NEM Engineering Framework Gaps and Actions Information Session

October 2021

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NEM Engineering Framework Gaps and Actions Information Session

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Q&A with Slido

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Slido.com

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#NEMEF

Please use the **Audience Q&A tab** to ask and upvote questions throughout the session

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To make for a shorter session, only the top voted questions will be answered verbally. If your question is selected, we may unmute you to ask your question verbally to make sure we have the full context. Other questions will receive written responses throughout the presentation.

There will be breaks to verbally answer questions after Daniel Westerman’s introduction, and periodically throughout the presentation

Welcome, Introduction and Q&A

Daniel Westerman, Chief Executive Officer

FOR Q&A: **SLIDO.COM | CODE: #NEMEF**

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Session objectives

Update on the work to-date in the Engineering Framework

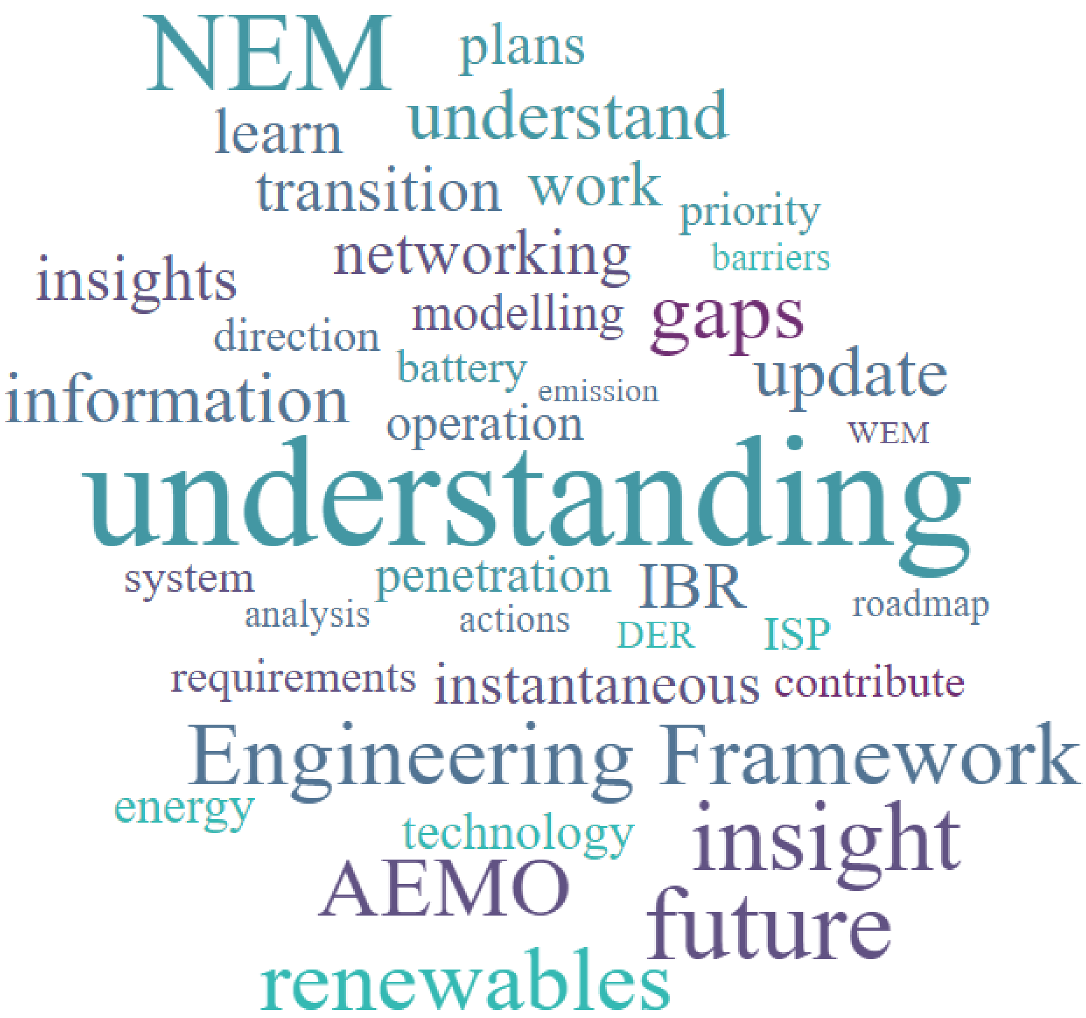
Share early concepts for upcoming actions roadmap publication

