Appendix A7. System Security

June 2026

Appendix to the 2026 Integrated System Plan for the National Electricity Market

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 Innovate Reconciliation Action Plan (RAP) in June 2026. '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.

Important notice

Purpose

This is Appendix A7 to the 2026 Integrated System Plan (ISP) which is available at https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp. AEMO publishes the 2026 ISP pursuant to its functions under section 49(2) of the National Electricity Law (which defines AEMO's functions as National Transmission Planner) and its supporting functions under the National Electricity Rules. This publication is generally based on information available to AEMO as at 20 April 2026 unless otherwise indicated.

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Version control

Version	Release date	Changes
1.0	25/06/2026	First release.

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AEMO's *Integrated System Plan* (ISP) is a roadmap for the National Electricity Market's (NEM's) transition, and outlines an 'optimal development path' (ODP) for generation, storage and network investments to meet both consumer needs and government policies, at least cost, to 2050. The 2026 ISP reaffirms that renewable energy, connected by transmission and distribution, firmed with storage and backed up by gas, presents the least-cost way to supply secure and reliable electricity to consumers through to 2050, as coal plants retire and while meeting government policies.

This appendix has assessed the emerging need for system strength and inertia in the most likely *Step Change* scenario. The assessments include the modelled parts of the preferred option in each transmission network service provider's (TNSP's) system strength regulatory investment test for transmission (RIT-T). This work builds on the existing assessments in the Network Requirements appendix of AEMO's 2025 *Transition Plan for System Security*[1], and extends their outlook period at five-yearly increments.

AEMO's 2025 *Transition Plan for System Security* identified a rapidly growing need for coordinated investment in system security services across the NEM. These services are necessary to enable delivery of the development plans considered in the ISP and are crucial to maintaining a secure and resilient power system throughout the energy transition.

This appendix quantifies these emerging requirements, estimates cost of procuring these essential system services to support the energy transition as captured in the assessment of the ODP, and provides insights into the nature, timing, and geography of the services needed to address them. It sets out:

- **A7.1 Recent and ongoing reforms to the security planning frameworks** – this section provides an overview of recent and ongoing regulatory reforms relevant to the power system security analysis in this appendix. These reforms aim to deliver increasingly efficient and proactive investment in fit-for-purpose services.
- **A7.2 AEMO's approach to system security planning** – this section explains AEMO's approach to power system security planning across multiple timeframes spanning urgent shortfalls to strategic planning, and across a broad remit of potential security services.
- **A7.3 System security concepts and requirements** – this section describes the technical, economic, and locational drivers for these services in the context of the security assessments presented later in the appendix.
- **A7.4 Projected outlook and opportunities** – this section defines the minimum system security planning standards for each NEM region, the factors that influence how these will evolve, and the expected adequacy of services available to address them. This section is structured geographically to reflect the nature of network investment obligations, and to comment on any potential options for co-optimised investment in multiple security services from a single asset or provider.

Key findings across the NEM

The appendix also highlights the emerging requirements for each NEM region:

- **New South Wales** – the projected decommitment and closure of coal fired generation is expected to cause system strength deficits in New South Wales at some nodes. Synchronous condensers identified through the Transgrid system

[1] At https://www.aemo.com.au/-/media/files/major-publications/tpss/2025-tpss-appendix-a2-network-requirements.pdf.

strength RIT-T[2] are now being delivered through the *New South Wales Electricity Infrastructure Investment Act*[3]. These, along with synchronous condensers being delivered through network augmentation such as Project EnergyConnect, will mitigate system strength deficits partially in 2026-27 and 2031-32 and fully for 2036-37 onwards, and allow inertia to remain above the sub-network allocation in New South Wales. The delay to the retirement of Eraring Power Station improves the outlook for both system strength and inertia, with a small system strength deficit remaining.

- **Queensland** – the projected decommitment and closure of coal-fired generation in Queensland is expected to result in significant reductions in synchronous fault current. The preferred option in Powerlink's system strength RIT-T[4] will allow current system strength requirements to be met into the 2030s, however beyond that, additional remediation may be required. The preferred option for system strength also allows inertia to remain above the sub-network allocation in Queensland for the entire study horizon.
- **South Australia** – four large synchronous condensers in South Australia currently provide sufficient fault current to meet minimum requirements across the horizon. However, significant inverter-based resources (IBR) build will require a corresponding investment in system strength services. Sufficient inertia is available to meet the inertia sub-network allocation requirements in South Australia.
- **Tasmania** – periods of increased variable renewable energy (VRE) generation in Tasmania and the mainland results in declining local synchronous hydro generation , which influences increased deficits in system strength and inertia across the horizon. However, remediation measures being progressed are sufficient to cover these deficits. AEMO will continue to work with TasNetworks to track the progress of its remediation activities[5].
- **Victoria** – projected closure of coal-fired generation in Victoria is expected to result in significant reductions in synchronous fault current at some nodes in Victoria. The preferred option in AEMO Victorian Planning's system strength RIT-T[6] would allow current system strength requirements to be met for the studied periods if available ahead of coal closures[7]. Inertia projections for the final 2026 ISP show available inertia in Victoria is expected to fall below the sub-network allocation requirement for the studied periods. VicGrid, which is now the jurisdictional planning body in Victoria, is required to ensure that the full inertia sub-network allocation is met from 2 December 2027.

[2] See https://www.transgrid.com.au/projects-innovation/meeting-system-strength-requirements-in-nsw/.

[3] See https://www.transgrid.com.au/projects-innovation/system-strength-project/.

[4] See https://www.powerlink.com.au/addressing-system-strength-requirements-queensland-december-2025.

[5] See https://www.tasnetworks.com.au/planning-and-projects/major-projects/meeting-system-strength-requirements.

[6] See https://www.aemo.com.au/initiatives/major-programs/victorian-system-strength-requirement-regulatory-investment-test-for-transmission.

[7] From 1 November 2025, AEMO's Victorian network functions transferred to a new State Business Corporation, VicGrid Body Corporate (VicGrid). VicGrid is the transmission network service provider and the System Strength Service Provider for Victoria under the NER, responsible for planning, procuring and delivering system strength services.

Key changes from the Draft 2026 ISP[8]

The final projections in this appendix reflect the 2026 ISP *Step Change* scenario's generation, storage and transmission build outcomes. They also incorporate the latest available modelling of the preferred option in each TNSP's system strength RIT-T, including updated assumptions on the location, timing, inertia and fault level contribution of synchronous condensers and other identified services. The final ISP also applied improved dispatch modelling used to project system conditions.

- **New South Wales** – the final ISP reflects the announced delay to the retirement of Eraring Power Station to 2029, beyond the timing of Transgrid's first phase of synchronous condensers as part of the system strength RIT-T[9], which improves system security. Later in the outlook, an expected delay to the second phase of synchronous condensers has been modelled, with system strength deficits projected in 2031-32. No system strength deficits are projected from 2036-37 onwards, following major network augmentations and complete delivery of the preferred option in Transgrid's system strength RIT-T. New South Wales remains above its inertia sub-network allocation in the studied periods.
- **Queensland** – in the final ISP, the updated dispatch modelling increases the likelihood of economic decommitment of coal-fired generation. This results in projected system strength deficits from 2031-32 onwards, particularly at Greenbank and Western Downs. Queensland's inertia outlook remains above the sub-network allocation across the studied periods.
- **South Australia** – the outlook remains broadly unchanged from the Draft 2026 ISP.
- **Tasmania** – the longer-term outlook is materially different from the Draft 2026 ISP, particularly for inertia beyond 2029-30. The final ISP indicates lower available inertia, and larger deficits beyond 2029-30 compared to the draft. This is primarily driven by updated dispatch modelling, which, together with periods of increased VRE generation in Tasmania and the mainland, reduce local synchronous hydro generation during periods of high wind output, thereby exacerbating system strength deficits in Tasmania
- **Victoria** – the system strength and inertia outlook is broadly unchanged from the Draft 2026 ISP. The final analysis reflects the latest synchronous condenser timing assumptions available at the time of modelling, which includes the delayed delivery of synchronous condensers at Hazelwood until 2030-31. However, as the ISP system security analysis only considers every fifth year, this change is between the years studied. The 2026 *Transition Plan for System Security* will analyse the impact of delayed synchronous condenser timing in further detail.

[8] AEMO has published all inputs and assumptions within the 2026 ISP Inputs and Assumptions Workbook, including a change log of changes.

[9] This delay applies to Transgrid's 'Phase 2' synchronous and is described in Transgrid's *Notification of Material Change in Circumstances Assessment*. For more information, see https://www.aer.gov.au/industry/registers/determinations/transgrid-system-strength-material-change-circumstances.

A7.1 Recent reforms to the security planning frameworks

The energy transition is transforming the way electricity is generated, transported, and consumed across the NEM. The pace of this change is still accelerating, and traditional ways of operating are being challenged as system security and reliability become increasingly complex.

The scope of these technological and economic changes must be matched by a supportive and adaptive regulatory framework that can drive action on critical services, remove unnecessary barriers to participation, and streamline investment in least-regret assets and services.

The system security planning frameworks have undergone a series of major overhauls in recent years to ensure they remain fit for purpose, and to continually push for more efficient long-term outcomes.

Changes to the security frameworks have enabled progress on essential system security services

Significant work has been done on establishing the planning frameworks to date. In 2021, the system strength framework was amended to drive more proactivity in the provision of system strength services, to deliver a streamlined connection process, and to leverage economies of scale in larger, centralised investments. In 2024, the Improving Security Frameworks (ISF) final rule change made several improvements to proactively address system security issues for the energy transition[10]. The final rule was implemented in stages starting 3 June 2024. AEMO's full enablement obligations commenced on 2 December 2025.

TNSPs have now completed their first system strength RIT-Ts under the new frameworks. With the exit of coal generation, TNSPs are looking to procure synchronous solutions to meet minimum three phase fault level requirements in the short term and have planned investment in the longer term.

AEMO is required to assess and enable the necessary security services in operational timeframes to ensure that the power system is secure day-to-day. The methodologies for determining and enabling these system security services, as well as the requirements to be included in agreements for the provision of system security services procured by TNSPs, are outlined in AEMO's Security Enablement Procedures[11]. AEMO has developed a System Security Management (SSM) tool to support its enablement functions, including the management of security service availability from providers, issuance of enablement instructions and automated reporting.

The ISF rule change also enables AEMO to procure transitional services to assist in maintaining power system security in the transition to a low- or zero-emissions power system. Type 1 Transitional Services address near-term power system security needs that cannot be provided by other system services. Type 2 Transitional Services provide services to trial new technologies, or the new application of existing technologies, to manage power system security in the transition. AEMO entered into Type 1 Transitional Services contracts in 2025 for management of minimum system load conditions, and is intending to acquire additional Type 1 transitional services for additional management of minimum system load conditions and grid reference[12]. AEMO has also taken steps to procure Type 2 Transitional Services, including releasing five Statements

[10] See https://www.aemc.gov.au/rule-changes/improving-security-frameworks-energy-transition.

[11] See https://www.aemo.com.au/consultations/current-and-closed-consultations/security-enablement-procedures.

[12] See https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/transition-planning/transitional-services---type-1-services.

of Need in October and November 2025[13], and undertaking market engagement. This has included issuing a request for expressions of interest and conducting a tender process to acquire Type 2 Transitional Services for managing minimum system load conditions[14].

Framework enhancements to deliver efficient, timely resources to meet system security needs

In November 2025, AEMO submitted the Security Framework Enhancements rule change request[15] to the Australian Energy Market Commission (AEMC) to enhance the system strength, inertia and associated system security frameworks under the National Electricity Rules (NER). The intent of the proposal was to ensure these frameworks can deliver the timely and efficient deployment of system security services required through the energy transition.

AEMO's request was driven by observed limitations in the current arrangements. In practice, the newly established security frameworks do not consistently provide sufficient time, flexibility or coordination to respond to evolving system conditions, policy settings and technology capabilities. This creates risks to the timely availability of essential system security services.

Through the rule change, AEMO is seeking to improve how system security needs are planned for and delivered. Key outcomes sought include:

- earlier and more proactive identification and management of system strength and inertia shortfalls,
- improved investment signals and planning certainty for both network and non-network solutions, and
- better alignment of planning, procurement and asset lifecycles to support efficient entry and exit of system security resources.

On 12 March 2026, the AEMC published a consultation paper[16] on AEMO's rule change request and an additional rule change request proposed by the Australian Energy Council (AEC) and the Clean Energy Council (CEC). The AEC and CEC rule change request discusses accountability and transparency in system security planning and provision, with a focus on reform to governance arrangements and investment signals. The AEMC consultation paper sought stakeholder views on the issues noted by AEMO, the CEC and the AEC, which are informing the AEMC's consideration of the rule change requests.

While AEMO acknowledges the significant work already undertaken to establish the current planning frameworks, and notes they are still settling and in the early stages of implementation, identifying enhancements now that address the observed issues means the frameworks will be ready and better positioned ahead of the next planning cycle to deliver outcomes that support the energy transition and are in the long-term interests of consumers.

[13] At https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/transition-planning/transitional-services---type-2-services.

[14] At https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/transition-planning/transitional-services---type-2-services/msl-transitional-services.

[15] At https://www.aemc.gov.au/rule-changes/security-framework-enhancements.

[16] At https://www.aemc.gov.au/sites/default/files/2026-03/Consultation%20paper%20-%20rule%20change%20-%20ERC0424%20428%20-%20final.pdf.

A7.2 AEMO's approach to system security planning

AEMO has two key roles to support system security in the planning horizon:

- to plan how to maintain power system security through the transition to a low- or zero-emissions power system, and
- to forecast system security requirements in the next 10 years and assess the likelihood of these requirements being met.

The ISP identifies the ODP based on detailed modelling and stakeholder input, and provides a solid plan for at least the next 20 years. This plan supports the identification, quantification, and forward planning of system security requirements. System security costs are included in the total costs of each candidate development path (CDP), informing the cost-benefit analysis to select the ODP. This ensures that the ODP is the least-cost way to meet power system needs, while meeting government policy.

AEMO's system security planning activities are informed by operational insights and information, including AEMO's General Power System Risk Review (GPSRR).

AEMO's transition planning activities

Recent rule changes have extended AEMO's planning activities with a dedicated and holistic focus on key transition points. This complements AEMO's long-standing system planning functions.

Transition planning focuses on continual enhancement of operational readiness, preparing for upcoming transition points while continually assessing the end state of the transition. Transition points are events and milestones that require material changes in the operational approach to managing power system security needing detailed analysis, risk assessment, and cross-functional coordination to plan, and manage.

For more information see the *Transition Plan for System Security*[17], which is an annual report on these activities that outlines AEMO's preparatory actions and seeks to inform proactive investment for medium-term challenges, and provides signals to stakeholders on nearer-term system security risks. The *Transition Plan for System Security* uses three horizons:

- **operational planning (0 to 2 years)**, for preparing for imminent transition points,
- **transition planning (2 to 10 years)**, for assessing transition point readiness and risks to inform preparatory actions and investment, and
- **future system needs (10+ years)**, to identify and begin framing risks and opportunities to prepare for anticipated power system conditions outside the Transition planning timeframe.

Forecasting system security requirements in the next 10 years

AEMO undertakes detailed power system analysis and market simulation to set system standards, determine security requirements, forecast levels of available system services, and declare any network support and control ancillary services (NSCAS) gaps. The associated NSCAS Reports, System Strength Reports and Inertia Reports are published as part of the *Transition Plan for System Security* (see Appendix A2 Network Requirements of the *Transition Plan for System Security*), and

[17] See https://www.aemo.com.au/energy-systems/major-publications/transition-plan-for-system-security-tpss.

must be taken into account by AEMO in preparing the ISP, and by System Strength Service Providers (SSSPs) when planning system strength solutions that co-optimise other power system stability services, such as inertia and reactive power control.

General Power System Risk Review (GPSRR)

AEMO undertakes the GPSRR[18] annually for the NEM in consultation with NSPs. It includes review and prioritisation of power system risks, events, and conditions that could lead to cascading outages or supply disruptions. The GPSRR also draws inputs from, and in turn informs and supports, a number of AEMO's related reports and processes, including the ISP and *Transition Plan for System Security*.

