

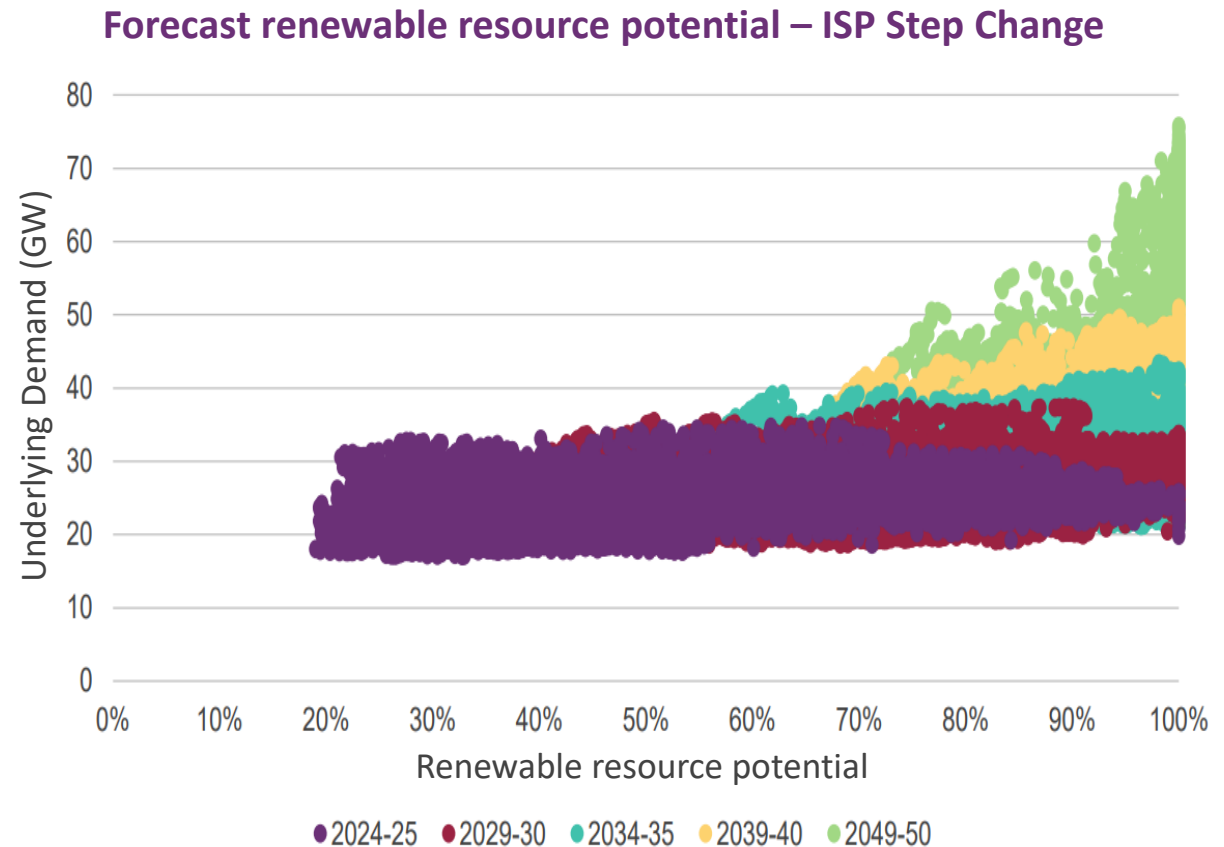
Application of grid-forming inverters in Australia

IRED2022 – 26 October 2022



Penetration of renewables in the NEM

- The energy transition will dramatically change the conditions in which AEMO manages power system security.
- Based on current trends, AEMO expects there will be enough renewable resource potential to meet all underlying NEM demand at certain times of the day throughout the year by 2025.



Engineering Framework Initial roadmap



NEM Engineering Framework

Initial Roadmap

December 2021



Maintaining essential power system capabilities as the synchronous generator fleet exits

Plan and facilitate
**efficient synchronous
condenser rollout and
conversion**

Trial, enable, and
incentivise **advanced
inverter deployment**



Develop mechanisms to enable
flexibility in the delivery of
essential power system services