Provide overview of high-level themes from recent gap analysis process

Gather your feedback on the Engineering Framework process (survey at the end)

Your thoughts

- Before the event, registrants were asked to share what they are hoping to gain from the session today.
- The following word cloud shows the most popular responses.



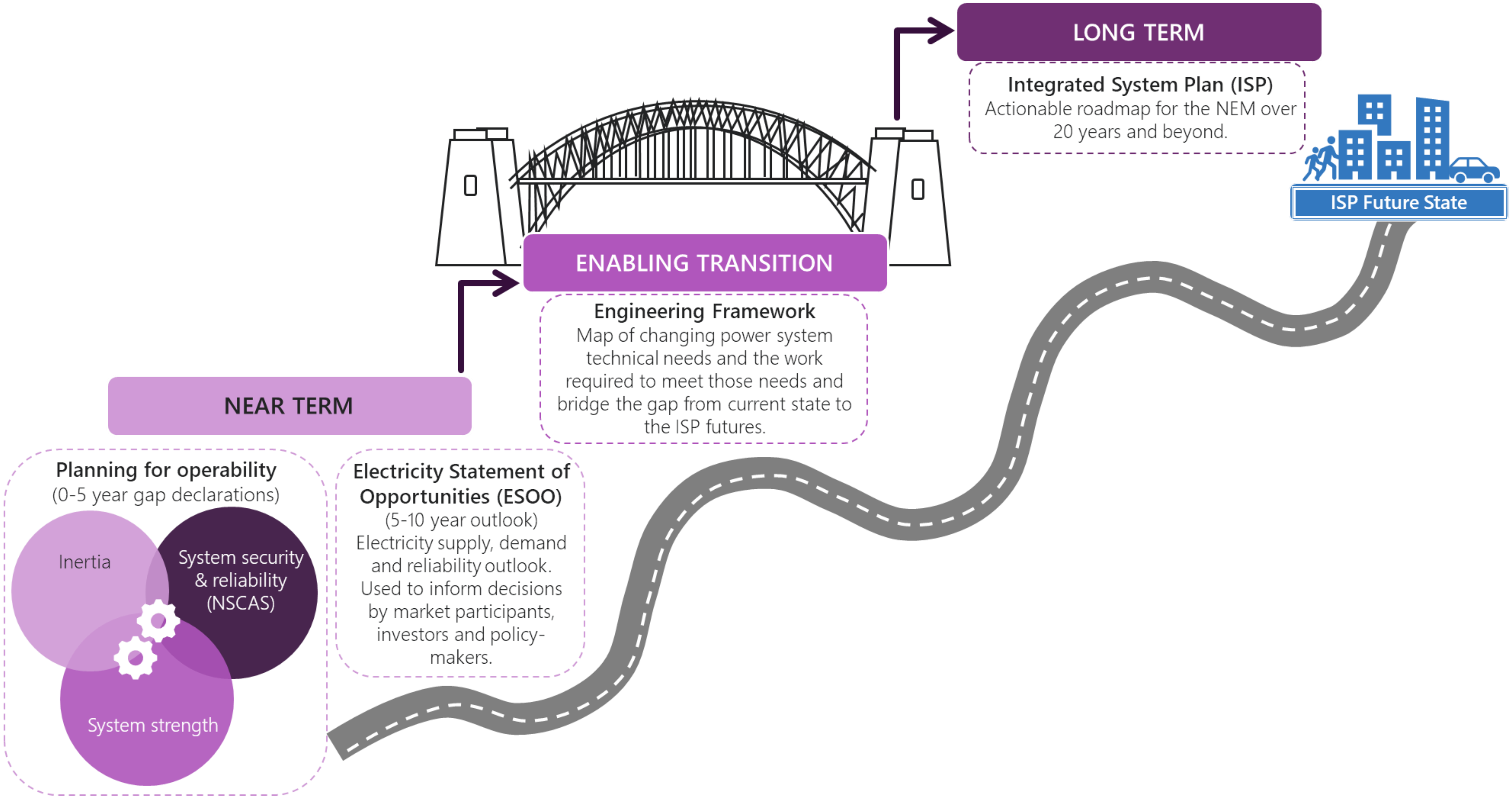
Defining the Engineering Framework

The Engineering Framework seeks to facilitate an orderly transition to a secure and efficient future NEM.