For each priority risk, the GPSRR assesses the adequacy of current risk management arrangements. The GPSRR also reviews arrangements for managing existing protected events and considers any necessary changes or revocations.

[18] See https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/general-power-system-risk-review.

A7.3 System security concepts and requirements

System strength

System strength is the ability of the power system to maintain and control the voltage waveform at any location during both steady-state operation and following a disturbance. System strength is often approximated by the amount of electrical current available during a network fault (fault current), however the concept also encompasses a collection of broader electrical characteristics and power system interactions[19,20].

Historically, fault level was often used as a proxy for system strength in the NEM, as areas with strong voltage waveforms typically exhibited high fault levels due to synchronous machine characteristics. With the rapid growth of grid-following IBR, industry understanding has matured, and it is now clear that protection-quality fault current and voltage waveform stability are distinct technical needs.

The current system strength planning framework consists of two complementary requirements:

- **the minimum level,** being the minimum three phase fault levels required for power system security at each system strength node, and
- **the efficient level,** being a requirement to maintain stable voltage waveforms at connection points to host levels of IBR forecast by AEMO (as the national transmission planner) at each system strength node.

Each requirement plays a distinct role – minimum fault levels ensure reliable protection operation and system security, while stable voltage waveforms support the secure operation and connection of IBR. These requirements are assessed at designated system strength nodes and may be further refined as technology and understanding evolve.

More details on the nature of system strength requirements are available in the *System Strength Requirements Methodology*[21].

Inertia

In the context of the power system, inertia describes an immediate, inherent, electrical response from connected devices that acts to oppose changes in frequency. Ensuring sufficient levels of inertia are available allows the power system to resist large changes in frequency that can arise following a contingency event, slowing the rate of change of frequency (RoCoF) and providing time for other automated control systems to respond[22].

Inertia includes the physical inertia of the spinning masses inside synchronous machines and the emulated 'synthetic' inertial response that IBR may be programmed to produce. Inertia impacts the overall system dynamic performance, particularly frequency stability, and interacts with other forms of stability, both local and global.

The current inertia management framework consists of the following requirements:

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[19] AEMO. *System strength in the NEM explained*. March 2020, at https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/system-strength-requirements/ssr/system-strength-explained.pdf?la=en.

[20] For more information on system strength, see Section 1.2.5 of AEMO's 2025 *Transition Plan for System Security*, at https://www.aemo.com.au/-/media/files/major-publications/tpss/2025-transition-plan-for-system-security.pdf.

[21] At https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/system-strength-requirements/system-strength-requirements-methodology.pdf.

[22] See https://aemo.com.au/-/media/files/initiatives/engineering-framework/2023/inertia-in-the-nem-explained.pdf?la=en.

- **satisfactory inertia level**, being the minimum level of inertia required to operate an inertia sub-network in a satisfactory operating state when the inertia sub-network is islanded,
- **secure inertia level**, being the minimum level of inertia required to operate an inertia sub-network in a secure operating state when the inertia sub-network is islanded,
- **system-wide inertia level**, being the mainland inertia required to operate the mainland regions of the NEM securely,
- **inertia sub-network allocation**, being the portion of the system-wide inertia level allocated to that inertia sub-network, and
- **inertia sub-network islanding risk**, being the likelihood of a sub-network islanding, and whether the secure inertia level is met if it does.

More details on the nature of inertia requirements are available in the *Inertia Requirements Methodology*[23]. For the purposes of the ISP, islanded inertia requirements are not explicitly modelled. These detailed studies are considered in the *Transition Plan for System Security.*

Network support and control ancillary services (NSCAS)

NSCAS are non-market services with the capability to control the active or reactive power flow into or out of a transmission network. They can be procured to address the following two categories of need[24]:

- **Reliability and security ancillary services (RSAS)** are used to maintain security and supply reliability of the transmission network in accordance with the power system security standards and the reliability standard. RSAS can include any:
  - non-market ancillary service (NMAS),
  - inertia network service, or
  - system strength service.
- **Market benefits ancillary services (MBAS)** are used to maintain or increase the capability of the transmission network to maximise net economic benefits to all those who produce, consume or transport electricity in the market.

AEMO assesses the need for these services annually, with a three- to five-year outlook horizon, and declares NSCAS gaps where it identifies an unmet need.

The Improving security frameworks for the energy transition rule change[25] introduced inertia network services and system strength services into the NSCAS framework in the NER. Under these frameworks, TNSPs have three years to deliver any forecast requirements for additional inertia or system strength from the time AEMO publishes them in the annual System Strength Report and Inertia Report (now part of the *Transition Plan for System Security*).

Where these requirements change within the three-year period, AEMO can declare and procure shortfall services via its NSCAS procurer of last resort functions.

[23] Version 2.0 is on AEMO's website at https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/system_security_planning/inertia-requirements-methodology-v2-0.

[24] NER 3.11.6 (a)(1) and(a)(2).

[25] See https://www.aemc.gov.au/rule-changes/improving-security-frameworks-energy-transition.

Transitional Services

AEMO has been provided with two new powers in the NER to acquire 'Transitional Services' to assist in maintaining power system security in the transition to a low- or zero-emissions power system (see Section A7.1). These services are additional and time limited, with Type 1 Services available until 2029 and Type 2 Services available until 2039, and are particularly critical to help decouple reliance on coal for system security as coal generators age and approach retirement.

Type 1 Transitional Services are focused on addressing near-term challenges that cannot be met through other available services without issuing directions. Type 2 Transitional Services are focused on addressing longer-term challenges by proving new, low- or zero-emissions contributions to system security through real-world trials. More information on transitional services is available in the *Transition Plan for System Security*[26].

Opportunities to co-optimise investment in reliability and system security

New investments are needed to maintain system security in advance of the coal exits, with opportunities to co-optimise both reliability and security to help keep costs of the transition as low as possible.

Accordingly, the ISP assumes that:

- **for inertia and minimum fault level requirements**, a declining synchronous unit commitment constraint is applied, and retiring coal-fired units incur an additional system strength remediation cost to replace their fault current contribution. This cost is allocated to each unit in proportion to its fault current contribution, using synchronous condenser costs as a proxy for the remediation cost, while recognising that a range of technologies may contribute in practice. The costs of meeting inertia requirements are assumed to be second order and are therefore captured within the cost of delivering adequate system strength solutions, including by assuming some synchronous condensers are fitted with flywheels.
- **for system strength to connect IBR**, connections face an additional cost for system strength, expressed as a $/kW premium. This cost is modelled as a weighted blend[27] of synchronous condenser and grid-forming battery energy storage system (BESS) solutions. This reflects the assumption that grid-forming BESS can provide efficient-level services, although with different effectiveness to synchronous condensers.

There are also broader efficiency opportunities to co-optimise reliability and system security outcomes across a wider range of technologies, including pumped hydro and gas turbines fitted with clutches, which may contribute security services even when not generating.

For more information, see the *Transition Plan for System Security*.

[26] At https://www.aemo.com.au/energy-systems/major-publications/transition-plan-for-system-security-tpss.

[27] This weighted blend changes over time to increase the proportion of system strength provided by grid-forming BESS. See Section 3.11.1 of the 2025 *Inputs, Assumptions and Scenarios Report* (IASR) for further information, at https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/2025-inputs-assumptions-and-scenarios-report.pdf.

A7.4 Projected ISP outlook and opportunities

This section evaluates the system security services required under the *Step Change* scenario by comparing projected service availability with regional requirements at five-year intervals. It also outlines the estimated build costs for delivering these services within the ODP, ensuring power system security is maintained throughout the planning horizon. The section is structured geographically to reflect the largely regional nature of investment obligations for system security services. This structure also makes it easier to identify any potential options for co-optimised investment to deliver multiple system security services from a single asset or provider.

Analysis scope and assumptions

In assessing the adequacy of system security services in this appendix, AEMO has considered system strength requirements and inertia requirements as presented in the Network Requirements appendix (Appendix A2) of the 2025 *Transition Plan for System Security*[28]. These requirements have been assumed to continue unchanged over the assessment period, though in reality these requirements may change over time.

The system strength and inertia projections included some parts of the preferred options from each TNSP's system strength RIT-T, where modelling information was available or a reasonable assumption could be made. The remainder of the preferred option was not modelled due to uncertainty with contracting or confidentiality. Through joint planning with TNSPs, AEMO has used the latest available modelling information including the most up-to-date location, timing, inertia, and fault level contribution for synchronous condensers based on current procurement status, and services from non-network synchronous condensers and synchronous generation where a proponent has been identified.

Results are presented for system strength and inertia studies for 2026-27, 2031-32, 2036-37 and 2041-42. The 2026-27 results come from the 2025 *Transition Plan for System Security* sensitivity implementing the modelled parts of the RIT-T solutions (see the Network Requirements Appendix A2). Results for 2031-32 onwards are from ISP modelling.

Although projections in this appendix may show some new and existing deficits over the studied period, no shortfalls or gaps are declared on the basis of results in this report. The 2025 *Transition Plan for System Security* Network Requirements Appendix A2 (encompassing system strength, inertia and NSCAS reports by AEMO under the NER) – and each subsequent *Transition Plan for System Security* – is the key source of system security requirements informing the obligations of TNSPs and SSSPs under the NER.

The market modelling simulations that underpin these projections:

- were based on *Step Change* scenario generator, storage and transmission build outcomes for this 2026 ISP,
- included generator dispatch projections from a time-sequential model with bidding strategies that change to reflect greater uncertainties further out into the future – the 2026-27 projections used benchmarked competitive bidding, included the desynchronisation of one coal power station in New South Wales, and detailed network constraints, and projections from 2031-32 onwards used a bidding behaviour model[29], and
- modelled the mainland NEM intact for all inertia projections (Tasmania is always an island from an electrical alternating current [AC] perspective).

[28] At https://www.aemo.com.au/energy-systems/major-publications/transition-plan-for-system-security-tpss/2025-transition-plan-for-system-security.

[29] Details for the bidding behaviour model are provided in AEMO's *Market Modelling Methodologies* report, at https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2026-isp-methodology/isp-methodology-june-2025.pdf.

A7.4.1 NEM-wide outlook

Near-term outlook

AEMO has assessed emerging needs and deficits for a broad range of power system needs, as reported in Appendix A2 of the 2025 *Transition Plan for System Security*:

- The system strength assessments identified emerging system strength deficits in Queensland from 2027-28, and in Victoria from 2027-28. Assessments also confirmed immediate system strength deficits across New South Wales (noting that the extension of Eraring Power Station had not been announced at that point in time)[30], and projected system strength deficits across Tasmania. TNSPs in these regions are progressing work to manage these requirements.
- The inertia assessments identified inertia deficits in New South Wales and Victoria from 2027-28. Solutions are in progress to address these deficits with some interim deficits remaining. Assessments also identified two emerging inertia needs in Queensland with remedial measures underway, and inertia deficits in Tasmania, noting longer-term contracts are being explored alongside system strength remediation in Tasmania.
- The NSCAS assessment confirmed the existing voltage control and thermal loading risks in Victoria (at Deer Park), with solutions being progressed to address this risk. The previously declared voltage control gap in South Australia is actively being addressed.

While most of these identified risks have solutions underway, interim measures such as contracting synchronous plant are likely to be required until permanent solutions are installed, and in some cases may form part of the long-term solution.

Long-term outlook

In the long term, trends for system security services are driven by the following phenomena:

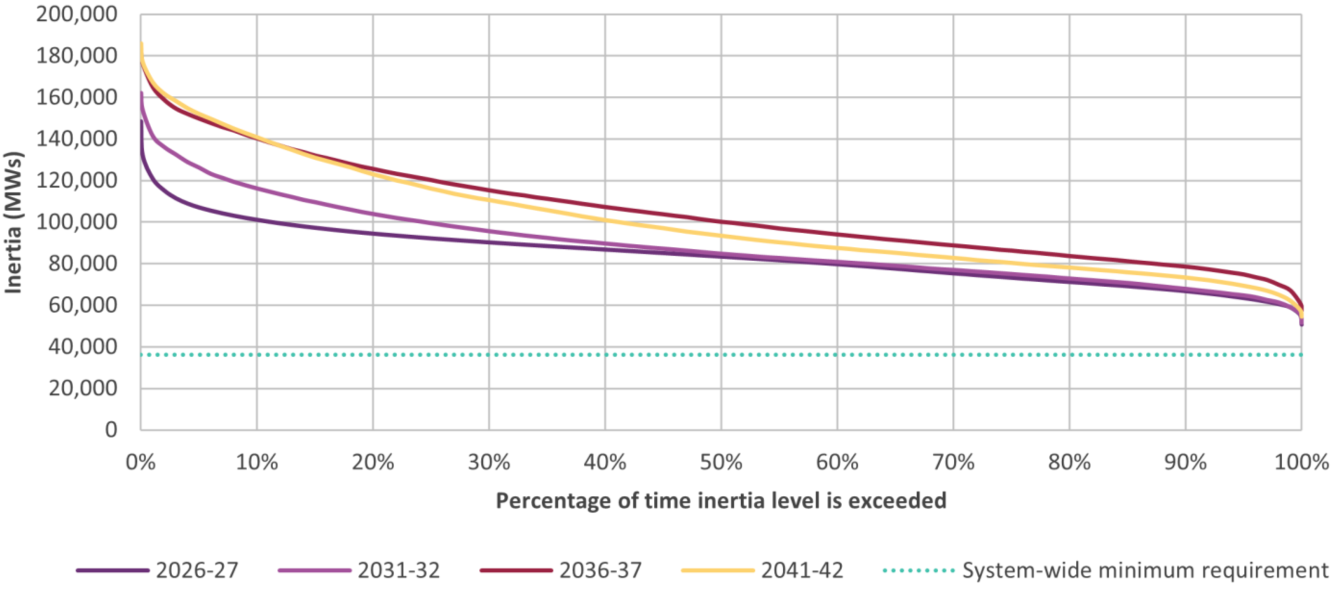
- **Retiring coal-fired generation** – historically, coal-fired generation has been the source of the majority of the system strength and inertia in the NEM and a significant source of voltage control capability. The ODP in the *Step Change* scenario projects that two-thirds of the NEM's coal fleet would retire by 2035 (some earlier than the asset owner's reported expected closure year), with all to retire by 2049.
- **Increases in IBR development** – by 2050, the *Step Change* scenario would see the delivery of 117 gigawatts (GW) of wind and solar. Adequate system strength services will need to be procured to ensure this generation can stably operate. Some of these services will be provided by established technologies, and AEMO expects that IBR with grid-forming inverters will also contribute to system strength. Additionally, IBR generation dispersed across the NEM will provide new sources of voltage control capability.
- **Commissioning of major network augmentations such as new interconnectors** – new interconnectors help system strength and voltage control by lowering the system impedance. They will also reduce the likelihood of regions becoming islanded, which can reduce the need for inertia services.
- **Implementation of system strength RIT-T solutions** – the preferred options across TNSPs' system strength RIT-Ts include plans to install synchronous condensers, contract with existing synchronous plant, and procure services from

[30] The delay to the retirement of Eraring Power Station will improve the outlook, but may not fully mitigate the system strength deficit. A detailed, revised assessment of system strength deficits from 2026-27 to 2032-33 will be conducted in the 2026 *Transition Plan for System Security*.

grid-forming plant as part of portfolios that optimise across all available options. Synchronous condensers support system strength by providing 'protection quality fault current' and inertia support.

Figure 1 below shows the projected total inertia online in the mainland NEM remains above system-wide minimum requirement to 2041-42[31]. It illustrates that the declining coal-fired generation utilisation and retirements is mitigated by the delivery of major network augmentations and system strength RIT-T solutions across the NEM.

Figure 1 Projected mainland NEM inertia, *Step Change* scenario (megawatt seconds [MWs])



AEMO assesses system strength and inertia deficits against the 99.87th percentile, or three standard deviations from the mean (three-sigma), based on its regular usage for identifying statistical significance, limiting noise in modelled outcomes, and providing a balance between rigour and usability[32].