RISK! Earlier than
expected
synchronous
decommitments

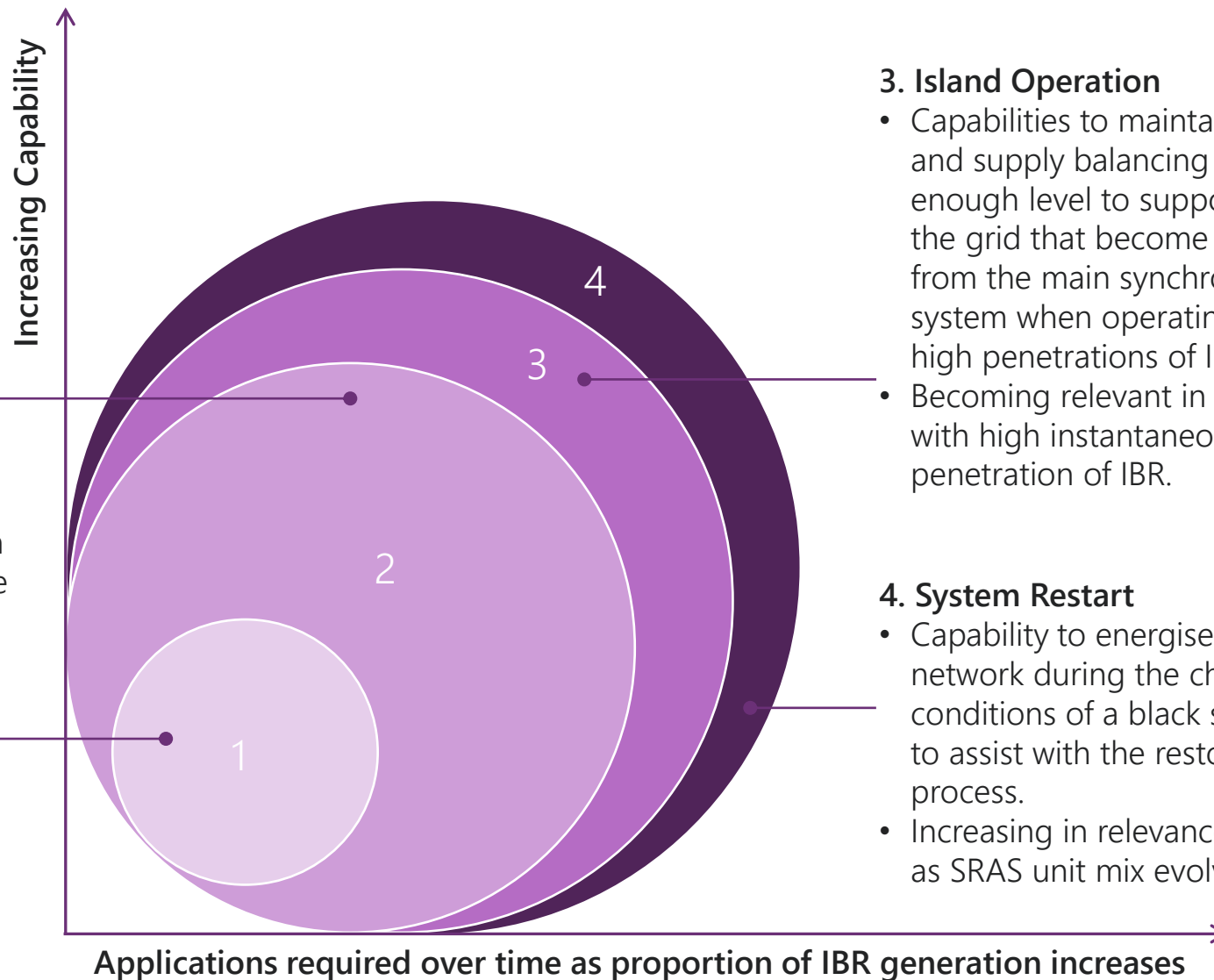
Applications of advanced inverters

2. Supporting system security

- Capabilities to maintain system security that are predominantly provided by synchronous generators today, such as inertia and system strength, to support the broader power system.
- Key development focus for the NEM as it transitions to operating with fewer synchronous generators online.

1. Connecting IBR in weak grids

- Capability to maintain stable operation in weak grid areas to meet IBR performance obligations, and potentially to provide system strength to support the connection of other nearby IBR plant.
- Provides localised capability to stabilise nearby IBR generation, but does not necessarily support the broader power system.
- Key importance to VRE project developers.






3. Island Operation

- Capabilities to maintain stability and supply balancing at a high enough level to support areas of the grid that become separated from the main synchronous system when operating under high penetrations of IBR.
- Becoming relevant in regions with high instantaneous penetration of IBR.

4. System Restart

- Capability to energise the local network during the challenging conditions of a black system, or to assist with the restoration process.
- Increasing in relevance over time as SRAS unit mix evolves.