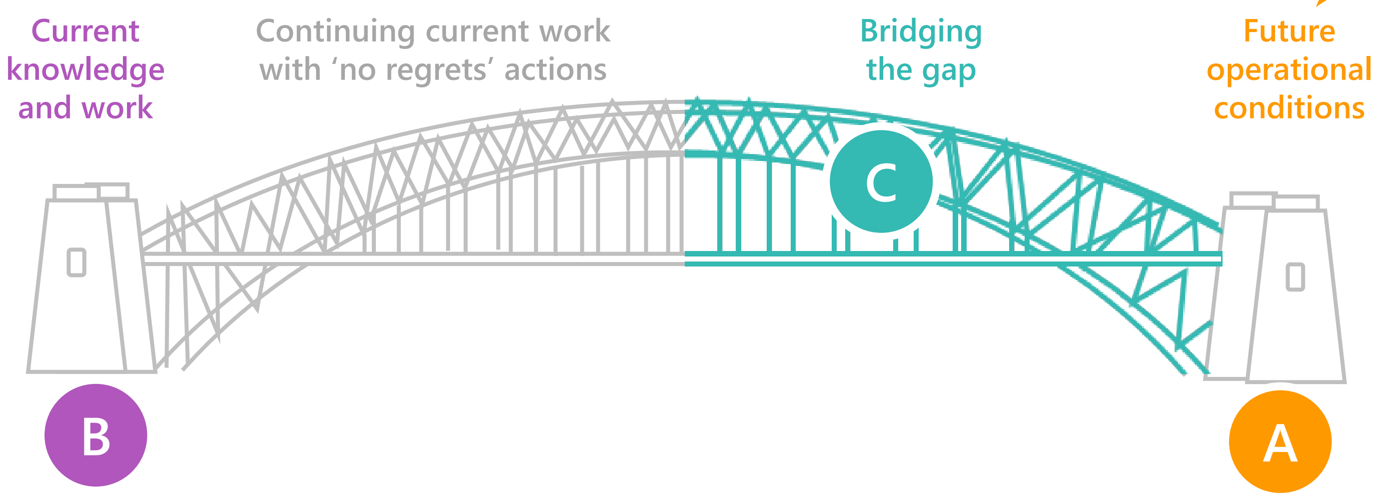
It is a toolkit to define the range of requirements needed to enable the futures envisaged by the Integrated System Plan (ISP).

AEMO will publish an initial Engineering Framework Actions Roadmap in December this year, beginning an enduring process to collaboratively determine the actions needed to meet these requirements.

Relationship of AEMO's Planning Publications



Overview of the Engineering Framework



March 2021 report (complete)

December publication (in progress)