Figure 2 below shows the 99.87th percentile of synchronous fault level projected to 2041-42 for a representative system strength node in each region, and highlights the following trends:

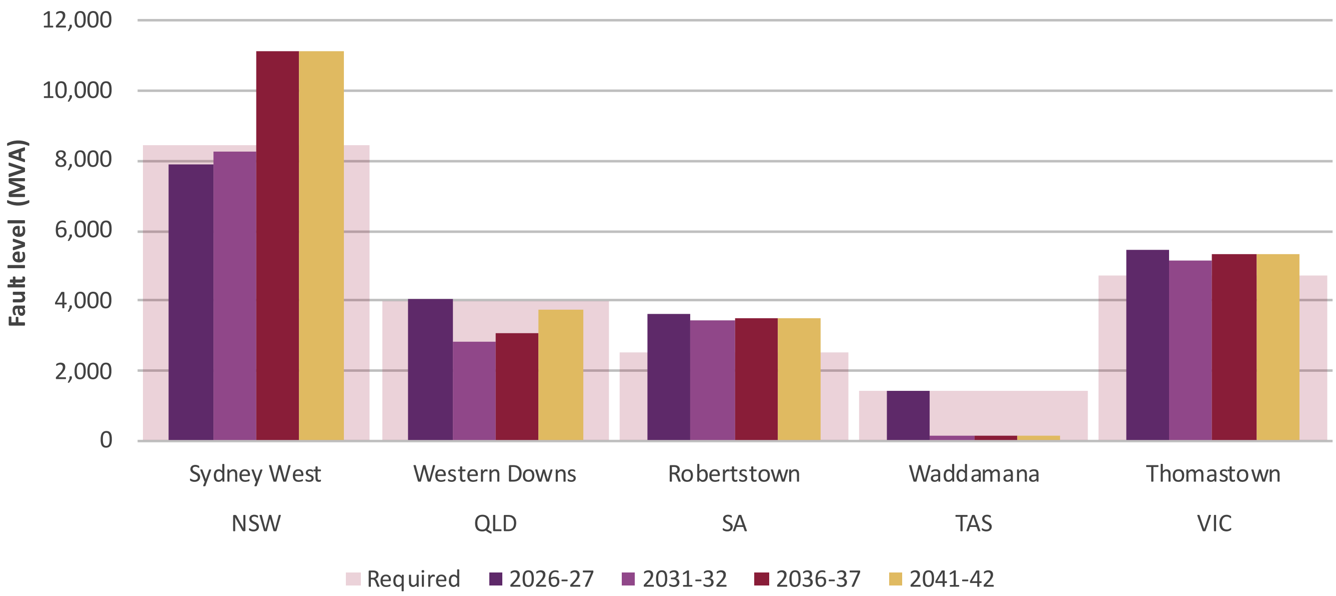
- **New South Wales** – 99.87th percentile fault levels show deficits in 2026-27, driven by coal behaviour including two-shifting and multiple coal units taking maintenance at once. The retirement of Eraring from 2028-29 will reduce fault levels, and deficits are no longer present in 2036-37 and onwards due to the delivery of major network augmentations described in the ODP (such as HumeLink and Victoria – New South Wales Interconnector West [VNI West]) and the synchronous condensers in the preferred option in Transgrid's System Strength RIT-T.
- **Victoria** – 99.87th percentile fault levels will decline as coal generators exit the market, however this is mitigated by 2031-32 and onwards by the delivery of major network augmentations and system strength RIT-T solutions. The Victorian Government also has a Structured Transition Agreement (STA) for the orderly closure of Loy Yang A by 2035, safeguarding against early closure of the station if reliable and secure supply of electricity in Victoria is at risk.

[31] The modelling accounted for generation, storage, and transmission built as part of the *Step Change* scenario, which may include some level of associated inherent inertia. Additionally, it included likely installed plant of the preferred option in the System Strength RIT-Ts for each region.

[32] For more information, see https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/system_security_planning/final-nscas-description-and-quantity-procedure-determination.pdf.

- **Queensland** – 99.87th percentile fault levels show deficits from 2031-32 and beyond. This is due to the updated dispatch modelling in the final 2026 ISP showing economic decommitment of coal generation in Queensland may become more likely, unless contracted to provide system security services.
- **South Australia** – 99.87th percentile fault levels remain relatively stable for the studied period.
- **Tasmania** – 99.87th percentile fault levels do not show deficits in 2026-27 due to the expected RIT-T generator and synchronous condenser contracts. The 99.87th percentile fault levels are lower and relatively stable from 2031-32 onwards, reflecting declining local synchronous hydro generation driven by periods of increased VRE generation in Tasmania and the mainland, together with the updateddispatch modelling.

Figure 2 Fault level projections and requirements at representative nodes in each region (megavolt-amperes (MVA))

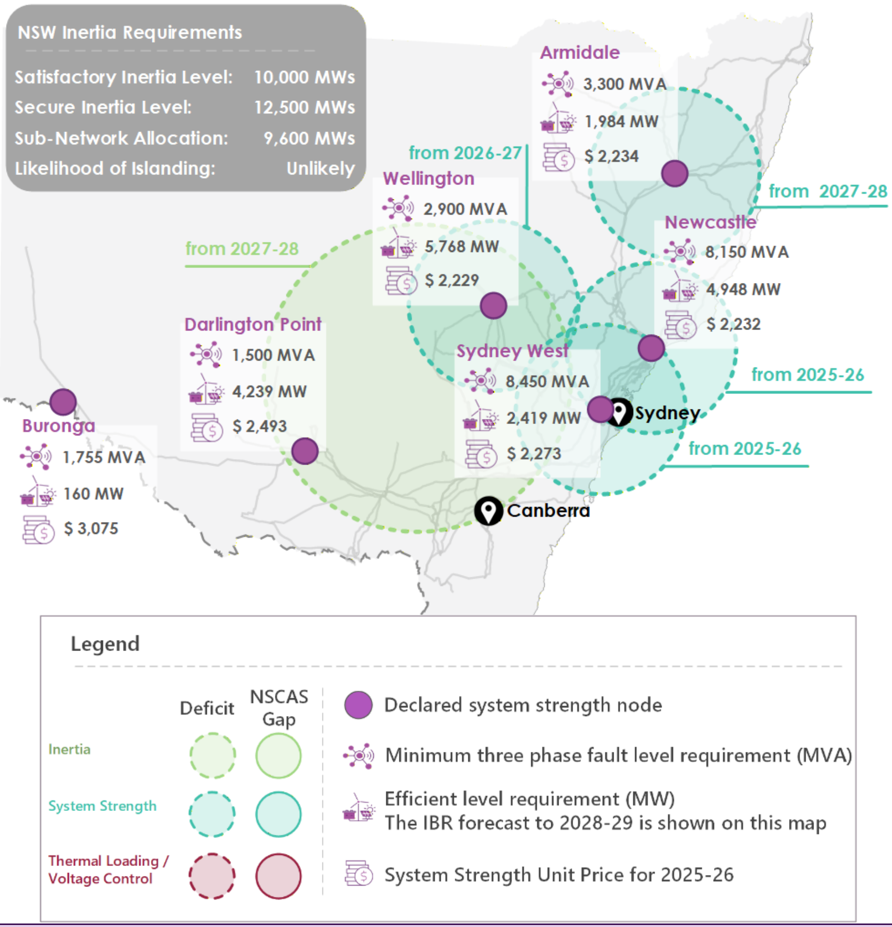


AEMO has prepared high-level cost estimates for provision of system strength services in each renewable energy zone (REZ) across the NEM, for inclusion in the total system cost of each CDP in the ODP assessment; these estimates are further explored in Section A7.4.7.

A7.4.2 New South Wales

System strength outlook – synchronous fault levels

System strength and inertia requirements[33]



Key results

The projected decommitment and closure of coal-fired generation is expected to cause system strength deficits in New South Wales at some nodes. Synchronous condensers identified through the Transgrid system strength RIT-T are now being delivered through the *New South Wales Electricity Infrastructure Investment Act*. These, along with synchronous condensers being delivered through network augmentation such as Project EnergyConnect, will mitigate system strength deficits partially in 2026-27 and 2031-32 and fully for 2036-37 onwards.

Projected deficits against current minimum requirements

Node	Indicative deficit against minimum system strength requirement				Trends
	2026-27	2031-32	2036-37	2041-42	
Armidale 330 kilovolts (kV)	0 MVA	0 MVA	0 MVA	0 MVA	No significant changes
Buronga 220 kV	0 MVA	0 MVA	0 MVA	0 MVA	
Darlington Point 330 kV	0 MVA	0 MVA	0 MVA	0 MVA	
Newcastle 330 kV	132 MVA	66 MVA	0 MVA	0 MVA	Deficits in 2026-27 driven by coal behaviour are not projected in 2036-37 due to the prior delivery of major network augmentations and the preferred option in Transgrid's System Strength RIT-T.
Sydney West 330 kV	531 MVA	171 MVA	0 MVA	0 MVA	
Wellington 330 kV	111 MVA	0 MVA	0 MVA	0 MVA	

The above table presents the indicative system strength deficits that result from the assessment of expected three phase fault levels at each New South Wales system strength node against the current minimum fault current requirements.

[33] The efficient level requirement (MW) IBR forecast value for 2028-29 shown is according to the 2025 *Transition Plan for System Security*, as the official source specifying requirements that TNSPs must meet. IBR forecasts for 2031-32 onwards are according to the *Step Change* scenario and are presented for informational purposes only.

System strength and inertia requirements[33]
Projected versus required level of fault current available at least 99.87% of the time

Since the Draft 2026 ISP, there have been material changes in the system security outlook for New South Wales – specifically the delay to Eraring Power Station's retirement date improving system strength. There have also been delays in the global synchronous condenser procurement[34] supply chain, pushing back the delivery dates of the second phase of synchronous condensers which are part of Transgrid's system strength RIT-T. As a consequence, small deficits are projected to be a risk until all of Transgrid's synchronous condensers are delivered as part of the system strength RIT-T. The size of these deficits will be more accurately assessed as more information becomes available in AEMO's 2026 Transition Plan for System Security assessments in consultation with Transgrid.

The figure below shows the amount of synchronous fault level projected to be available 99.87% of the time at each New South Wales system strength node against the current minimum requirements. The cost of security remediation to address these deficits is considered in the cost-benefit analysis, with the estimated costs under the ODP presented in Section A7.4.7.

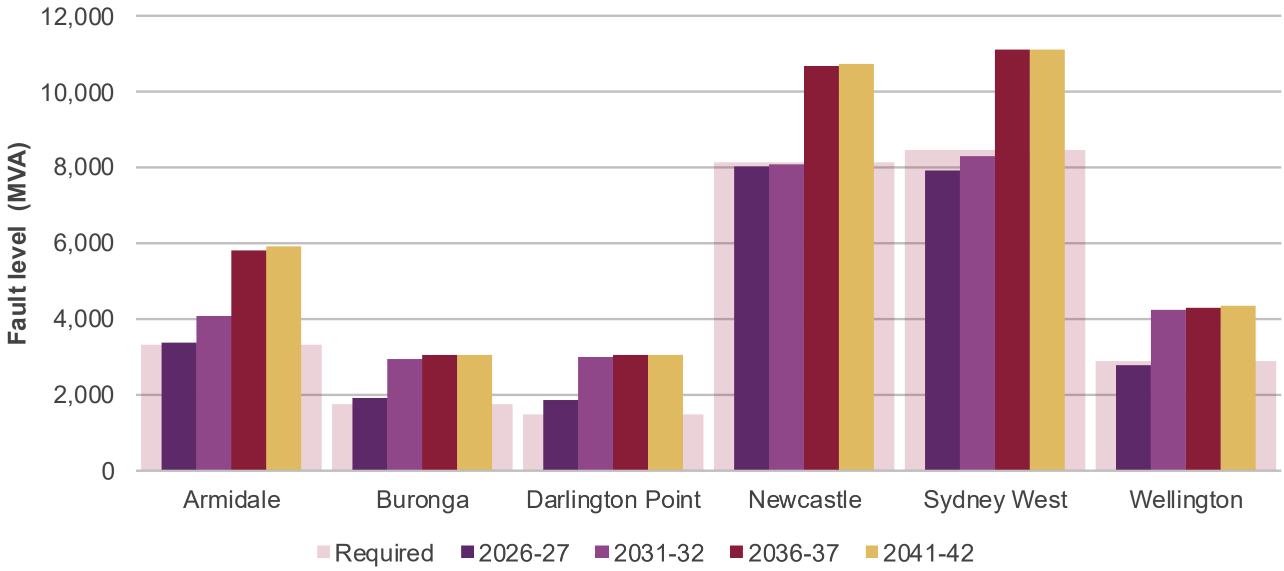
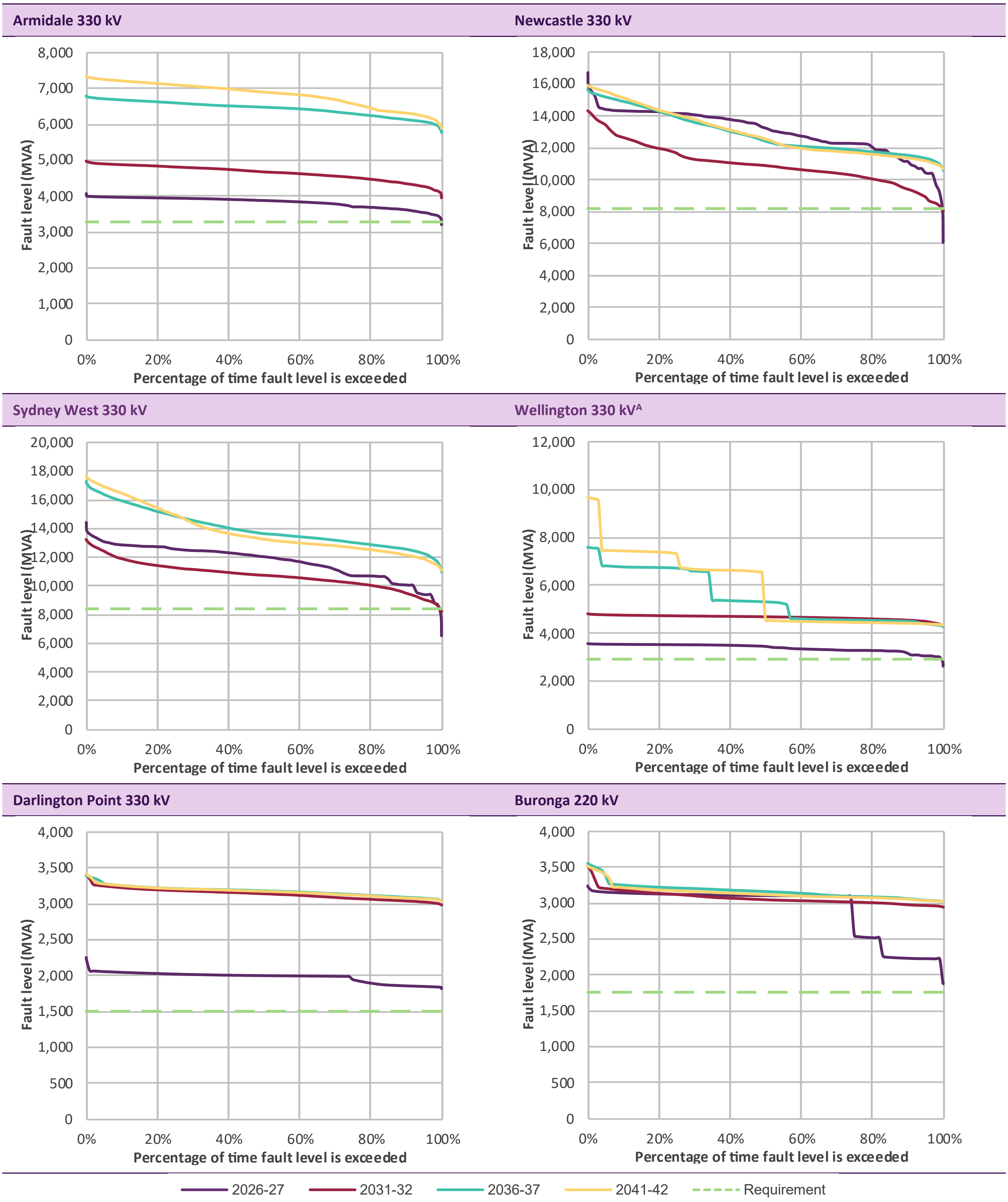


Figure 3 presents the fault level duration curves for New South Wales and shows synchronous fault level projected to be available at each system strength node.