Priority advanced inverter actions

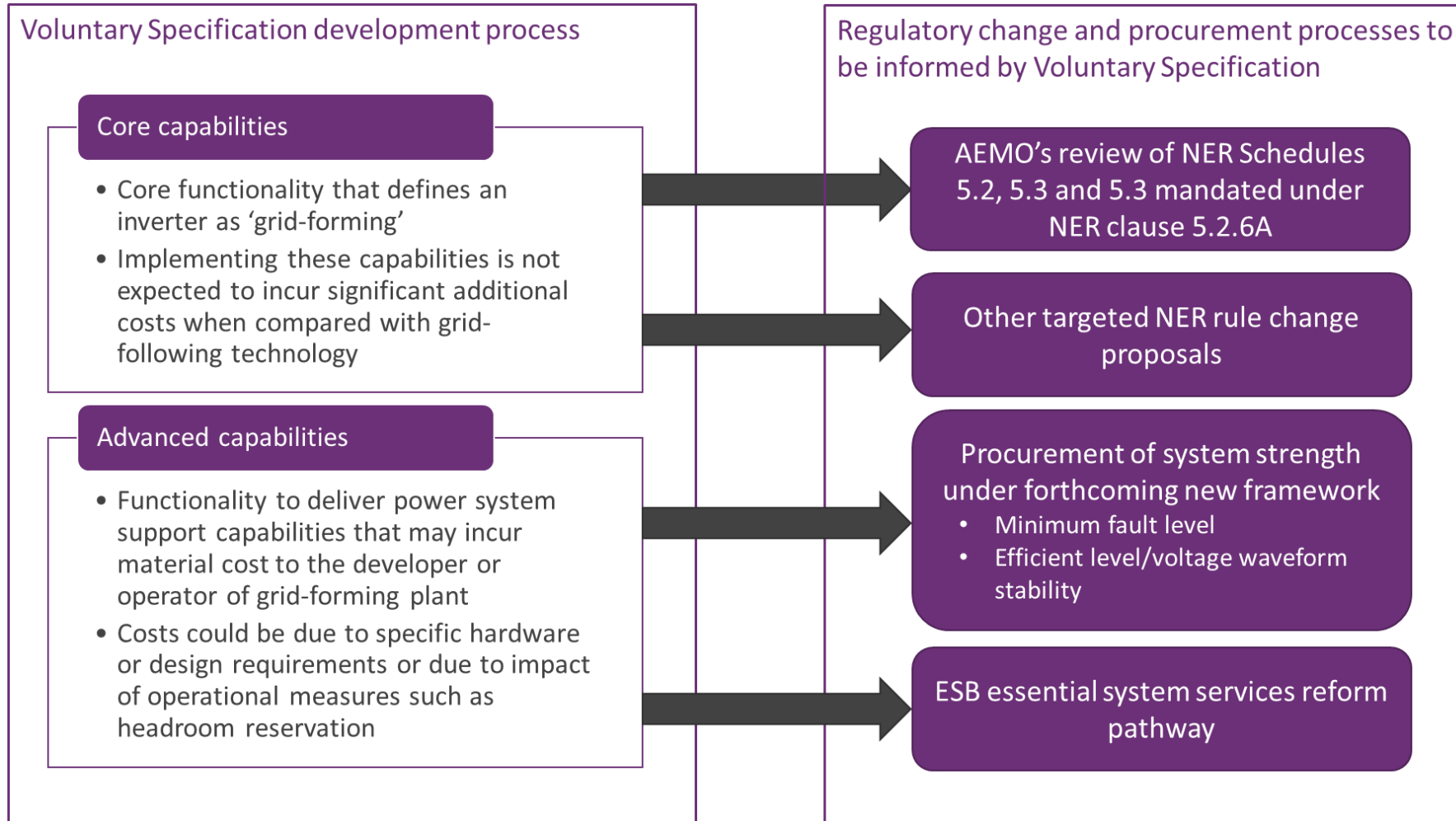
Action ID	Target end-state objective for action	AEMO commitment for financial year 2022-2023
 Define necessary capabilities	A3 Define necessary power system support capabilities for grid-forming inverters to guide Original Equipment Manufacturers (OEMs) and developers.	Collaborate with industry on a voluntary specification for grid-forming inverters.
 Enable capabilities on new grid-scale batteries	A14 Enable advanced inverter capabilities on new grid-scale batteries.	Support ARENA advanced inverter funding round.
 Enable connection of grid-forming projects	A27 Simplify treatment of grid-forming inverter projects in the connections process.	Publish a fact sheet to clarify the pathway for grid-forming inverters through the existing connections process.

Grid-forming inverters voluntary technical specification

Action ID	Target end-state objective for action	AEMO commitment for financial year 2022-2023
A3	Define necessary power system support capabilities for grid-forming inverters to guide Original Equipment Manufacturers (OEMs) and developers.	Collaborate with industry on a voluntary specification for grid-forming inverters.

- Collaborate with industry to prepare a preliminary document to establish alignment and provide guidance on technical and operational design considerations.
- Could be used to inform future regulatory change in technical standards, service specifications, and procurement processes.

Specification development



Next steps

- *Voluntary grid-forming inverter specification* development will proceed from November 2022 to March 2023.
- Publication of *grid-forming BESS connections fact sheet* expected by December 2022 following feedback from network businesses.
- AEMO will publish an Engineering Framework *Roadmap to operating the NEM at 100% instantaneous penetration of renewables* in December 2022.
- Please contact FutureEnergy@aemo.com.au with any queries.