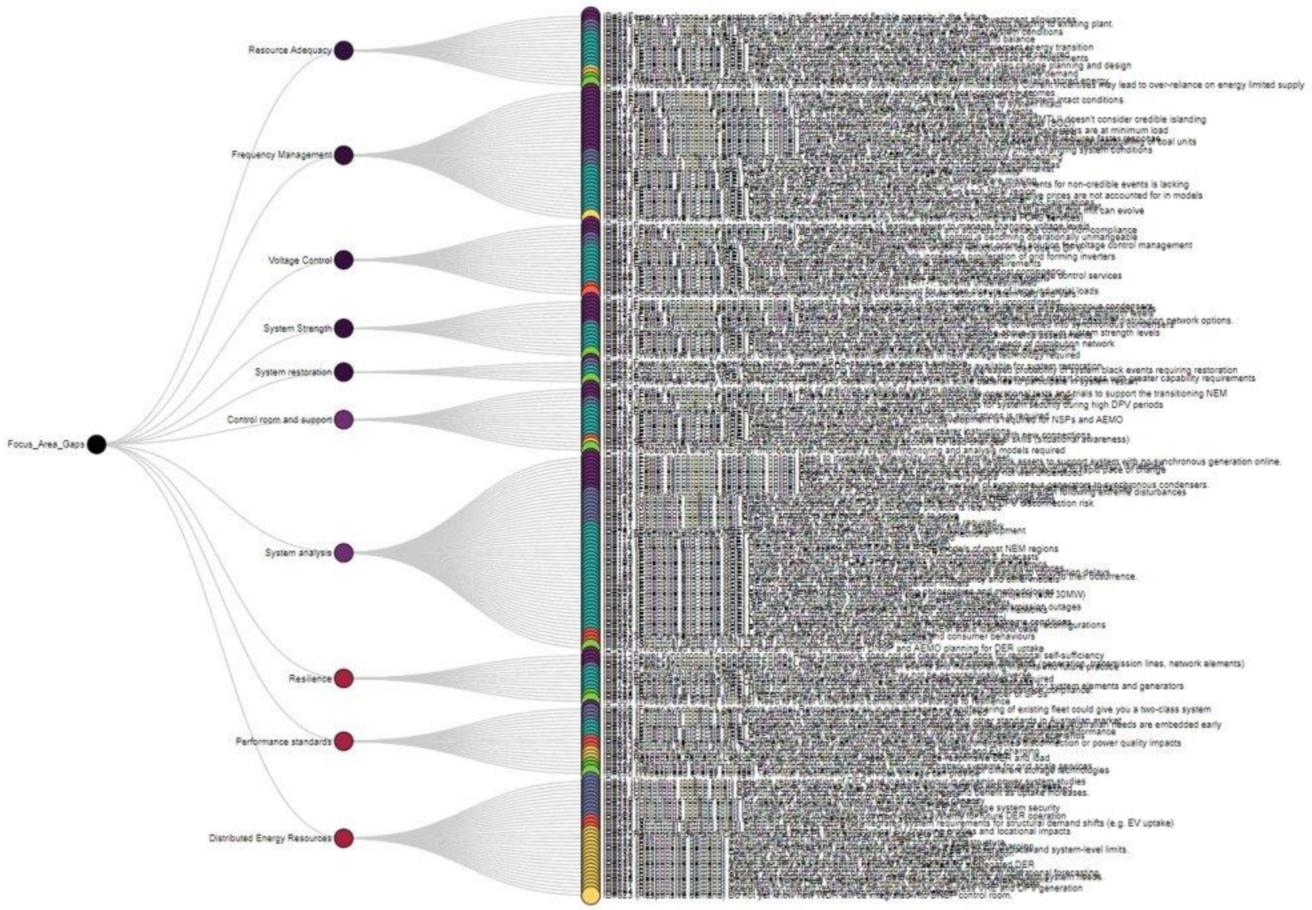
Operational conditions summary (complete)

- Fewer synchronous generators online
- Ubiquitous rooftop solar
- Extensive grid-scale VRE
- Structural demand shifts
- Responsive demand
- Widespread energy storage