[34] As described in Transgrid's *Notification of Material Change in Circumstances Assessment*. For more information, see https://www.aer.gov.au/industry/registers/determinations/transgrid-system-strength-material-change-circumstances.

Figure 3 Percentage of time fault level is exceeded in New South Wales



A. The stepped shape of the duration curves for 2031-32 and onwards is due to projected pumped hydro and its contribution to fault level at Wellington when dispatched.

System strength outlook – new IBR investment

Figure 4 presents the projected quantity and technology of IBR investment in New South Wales in the ODP under *Step Change* scenario; the underlying data is presented in **Table 1**.

Figure 4 IBR projections for New South Wales in 2026-27, 2031-32, 2036-37, and 2041-42 (MW), *Step Change* scenario

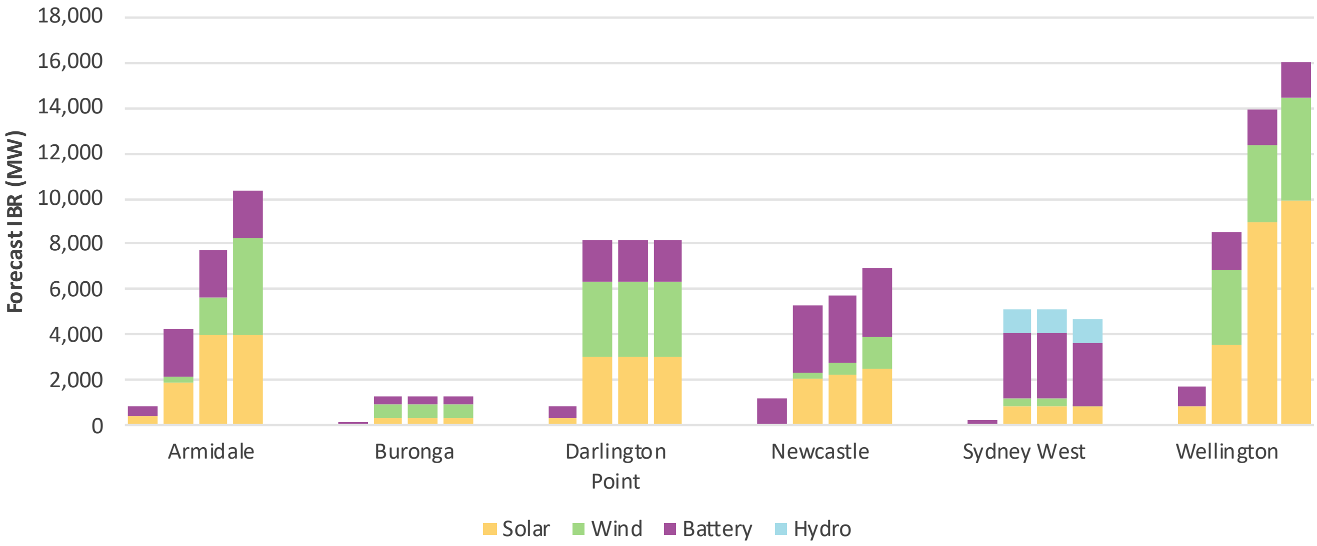


Table 1 IBR projections for New South Wales (MW)

Node	Technology	Existing	2026-27	2031-32	2036-37	2041-42
Armidale	Solar	321	400	1,875	3,945	3,945
	Wind	443	0	260	1,710	4,335
	Battery	0	450	2,069	2,069	2,069
Buronga	Solar	540	0	305	305	305
	Wind	198	0	595	595	595
	Battery	0	116	354	354	354
Darlington Point	Solar	1,949	307	3,058	3,058	3,058
	Wind	0	0	3,271	3,271	3,271
	Battery	0	560	1,810	1,810	1,810
Newcastle	Solar	0	0	2,021	2,242	2,520
	Wind	0	0	280	480	1,400
	Battery	0	1,200	2,991	2,991	2,991
Sydney West	Solar	10	0	840	840	840
	Wind	1,778	0	342	342	12
	Battery	0	250	2,906	2,896	2,781
	Hydro	0	0	1,000	1,000	1,000
Wellington	Solar	1,957	800	3,535	8,977	9,885
	Wind	399	0	3,365	3,365	4,598
	Battery	0	907	1,575	1,575	1,575

Inertia outlook

Key inertia results

New South Wales is expected to remain above the sub-network allocation for the studied periods with the inclusion of synchronous condensers identified through the Transgrid System Strength RIT-T, which are now being delivered through the New South Wales System Strength Framework.

Figure 5 presents the projected levels of inertia expected to be available in New South Wales, and **Table 2** presents the inertia deficits that result from the assessment of inertia against inertia sub-network allocation for New South Wales.

Figure 5 Projected levels of inertia available in New South Wales, *Step Change* scenario (MWs)

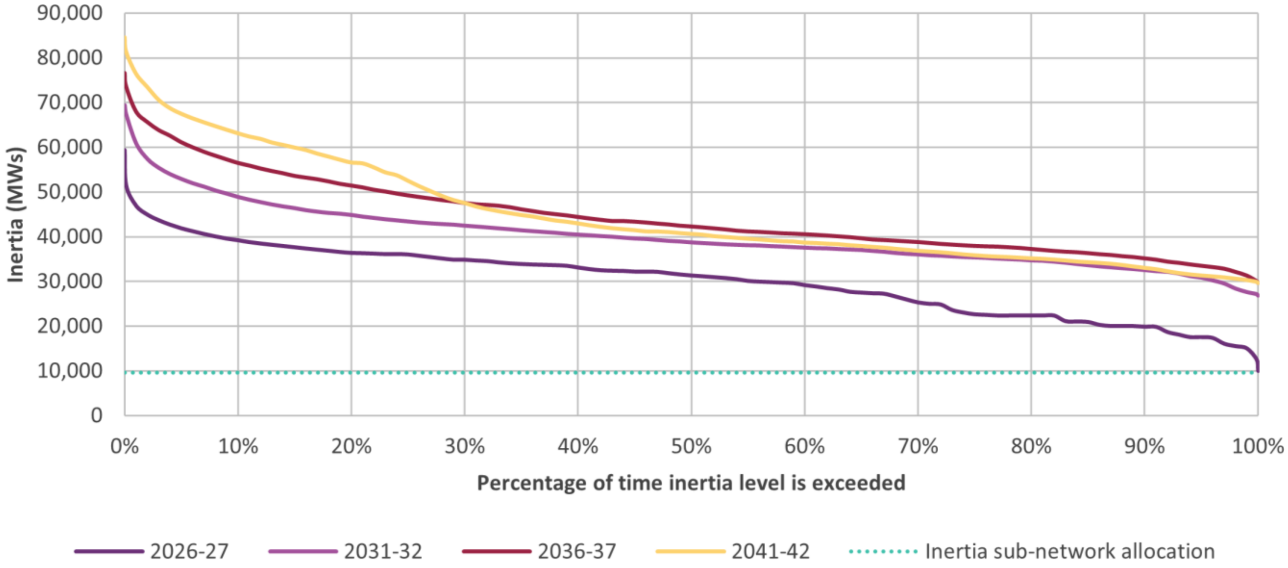


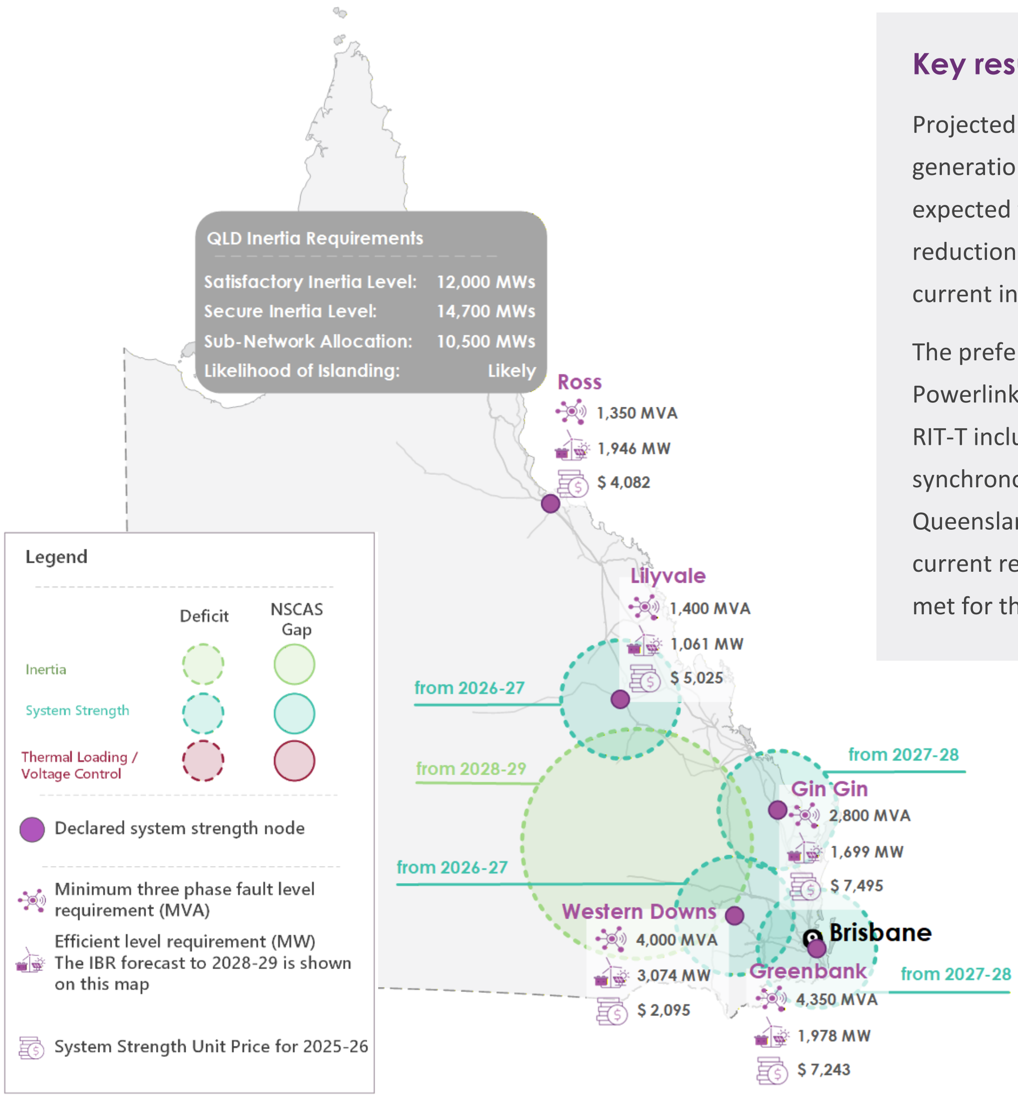
Table 2 Inertia outlook for New South Wales

	2026-27	2031-32	2036-37	2041-42
Inertia sub-network allocation (MWs)	9,600	9,600	9,600	9,600
Inertia available 99.87% of the time (MWs)	12,552	27,129	30,044	29,889
Calculated inertia deficit (MWs)	0	0	0	0

A7.4.3 Queensland

System strength outlook – synchronous fault levels

System strength and inertia requirements



Key results

Projected closure of coal-fired generation in Queensland is expected to result in significant reductions in synchronous fault current in 2031-32 and beyond.

The preferred option in Powerlink's System Strength RIT-T includes plans to install synchronous condensers across Queensland, which will allow current requirements to be met for the studied periods.

Projected deficits against current minimum requirements

Node	Indicative: deficit against system strength requirement				Trend
	2026-27	2031-32	2036-37	2041-42	
Gin Gin 275 kV	0 MVA	0 MVA	0 MVA	0 MVA	Deficits identified in Greenbank and Western Downs due to updated dispatch modelling which includes economic decommitment of coal generators in final 2026 ISP.
Greenbank 275 kV	0 MVA	1,277 MVA	1,098 MVA	729 MVA	
Lilyvale 132 kV	0 MVA	0 MVA	0 MVA	0 MVA	
Ross 275 kV	0 MVA	0 MVA	0 MVA	0 MVA	
Western Downs 275 kV	0 MVA	1,176 MVA	928 MVA	240 MVA	

The above table presents the indicative system strength deficits that result from the assessment of expected three phase fault levels at Queensland system strength node against the current minimum fault current requirements.

System strength and inertia requirements
Projected versus required level of fault current available at least 99.87% of the time

The figure below shows the amount of synchronous fault level projected to be available 99.87% of the time at each Queensland system strength node against the current minimum requirements. The cost of security remediation to address these deficits is considered in the cost-benefit analysis, with the estimated costs under the ODP presented in Section A7.4.7.

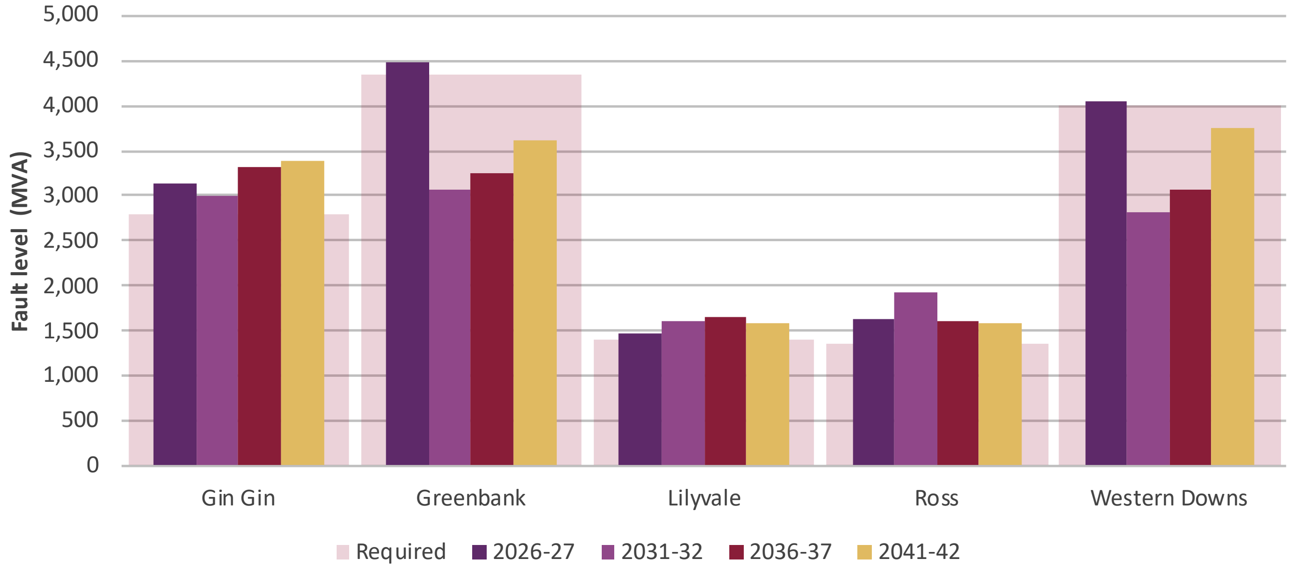
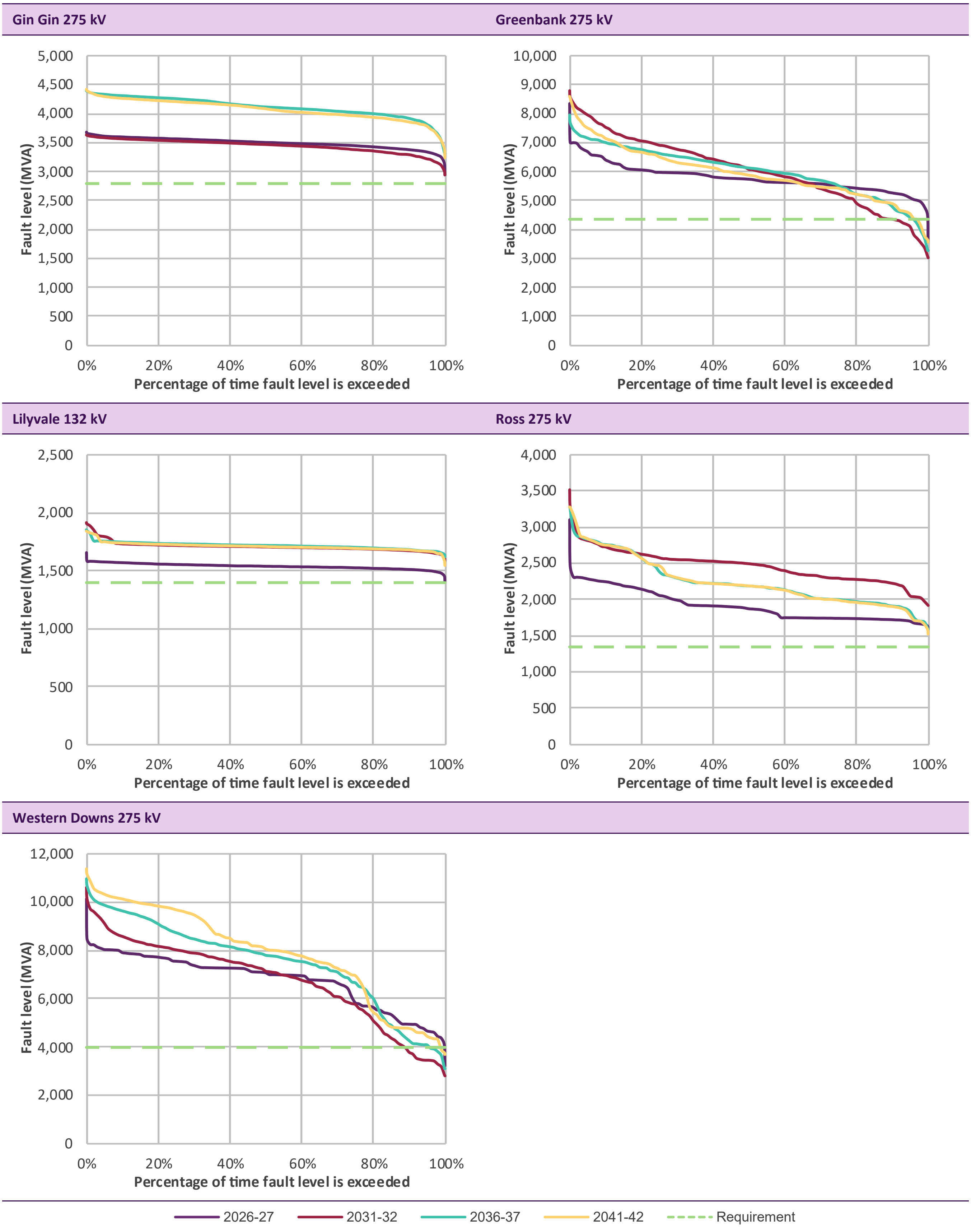


