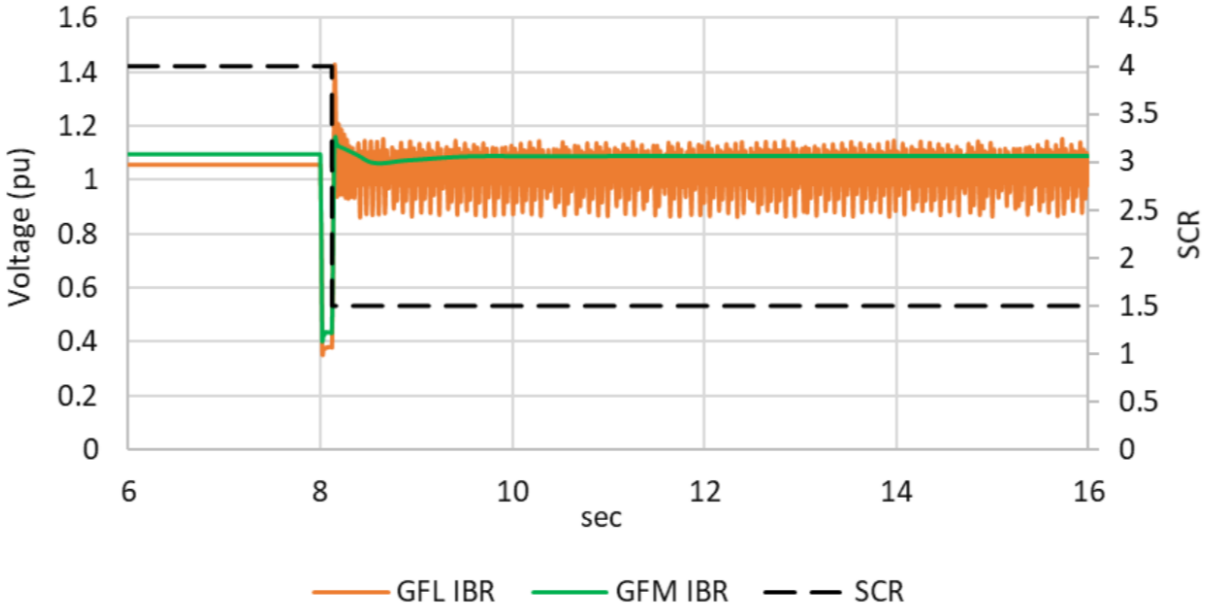
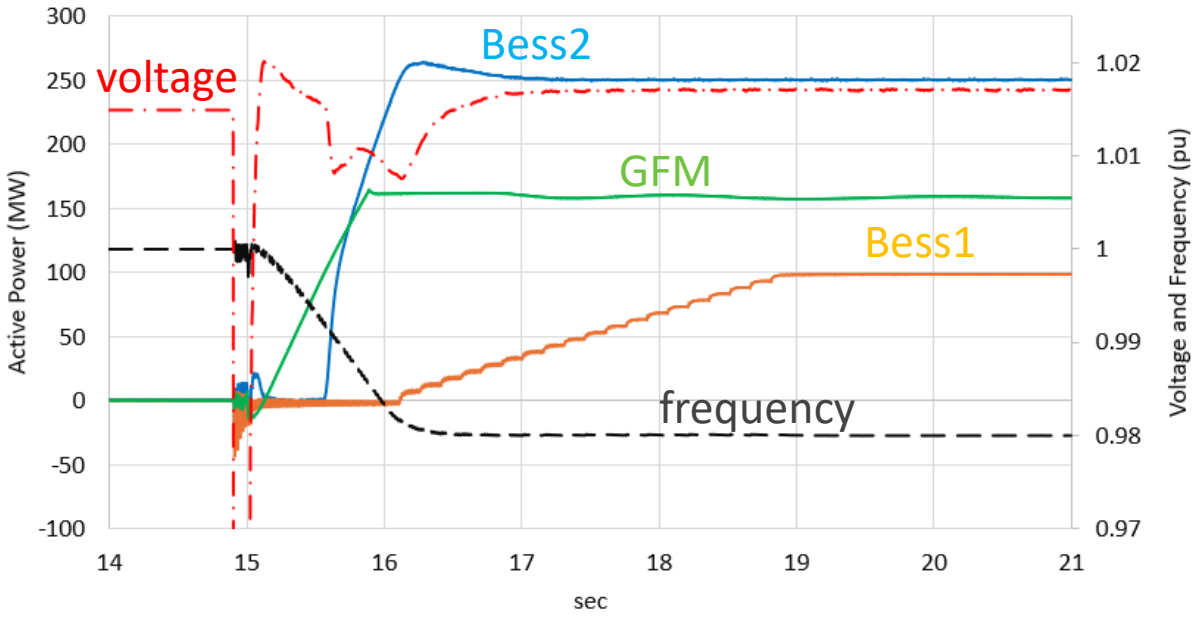
Well tuned GFM characteristics – Typical examples





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