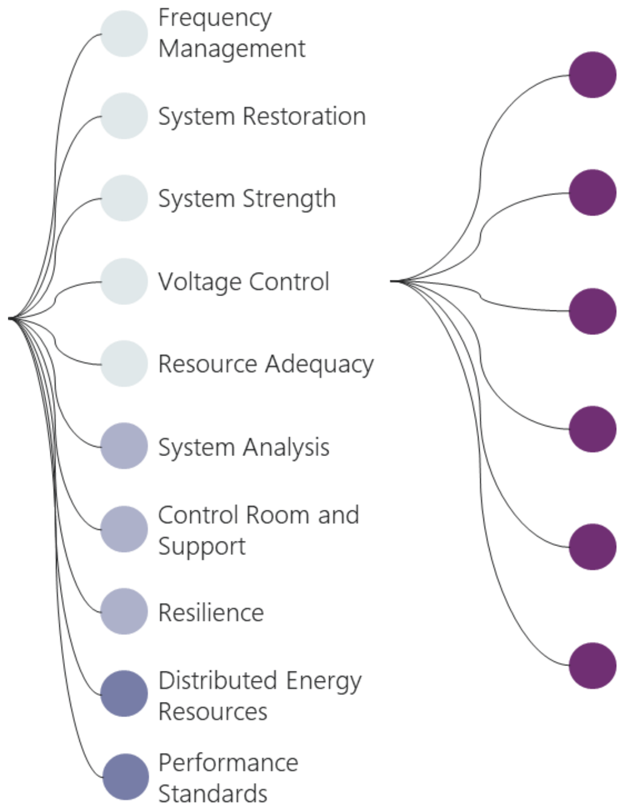
Gap identification with stakeholders

Gaps are critical issues, that, if not actioned, will make it difficult to manage the energy transition efficiently and securely.

- Over 300 gaps developed through targeted engagement across industry
- 18 external engagement sessions including market bodies, network service providers and market participants
- Written feedback provided by some stakeholders
- Gaps will be further refined and expanded in future iterations of the framework

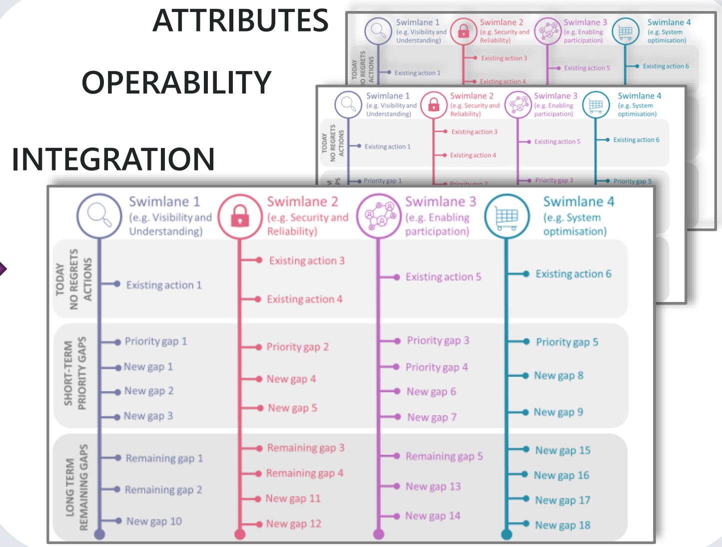


Roadmap development



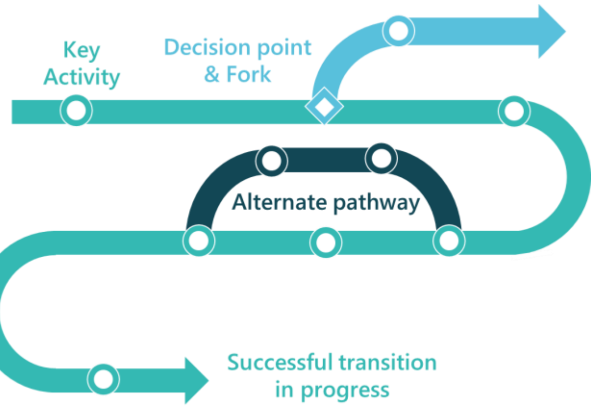
Gaps

Gaps are grouped and reviewed by focus area.



Sub-roadmaps

Gaps and identified actions (ongoing and no-regrets) are summarised by timeframe and swimlane category.