Figure 6 presents the fault level duration curves for Queensland and shows synchronous fault level projected to be available at each system strength node.

Figure 6 Percentage of time fault level is exceeded at each system strength node in Queensland



System strength outlook – new IBR investment

Figure 7 presents the projected quantity and technology of IBR investment in Queensland in the ODP under *Step Change* scenario, and the underlying data is presented in **Table 3**.

Figure 7 IBR projections for Queensland in 2026-27, 2031-32, 2036-37, and 2041-42 (MW), *Step Change* scenario

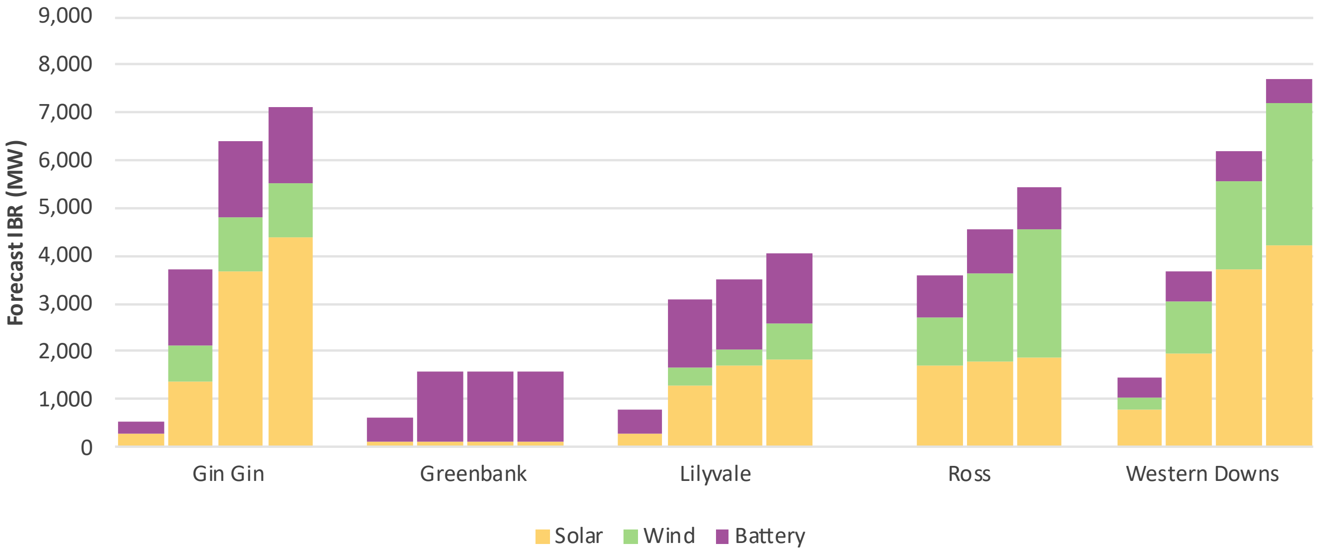


Table 3 IBR projections for Queensland (MW)

Node	Technology	Existing	2026-27	2031-32	2036-37	2041-42
Gin Gin	Solar	857	288	1,387	3,678	4,408
	Wind	0	0	753	1,121	1,121
	Battery	50	222	1,593	1,593	1,593
Greenbank	Solar	0	94	94	94	94
	Wind	0	0	0	0	0
	Battery	665	510	1,470	1,470	1,470
Lilyvale	Solar	388	296	1,295	1,693	1,821
	Wind	449	0	347	363	784
	Battery	0	480	1,452	1,452	1,452
Ross	Solar	978	0	1,724	1,790	1,863
	Wind	380	0	970	1,845	2,691
	Battery	0	0	904	904	904
Western Downs	Solar	1,710	799	1,961	3,729	4,234
	Wind	1,548	252	1,086	1,850	2,960
	Battery	755	410	610	610	510

Inertia outlook

Key inertia results

Queensland is expected to remain above the sub-network allocation for the studied periods with the inclusion of synchronous condensers from Powerlink's System Strength RIT-T preferred option. AEMO will continue to work with Powerlink to track the progress of its remediation activities.

AEMO's assessment of Queensland's inertia needs in the Network Requirements appendix of the 2025 *Transition Plan for System Security* has closed the inertia shortfall declared in AEMO's 2024 Inertia Report.

Figure 8 presents the projected levels of inertia expected to be available in Queensland, and **Table 4** presents the inertia deficits that result from the assessment of inertia against inertia sub-network allocation for Queensland.

Figure 8 Projected levels of inertia available in Queensland, *Step Change* scenario (MWs)

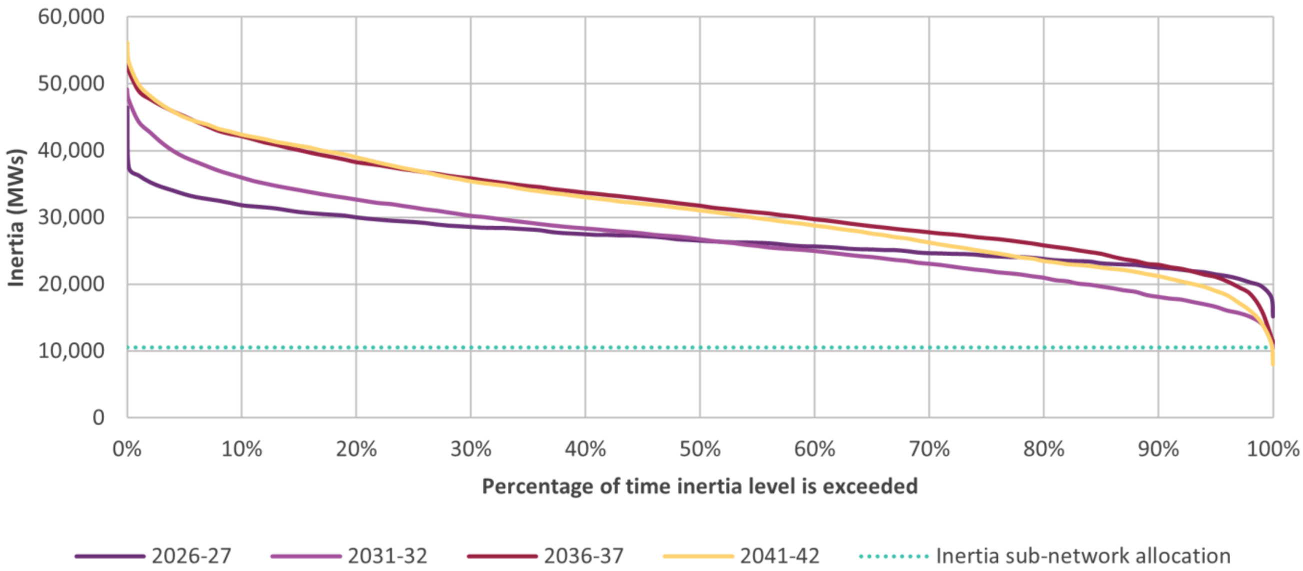


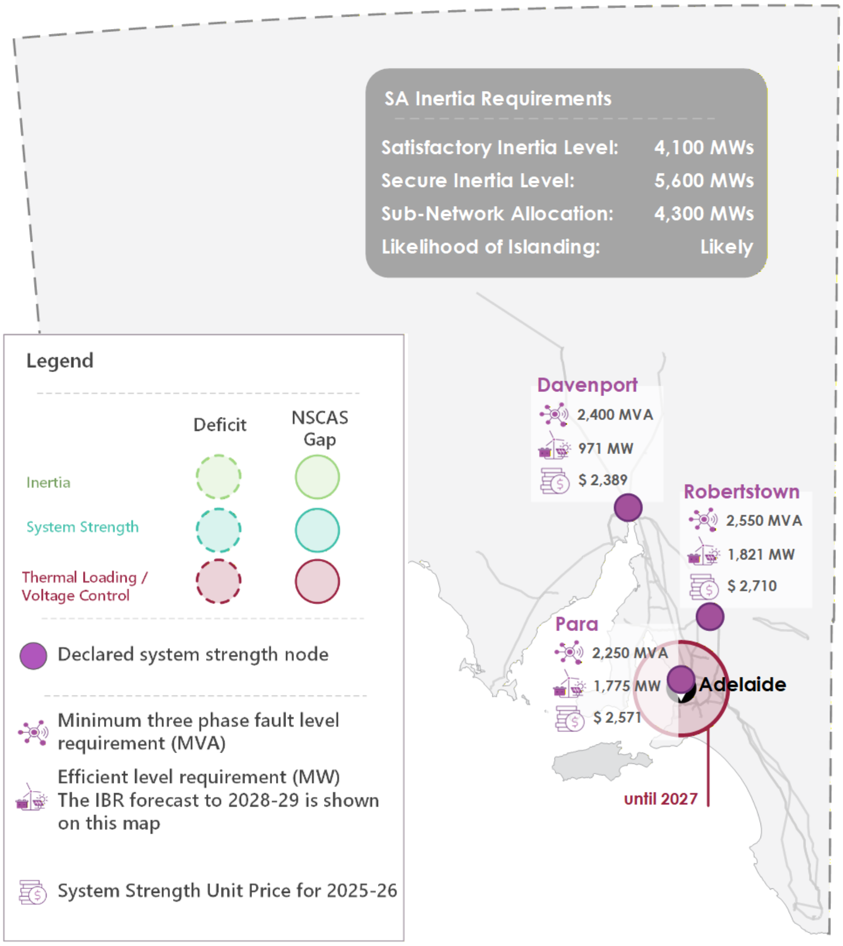
Table 4 Inertia outlook for Queensland

	2026-27	2031-32	2036-37	2041-42
Inertia sub-network allocation (MWs)	10,500	10,500	10,500	10,500
Inertia available 99.87% of the time (MWs)	18,025	12,054	11,855	11,077
Calculated inertia deficit (MWs)	0	0	0	0

A7.4.4 South Australia

System strength outlook – synchronous fault levels

System strength and inertia requirements



Key results

With the planned synchronous condensers installed in South Australia, projected system strength remains adequate to meet current minimum fault level requirements.

Projected deficits against current minimum requirements

Node	Current system strength minimum requirement met				Trend
	2026-27	2031-32	2036-37	2041-42	
Davenport 275 kV	0 MVA	0 MVA	0 MVA	0 MVA	No significant changes
Para 275 kV	0 MVA	0 MVA	0 MVA	0 MVA	
Robertstown 275 kV	0 MVA	0 MVA	0 MVA	0 MVA	

The above table presents the indicative system strength deficits that result from the assessment of expected three phase fault levels at each South Australia system strength node against the current minimum fault current requirements.

System strength and inertia requirements
Projected versus required level of fault current available at least 99.87% of the time

The figure below shows the amount of synchronous fault level projected to be available 99.87% of the time at each South Australia system strength node against the current minimum requirements.

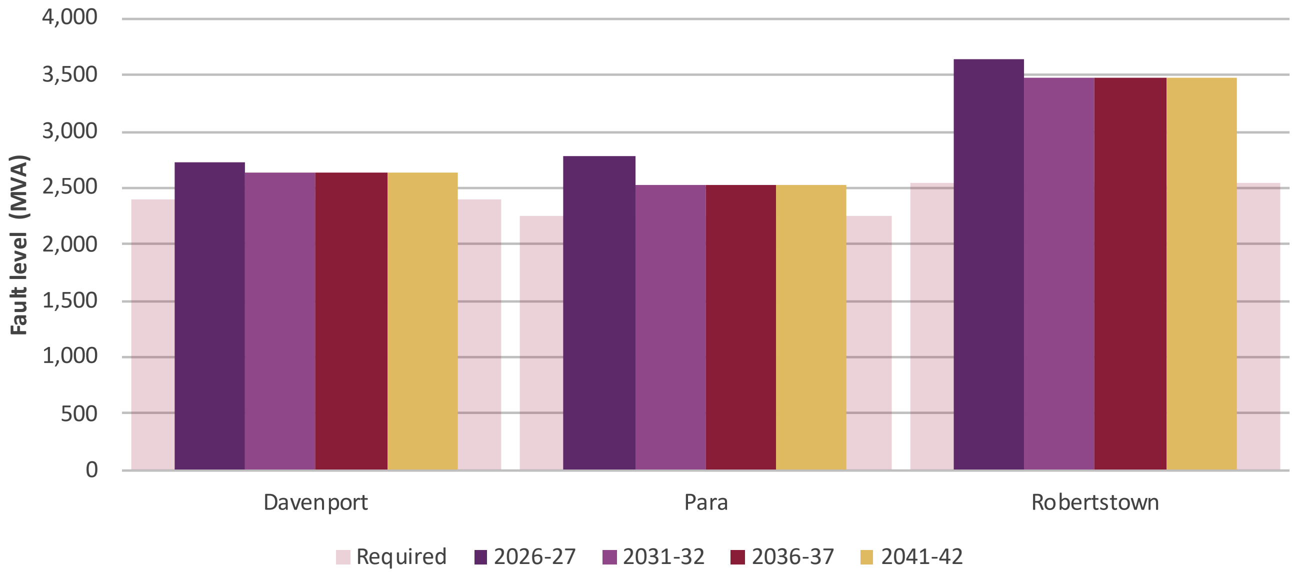
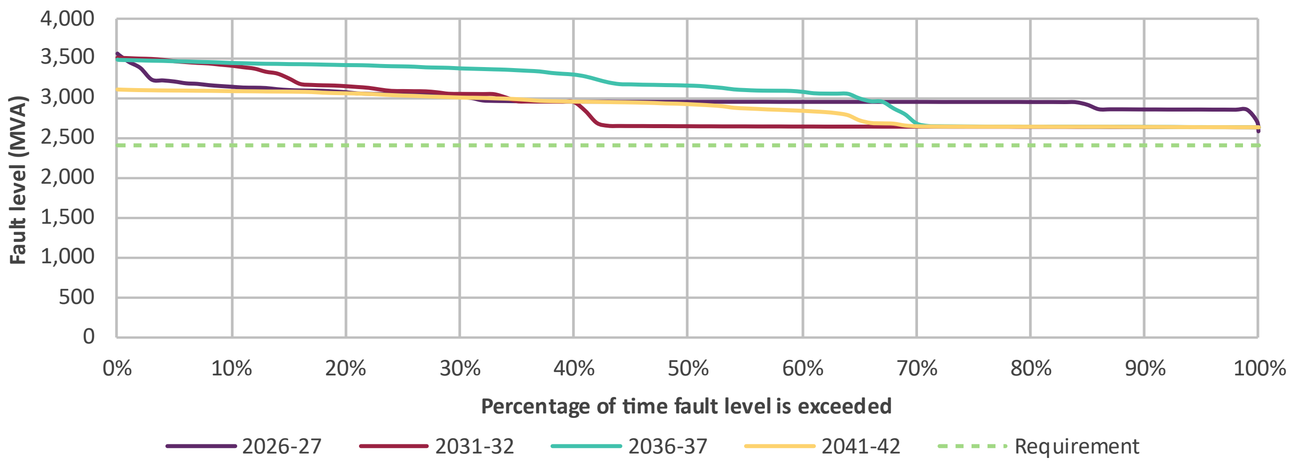


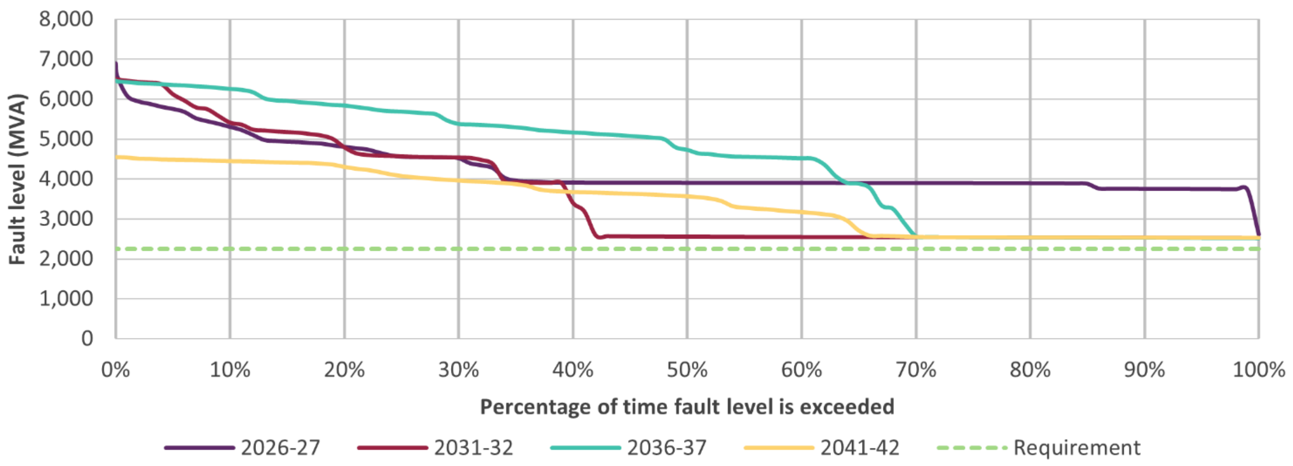
Figure 9 presents the fault level duration curves for South Australia and shows synchronous fault level projected to be available at each system strength node.

Figure 9 Percentage of time fault level is exceeded at each system strength node in South Australia

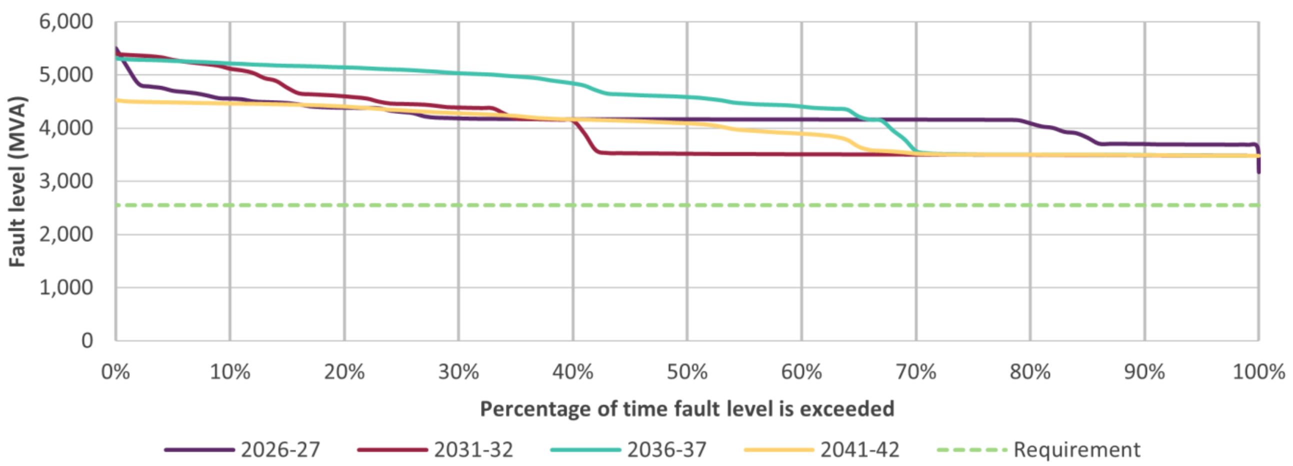
Davenport 275 kV



Para 275 kV



Robertstown 275 kV



System strength outlook – new IBR investment

Figure 10 presents the projected quantity and technology of IBR investment in South Australia in the ODP under *Step Change* scenario, and the underlying data is presented in **Table 5**.

Figure 10 IBR projections for South Australia in 2026-27, 2031-32, 2036-37, and 2041-42 (MW), *Step Change* scenario

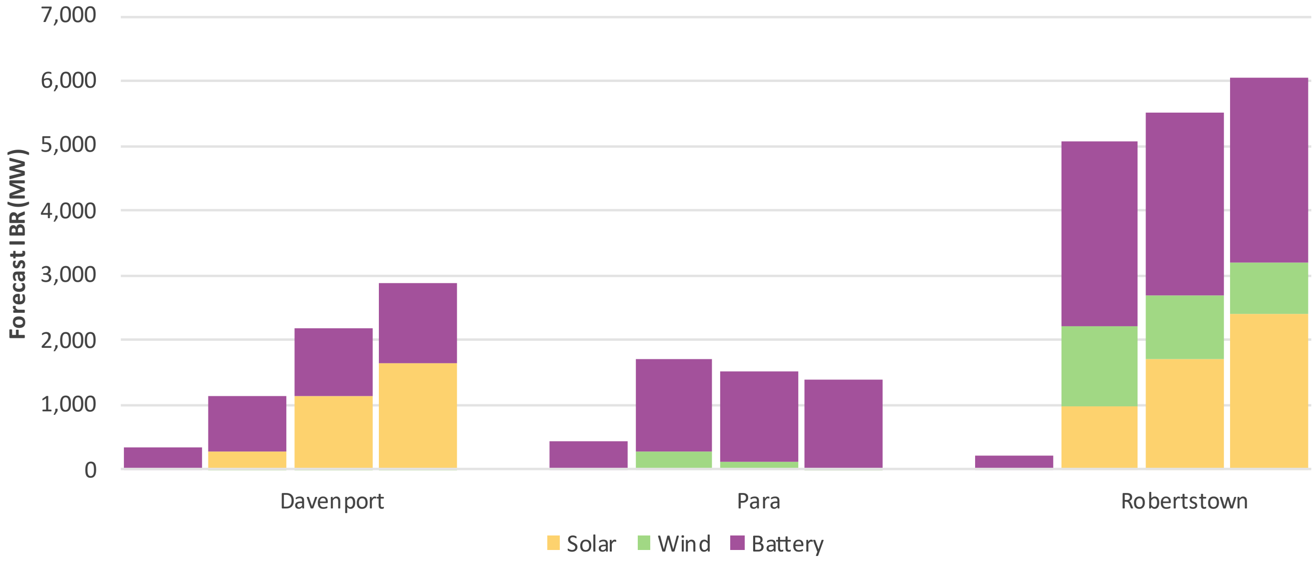


Table 5 IBR projections for South Australia (MW)

Node	Technology	Existing	2026-27	2031-32	2036-37	2041-42
Davenport	Solar	369	0	276	1,140	1,624
	Wind	548	0	0	0	0
	Battery	10	350	866	1,035	1,249
Para	Solar	310	0	0	0	0
	Wind	360	0	274	113	0
	Battery	432	444	1,415	1,390	1,390
Robertstown	Solar	24	0	967	1,694	2,416
	Wind	1,846	0	1,245	983	777
	Battery	491	210	2,855	2,855	2,855

Inertia outlook

Key inertia results

AEMO's assessment of the inertia needs indicates sufficient inertia is available to meet the inertia sub-network allocation requirements in South Australia.

Figure 11 presents the projected levels of inertia expected to be available in South Australia, and **Table 6** presents the inertia deficits that result from the assessment of inertia against inertia sub-network allocation for South Australia.

Figure 11 Projected levels of inertia available in South Australia, *Step Change* scenario (MWs)

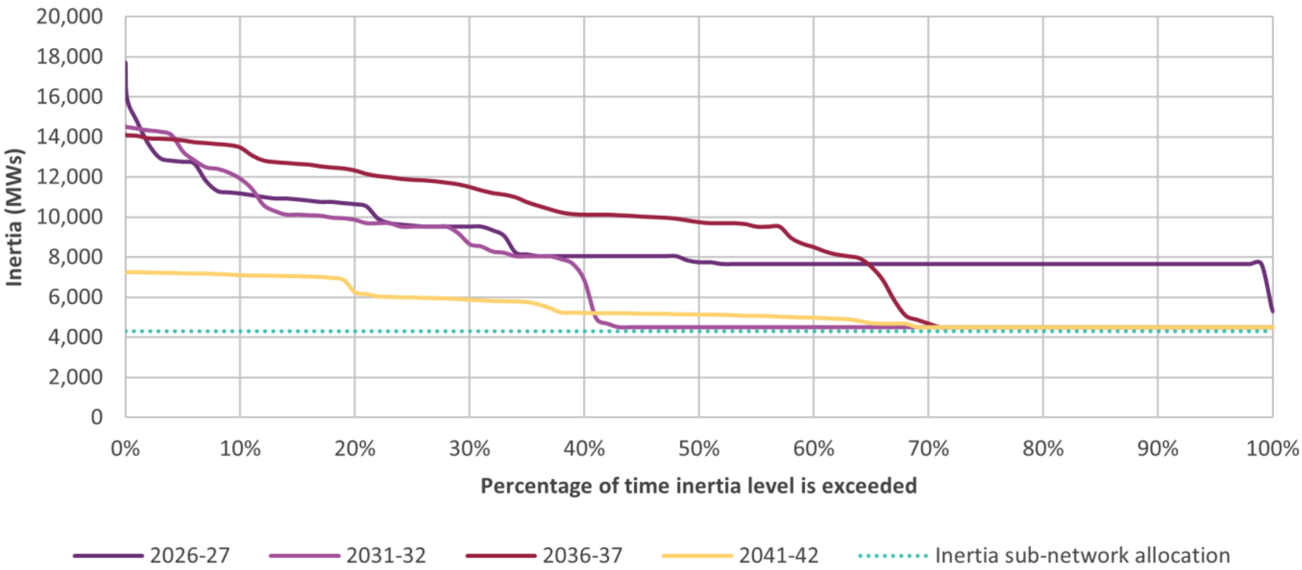


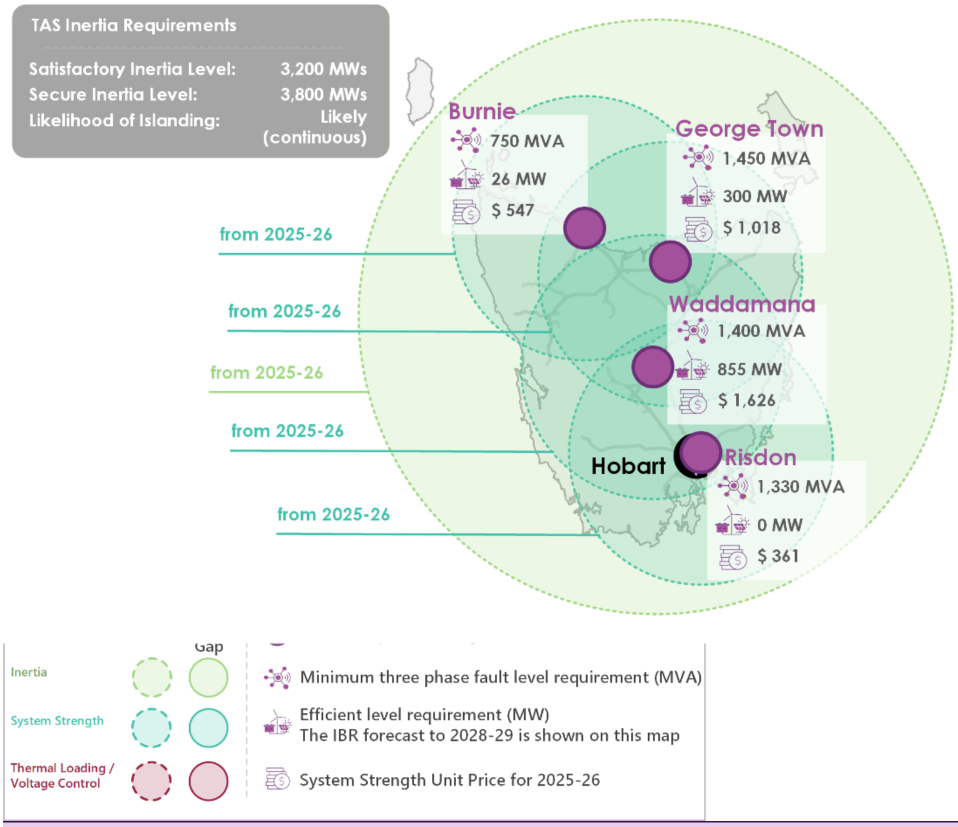
Table 6 Inertia outlook for South Australia

	2026-27	2031-32	2036-37	2041-42
Inertia sub-network allocation (MWs)	4,300	4,300	4,300	4,300
Inertia available 99.87% of the time (MWs)	5,510	4,503	4,503	4,503
Calculated inertia deficit (MWs)	0	0	0	0

A7.4.5 Tasmania

System strength outlook – synchronous fault levels

System strength and inertia requirements



Key results

Contracting with existing owners of synchronous condensers and generation assets is sufficient to meet minimum fault level requirements in Tasmania until the end of the coverage period.

Deficits in system strength are likely to occur across the rest of the outlook period. TasNetworks will commence a new RIT-T assessing system strength requirements for 2029-30 and beyond.

Projected indicative deficits against current minimum requirements

Node	Indicative deficit against minimum system strength requirement[35]				Trend
	2026-27	2031-32	2036-37	2041-42	
Burnie 110 kV	0 MVA	629 MVA	629 MVA	629 MVA	99.87th percentile fault levels do not show deficits in 2026-27 due to the expected RIT-T generator and synchronous condenser contracts covering the period to 2029-30.
George Town 220 kV	0 MVA	1320 MVA	1320 MVA	1320 MVA	
Risdon 110 kV	0 MVA	1192 MVA	1192 MVA	1192 MVA	
Waddamana 220 kV	0 MVA	1264 MVA	1264 MVA	1264 MVA	

The above table presents the indicative system strength deficits that result from the assessment of expected three phase fault levels at each Tasmania system strength node against the current minimum fault current requirements.

[35] TasNetworks is progressing work into contracting arrangements for additional system strength services for years beyond 2029-30.

System strength and inertia requirements
Projected versus required level of fault current available at least 99.87% of the time

The figure below shows the amount of synchronous fault level projected to be available 99.87% of the time at each Tasmania system strength node against the current minimum requirements.