High-level roadmap

Critical gaps and actions (ongoing and no-regrets) from the sub-roadmaps are highlighted in the high-level roadmap

Engineering Framework stages

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Operational conditions

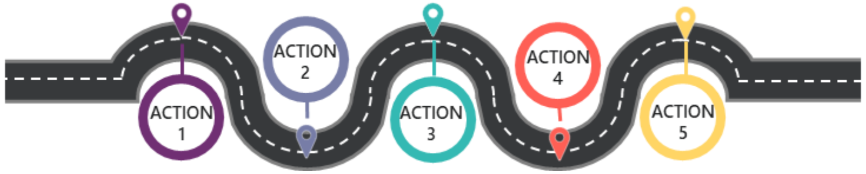
Defines future generation mix and loading combinations for the NEM.

Gaps (September/October)

Working with stakeholders, identify gaps that, if not addressed, will make it difficult to manage the energy transition efficiently and securely.

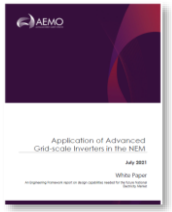
Action roadmap (initial roadmap in December for consultation)

Collaboration with stakeholders to identify priority actions that address gaps and opportunities to achieve operational conditions. Actions then sequenced and aligned with existing workplans and initiatives.



Implementation Workplans

Collaboration with stakeholders to integrate, align, and coordinate prioritised actions across a variety of industry workplans, both existing and new. These workplans are set based on complex regulatory and commercial frameworks, and will in many cases include activities beyond those identified by the Engineering Framework alone. The Engineering Framework will initiate additional workplans where priority actions are not covered elsewhere.



To be identified

Engineering Framework identified workplans

Integrate, align and coordinate

AUSTRALIAN ENERGY REGULATOR
DEIP
Energy Networks Australia
CSIRO
GLOBAL PST CONSORTIUM
AEMO
ENERGY SECURITY BOARD
AEMC
ARENA Australian Government Australian Renewable Energy Agency
+ other coordinating efforts

Existing workplans and initiatives

Monitor actions

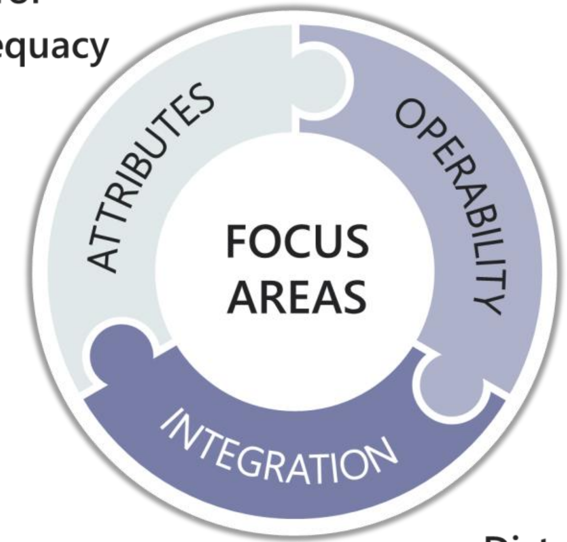
Monitor progress towards completion of identified priority actions, and overall preparedness for each operational condition. Through progress reports, highlight any ongoing gaps that may compromise achieving the operational conditions.

Focus Areas

- Focus areas are used as the common thread throughout the Engineering Framework to frame the array of activities and gaps into consistent themes.
- Sub-roadmaps will be built up from Focus Areas:
  - *Attributes* - maintaining the technical needs of the evolving power system as different operational conditions emerge.
  - *Operability* - system analysis, operational tools and practices to support and enable increasingly complex power system operation.
  - *Integration* - optimally deploying and incentivising new technologies within the power system and market.

- Frequency Management
- System Restoration
- System Strength
- Voltage Control
- Resource Adequacy

- System Analysis
- Control Room and Support
- Resilience



- Distributed Energy Resources
- Performance Standards

Frequency management gaps

The ability of the system to set and maintain frequency within acceptable limits via the constant balancing of electricity supply and demand.