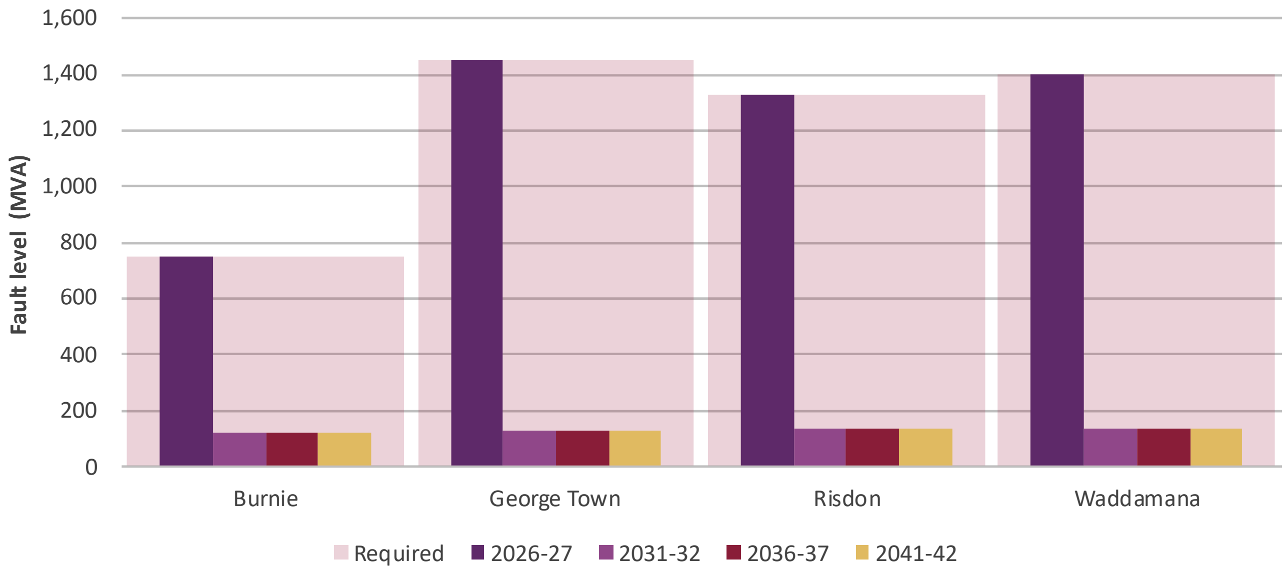
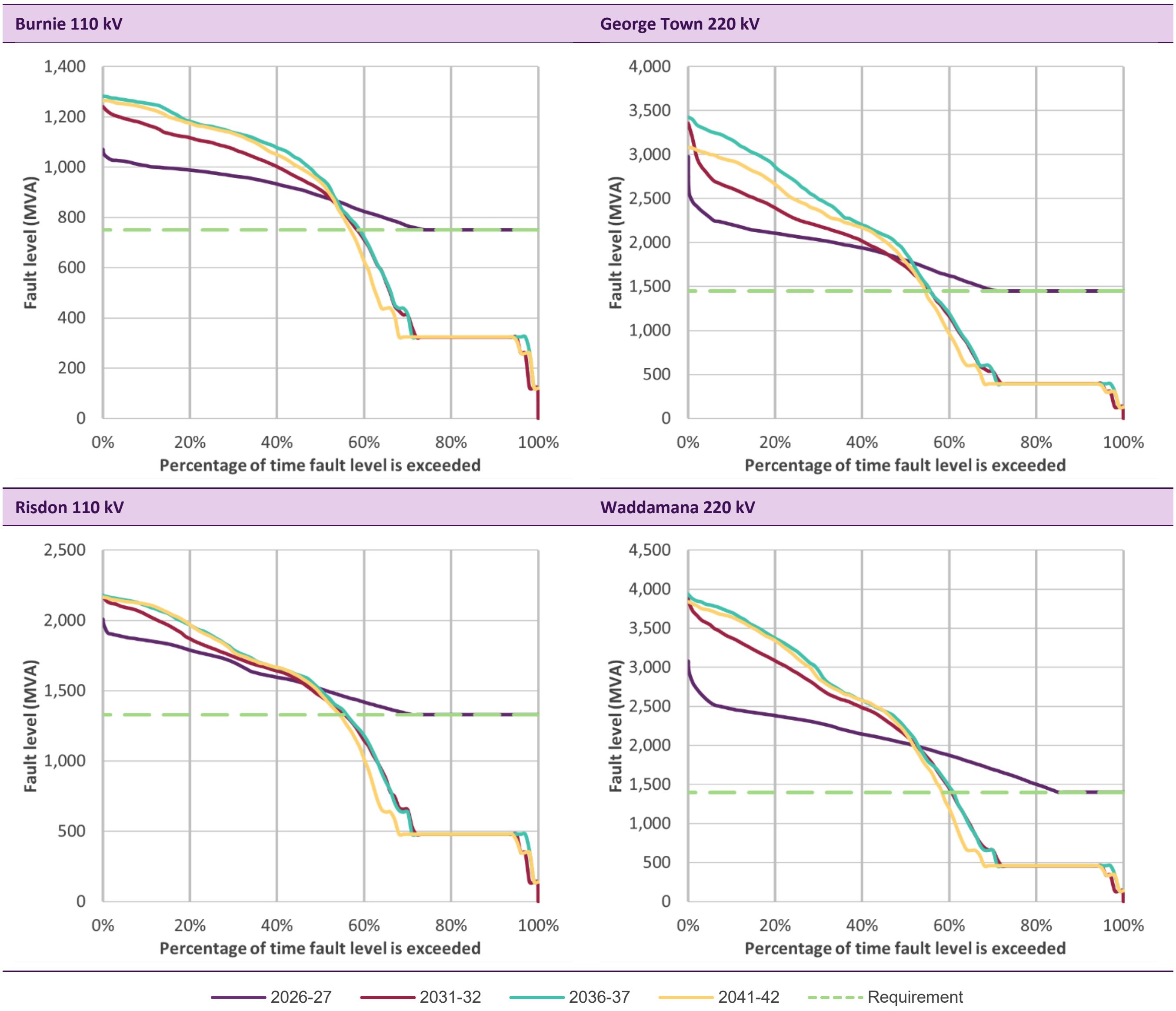


Figure 12 presents the fault level duration curves for Tasmania and shows synchronous fault level projected to be available at each system strength node.

Figure 12 Percentage of time fault level is exceeded at each system strength node in Tasmania



System strength outlook – new IBR investment

Figure 13 presents the projected quantity and technology of IBR investment in Tasmania in the ODP under *Step Change* scenario, and the underlying data is presented in **Table 7**.

Figure 13 IBR projections for Tasmania in 2026-27, 2031-32, 2036-37, and 2041-42 (MW), *Step Change* scenario

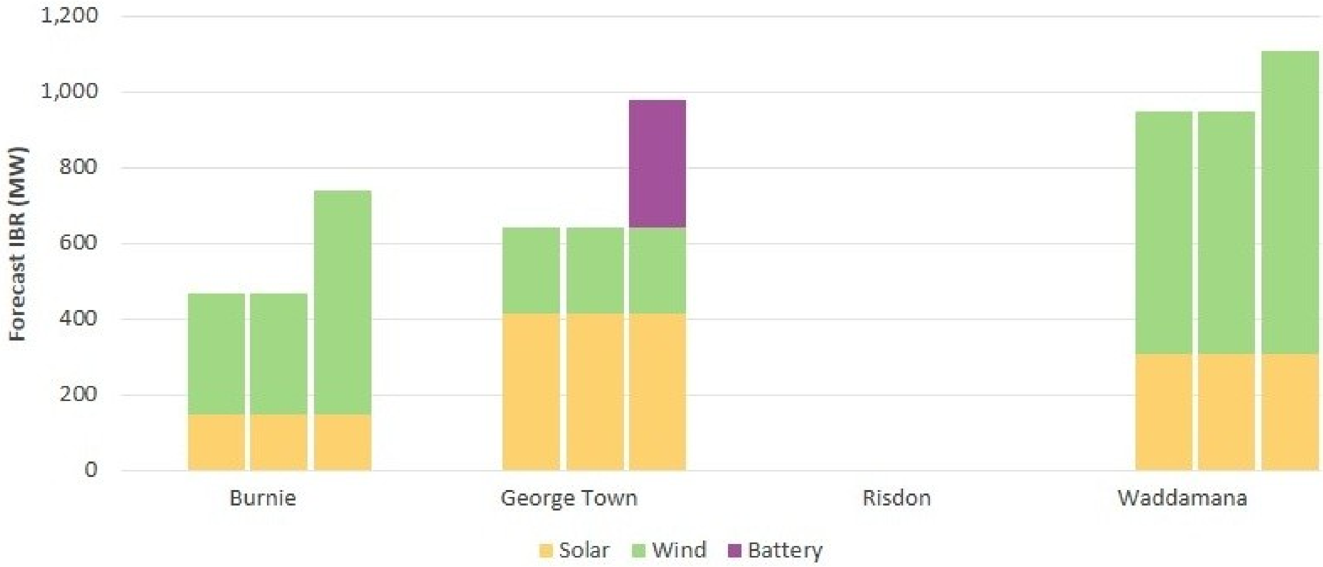


Table 7 IBR projections for Tasmania (MW)

Node	Technology	Existing	2026-27	2031-32	2036-37	2041-42
Burnie	Solar	0	0	150	150	150
	Wind	250	0	319	319	590
	Battery	0	0	0	0	0
George Town	Solar	0	0	413	413	413
	Wind	168	0	228	228	228
	Battery	0	0	0	0	338
Risdon	Solar	0	0	0	0	0
	Wind	0	0	0	0	0
	Battery	0	0	0	0	0
Waddamana	Solar	0	0	310	310	310
	Wind	144	0	637	637	797
	Battery	0	0	0	0	0

Inertia outlook

Key inertia results

AEMO's assessment of Tasmania's inertia needs in the Network Requirements appendix of the 2025 *Transition Plan for System Security* indicates that the inertia remediation measures being progressed by TasNetworks are sufficient to cover inertia deficits in Tasmania until the end of the portfolio's coverage period in 2029-30. TasNetworks will commence a new RIT-T for 2029-30 and beyond.

Tasmania is not subject to the system-wide inertia level, so the assessment for Tasmania considers only the islanded regional requirement.

Figure 14 presents the projected levels of inertia expected to be available in Tasmania, and **Table 8** presents the inertia deficits that result from the assessment of inertia against secure inertia level for Tasmania. The indicative inertia deficits shown can be remediated through a suite of technologies with potential solutions including synchronous plant or storage projected in the ODP that elect to use grid-forming technology. The cost of security remediation to address these deficits is considered in the cost-benefit analysis, with the estimated costs under the ODP presented in Section A7.4.7.

Figure 14 Projected levels of inertia available in Tasmania, *Step Change* scenario (MWs)

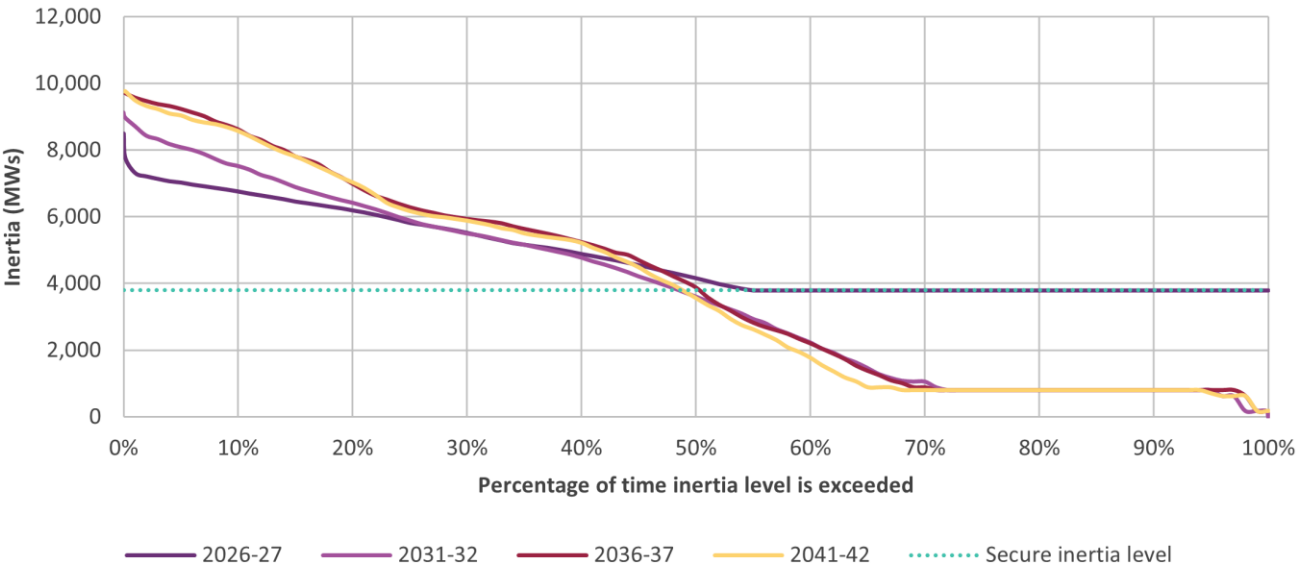


Table 8 Inertia outlook for Tasmania

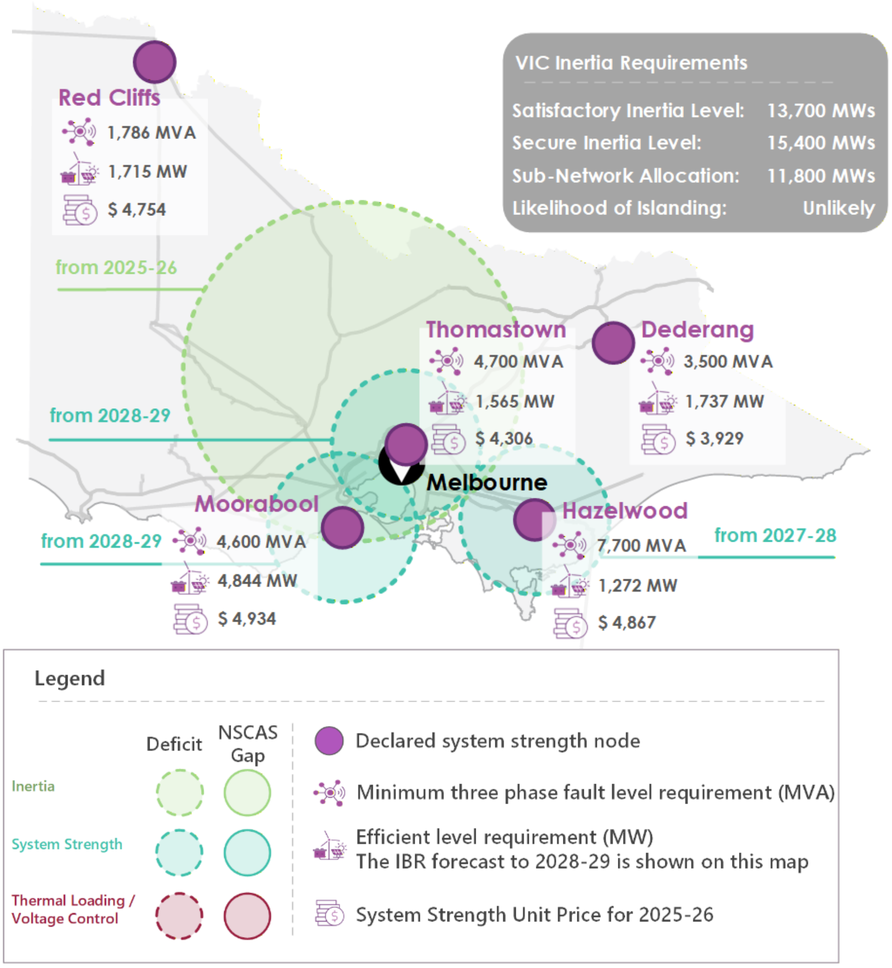
	2026-27	2031-32	2036-37	2041-42
Secure inertia level (MWs)	3,800	3,800	3,800	3,800
Inertia available 99.87% of the time (MWs)	3,800	180	180	180
Calculated inertia deficit (MWs)	0	3,620	3,620	3,620

Note: TasNetworks is progressing work into contracting arrangements for years beyond 2029-30.