Emerging themes

Determining the optimal frequency control mix

Frequency management requirements are increasing

The effectiveness of different frequency controls is evolving

Examples of early actions

- Primary frequency response (PFR) incentive arrangements rule change.
- Implementation of fast frequency response (FFR) markets.
- Investigate the need for a system inertia safety net.
- Under frequency load shedding (UFLS) effectiveness reviews.

Examples of future gaps

- Need to holistically look at frequency control mechanisms, how they work together, and the optimal dynamic mix of controls required to manage frequency in the NEM (ID #298).
- The incentives for VRE and new technologies to provide frequency control services are insufficient (ID #58).
- Increasingly challenging to manage load and generation swings from both on and off market resources (ID #458).

System restoration gaps

The ability of resources to restart and restore the system to a secure and reliable operating state following a system black or other major supply disruption.

Emerging themes

Diminishing sources of system restart ancillary services (SRAS)

Understanding the capability of new technologies to deliver system restoration services

Studying system restart under a variety of scenarios

Examples of early actions

- Study the capability of grid-forming inverters and other technologies to deliver system restart.

Examples of future gaps

- The NEM could face SRAS shortfalls if new SRAS sources aren't procured (ID #69).
- Increasing uncontrolled distributed photovoltaics (DPV) impact on stable load blocks available for system restoration (ID #38).
- SRAS framework does not account for challenging scenarios such as a more fragmented restart process (ID #68).

System strength gaps

The ability of the power system to maintain and control the voltage waveform at any given location in the power system, both during steady state operation and following a disturbance.

Emerging themes

Efficiency and effectiveness of the current system strength framework

Opportunities to better understand and optimise new technologies and approaches

Utilising existing protection systems vs redesigning protection systems

Examples of early actions

- Rule change on the efficient management of system strength in the power system. Final rule change delivered on 21 October 2021.
- AEMC consideration of a unit commitment mechanism for system security services.
- AEMO to investigate development of a voluntary grid-forming inverter specification to assist OEMs and developers in delivering solutions to meet power system requirements

Examples of future gaps

- Suitability of current system strength framework to incorporate distribution network needs (ID #146).
- System services are not fully defined for operation with fewer synchronous units (ID #22).

Voltage control gaps

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Maintaining voltages at different points in the network within acceptable ranges during normal operation, and enabling recovery to acceptable levels following a disturbance.

Emerging themes

Increasing operational intervention for voltage management

Voltage control challenges experienced at transmission and distribution levels

Suitability of voltage control strategies and frameworks for provision of reactive support from different technologies.

Examples of early actions

- Through its NSCAS processes, AEMO is exploring near-term voltage control requirements and gaps, and seeking to address key risks (such as assumptions regarding line switching).
- Collaboration between AEMO, transmission and distribution service providers and industry through Executive Joint Planning Committee to improve the planning coordination of voltage control.

Examples of future gaps

- Insufficient monitoring and data of changing power factor of loads (ID #182).
- Coordination of DNSP and TNSP investment cycles to deliver optimal solution for voltage control management (ID #195).
- Need to understand the benefits of different technologies to provide voltage control services (ID #259).

Resource adequacy gaps

Having a sufficient portfolio of energy resources to continuously achieve the balancing of supply and demand

Emerging themes

Flexibility to manage an increasingly variable, weather dependent supply-demand balance

Risks associated with unforeseen reduced commitment or exit of significant coal plant

Social licence issues may hinder developments required for energy transition

Examples of early actions

- Replacement of ST PASA system project. AEMO has submitted a rule change request, with a draft rule due to be made on 2 December 2021.
- Monitor the outcomes of 5-minute settlement (5MS) implementation.

Examples of future gaps

- No industry guidance to inform conversion decisions relating to existing plant (ID #338).
- Dynamic calculation of all security services may be required (ID #412).

System analysis gaps

The data and models required to assess system adequacy and support decision making.

Emerging themes

Approaches to modelling all power system phenomena given associated complexity and resources and data required

Modelling uplift to ensure industry keeps pace with transition

Visibility and modelling of pipeline of new connections less than 5 MW

Examples of early actions

- Under its *Simulator Initiative* AEMO is developing a Connections Simulation Tool.
- The Connections Reform Initiative commenced this year – joint AEMO and Clean Energy Council project.

Examples of future gaps

- Need to investigate inflexibility limits of thermal fleet (ID #164).
- Need for automated collection of post event data (ID #114).
- Need to improve TNSP/DNSP joint planning interface (ID #316).
- Consider how we might enable greater flexibility in control system tuning (and associated NER cl. 5.3.9 processes) to manage changing system dynamics (ID #478).

Control room and support gaps

The new operational practices, tools and data required to manage the system.

Emerging themes

Adequacy of control room tools into the future

AEMO and NSP operators preparing for new operational conditions emerging over time

Increasing operational coordination with DNSPs and other parties

Examples of early actions

- CSIRO to develop *Control Room of the Future* research plan.
- In SA, ElectraNet is seeking regulatory approval for a wide area monitoring scheme and enhancements to its control room systems to improve situational awareness and operational flexibility.

Examples of future gaps

- Need for real-time visibility of system instability (ID #26).
- Need for a comprehensive plan outlining the operational tests and trials to support the transition (ID #170).

Resilience gaps

The ability to limit the extent, severity, and duration of system degradation following an extreme event.

Emerging themes

Determining an appropriate level of resilience

Planning and investment frameworks to increase resilience

Role of geographic spread of system services and diversity in resource mix across regions

Examples of early actions

- *Enhancing operational resilience in relation to indistinct events* Rule change. Draft rule due on 28 October 2021.
- The General Power System Risk Review is being implemented to consider whole of power system risks.

Examples of future gaps

- Limited maintenance opportunities for key system elements (ID #43).
- Potentially insufficient weather infrastructure to support new REZs (ID #312).
- Type-faults represent a potential single-point of failure (ID #155).

Distributed energy resources (DER) gaps

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Integration of DER to maximise opportunities from their uptake, empower consumer participation in an optimised two-way power system, whilst ensuring system security.

Emerging themes

Device performance and capability for secure system operation and enabling consumer choice

Roles and responsibilities and operational processes for a high DER world

Operational coordination frameworks and technical requirements for aggregated DER to provide different services.

Examples of early actions

- AEMO's Electricity Statement of Opportunities explores technical challenges associated with the ongoing growth of distributed PV generation in the NEM.
- Energy Consumers Australia work on establishing social licence for DER management and control programs.
- The ESB DER implementation plan identifies key reforms to better integrate DER and transition to a two-sided market.
- Project EDGE and other trials are exploring how DER can be coordinated to provide wholesale and network services.

Examples of future gaps

- Monitoring data for modelling typical EV charging profiles and locational impacts (ID #235).
- Aggregator-DNSP-AEMO coordination so aggregated DER observes local and system-level limits (ID #237).
- DER consumer incentives (e.g. tariffs, subsidies) not aligned with system needs (ID #46).

Performance standards gaps

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Integration of technologies, systems, and parties to interact in a way that supports secure and reliable power system operation.

Emerging themes

Technical specification of services that emerging technology can provide

Performance standards commensurate with the growing role of new technologies and associated compliance arrangements

Requirements for scalable, secure communication and data exchange between parties

Examples of early actions

- Performance standards for small-scale DER inverters (AS/NZS4777.2) has been published and in implementation. Demand response from residential appliances (AS4755) is underway.
- Distributed Energy Integration Program (DEIP) is working with industry to consider device capability, interoperability, cybersecurity, necessary for DER integration.
- Review of power system data communication standard.

Examples of future gaps

- Emerging technologies require performance standards to consider or enhance grid support, for price-responsive DER and load (ID #94), electric vehicles and EV charging (ID #230), synchronous condensers (ID #18), grid-forming inverters (ID #65).
- Need cyber security performance standards for equipment (ID #446).
- Operational coordination and communication risks with parties located overseas (ID #157).
- Improvements to compliance management for DPV required (ID #222).

Wrap-up

Please send us your feedback using the Slido poll

You can also reach us at: FutureEnergy@aemo.com.au

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