A7.4.6 Victoria

System strength outlook – synchronous fault levels

System strength and inertia requirements



Key results

Projected closure of coal-fired generation in Victoria is expected to result in significant reductions in synchronous fault current.

The preferred option in AEMO Victorian Planning's system strength RIT-T includes plans to install synchronous condensers which will allow current requirements to be met for the studied periods, provided the assets are installed prior to Yallourn power station closure in winter 2028.

Projected deficits against current minimum requirements

Node	Current requirement met				Trend
	2026-27	2031-32	2036-37	2041-42	
Dederang 220 kV	0 MVA	0 MVA	0 MVA	0 MVA	No significant changes
Hazelwood 500 kV	0 MVA	0 MVA	0 MVA	0 MVA	
Moorabool 220 kV	0 MVA	0 MVA	0 MVA	0 MVA	
Thomastown 220 kV	0 MVA	0 MVA	0 MVA	0 MVA	
Red Cliffs 220 kV	0 MVA	0 MVA	0 MVA	0 MVA	

The above table presents the indicative system strength deficits that result from the assessment of expected three phase fault levels at each Victoria system strength node against the current minimum fault current requirements.

System strength and inertia requirements
Projected versus required level of fault current available at least 99.87% of the time

The figure below shows the amount of synchronous fault level projected to be available 99.87% of the time at each Victoria system strength node against the current minimum requirements.

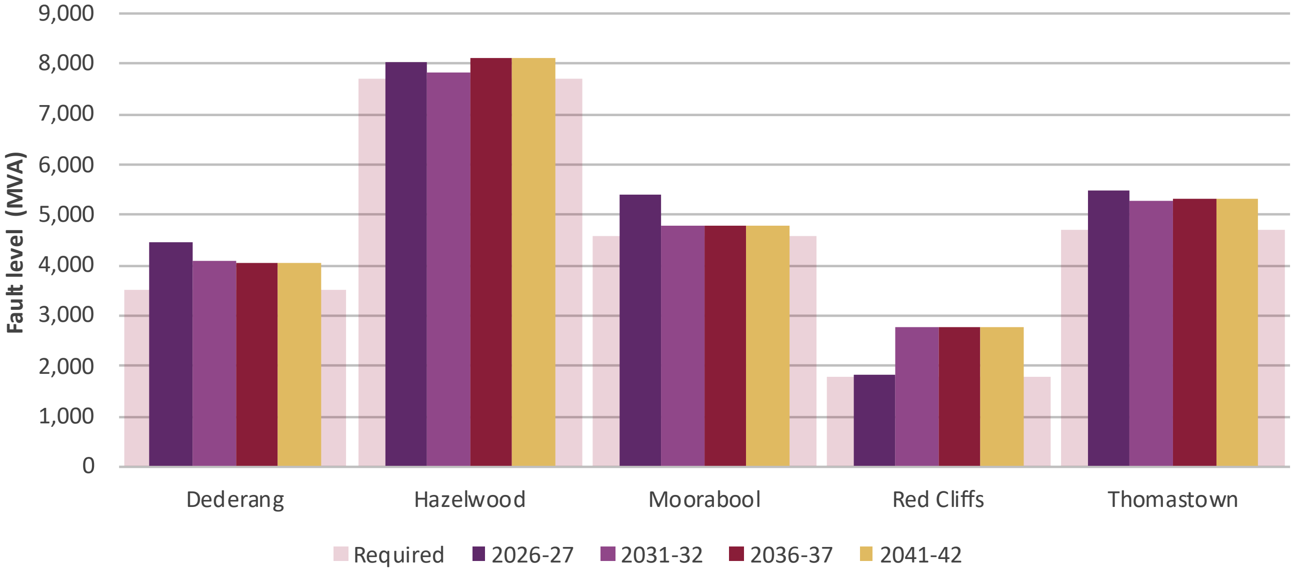
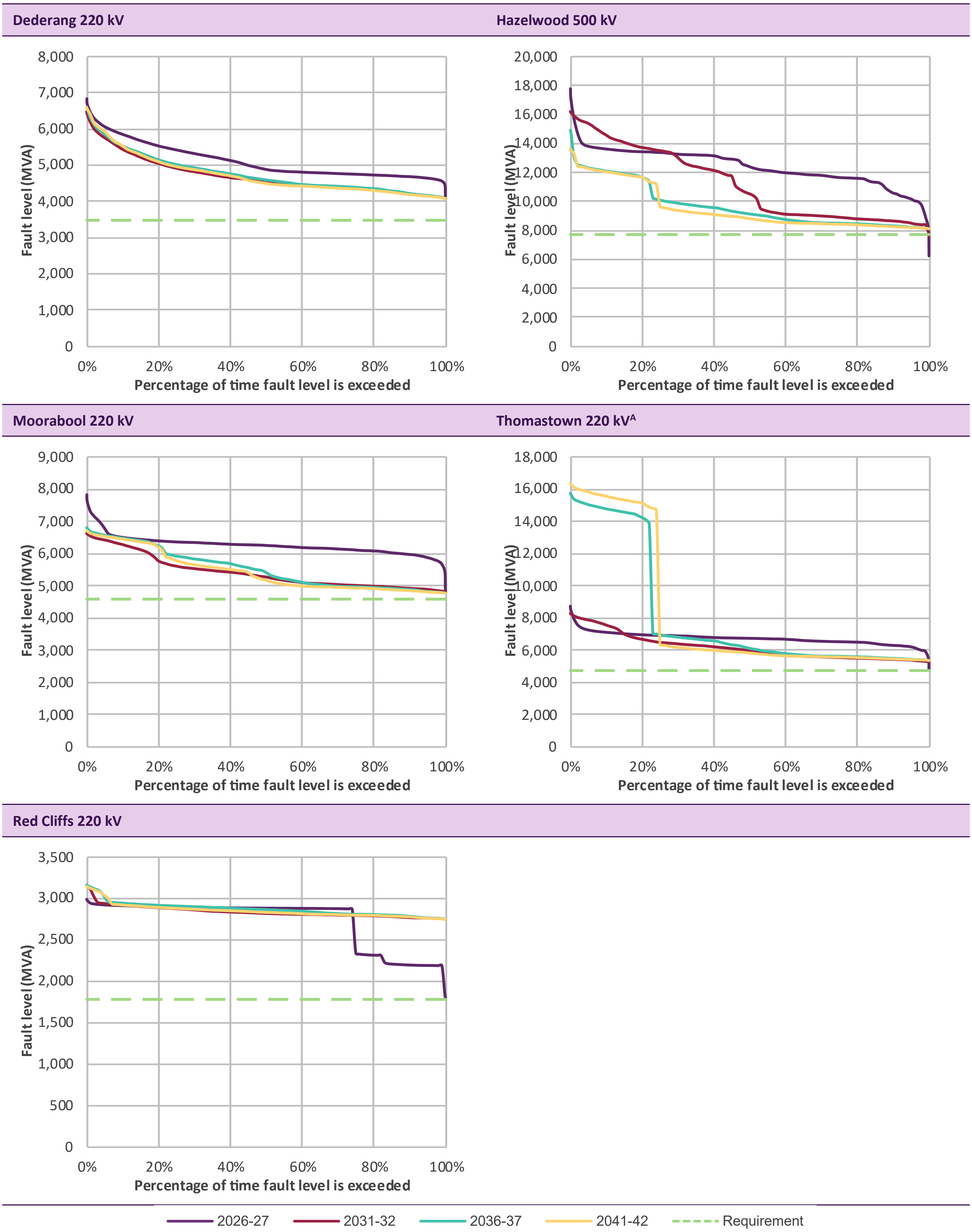


Figure 15 presents the fault level duration curves for Victoria and shows synchronous fault level projected to be available at each system strength node.

Figure 15 Percentage of time fault level is exceeded at each system strength node in Victoria



A. The stepped shape of the duration curve for 2041-42 is due to projected flexible gas and its contribution to fault level at Thomastown when dispatched.

System strength outlook – new IBR investment

Figure 16 presents the projected quantity and technology of IBR investment in Victoria in the ODP under *Step Change* scenario, and the underlying data is presented in **Table 9**.

Figure 16 IBR projections for Victoria in 2026-27, 2031-32, 2036-37, and 2041-42 (MW), *Step Change* scenario

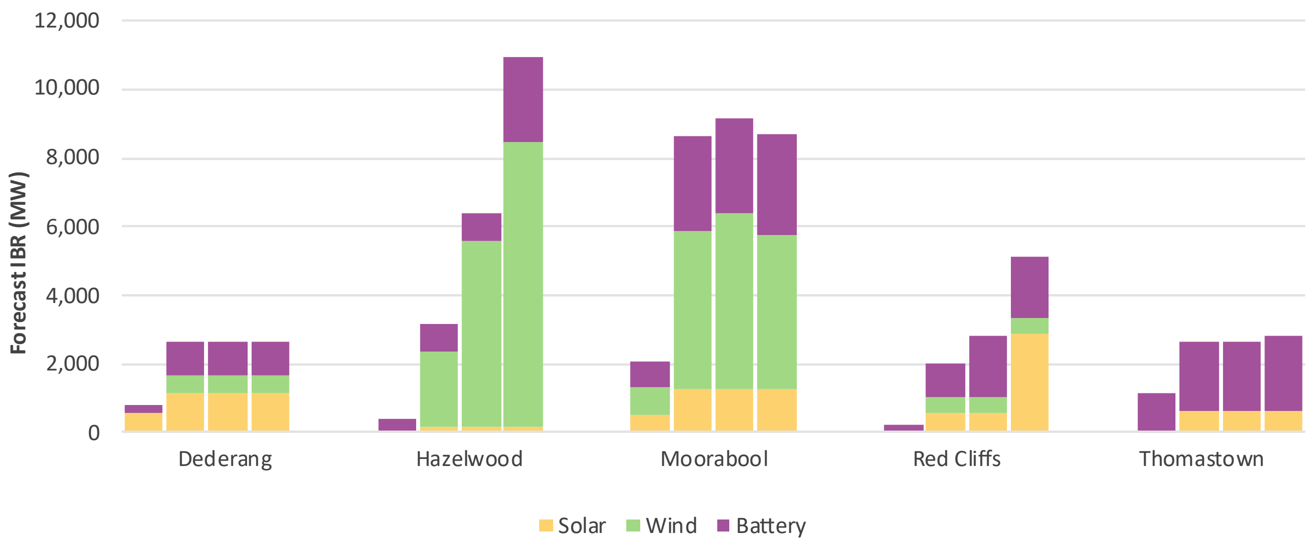


Table 9 IBR projections for Victoria (MW)

Node	Technology	Existing	2026-27	2031-32	2036-37	2041-42
Dederang	Solar	561	549	1,129	1,129	1,129
	Wind	0	0	526	526	526
	Battery	0	250	1,013	1,013	1,013
Hazelwood	Solar	0	77	157	157	157
	Wind	106	0	2,197	5,417	8,311
	Battery	0	300	817	813	2,455
Moorabool	Solar	0	499	1,262	1,262	1,262
	Wind	4,934	818	4,584	5,142	4,503
	Battery	0	750	2,804	2,774	2,955
Red Cliffs	Solar	673	31	578	578	2,869
	Wind	0	0	443	443	443
	Battery	0	211	1,013	1,800	1,800
Thomastown	Solar	0	0	620	620	620
	Wind	58	0	0	0	0
	Battery	0	1,169	2,014	2,014	2,190

Inertia outlook

Key inertia results

Available inertia in Victoria is expected to fall below the sub-network allocation for the studied periods with the synchronous condensers from AEMO Victorian Planning's system strength RIT-T included. VicGrid has advised that these synchronous condensers are intended to provide a significant inertia contribution, noting additional mitigation approaches are being explored, such as expressions of interest (EOIs) for synchronous plant.

VicGrid[36] is required to ensure that the full inertia sub-network allocation is met from 2 December 2027.

Figure 17 presents the projected levels of inertia expected to be available in Victoria, and **Table 10** presents the inertia deficits that result from the assessment of inertia against inertia sub-network allocation for Victoria. The indicative inertia deficits shown can be remediated through a suite of technologies with potential solutions including synchronous plant or storages projected in the ODP that elect to use grid-forming technology. The cost of security remediation to address these deficits is considered in the cost-benefit analysis, with the estimated costs under the ODP presented in Section A7.4.7.

Figure 17 Projected levels of inertia available in Victoria, *Step Change* scenario (MWs)

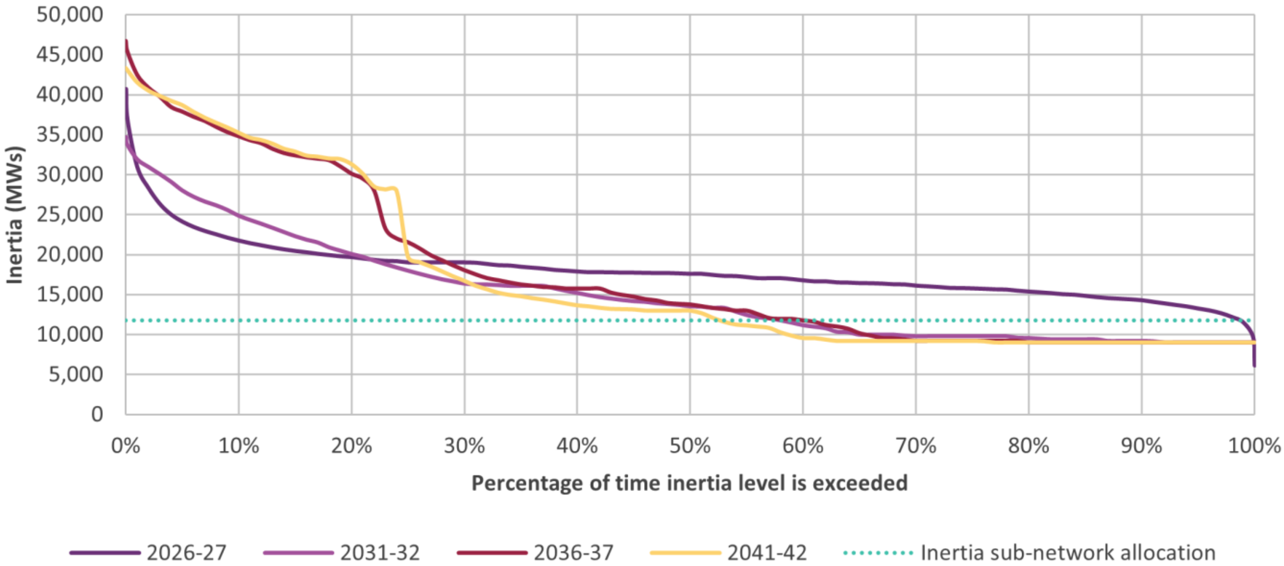


Table 10 Inertia outlook for Victoria

	2026-27	2031-32	2036-37	2041-42
Inertia sub-network allocation (MWs)	11,800	11,800	11,800	11,800
Inertia available 99.87% of the time (MWs)	9,657	9,016	9,016	9,016
Calculated inertia deficit (MWs)	2,143	2,784	2,784	2,784

[36] From 1 November 2025, AEMO's Victorian network functions transferred to a new State Business Corporation, VicGrid Body Corporate (VicGrid). VicGrid is the Declared Network Planner and the System Strength Service Provider for Victoria under the NER, responsible for planning, procuring and delivering system strength services.

A7.4.7 Estimated cost of security remediation

System security costs included as part of the ODP total system cost

AEMO has prepared high-level cost estimates for provision of system strength services in each REZ across the NEM, for inclusion in the total system cost of each CDP in the ODP assessment. System strength service requirements are based on assessment of existing synchronous generation dispatch, potential network upgrades, and the potential scale of local IBR.

AEMO has estimated costs for meeting the minimum fault level requirement based on synchronous condenser technology, as an existing, commercially viable, technology that has been demonstrated at scale and is capable of meeting both the minimum and efficient system strength requirements.

Over time, AEMO expects that alternative technologies such as grid-forming inverters will become available to provide system strength services more efficiently following adequate demonstration at scale, as could gas generators installed with a clutch. The cost estimates included in the ODP for minimum level requirements, and presented in this appendix, are therefore likely to represent an upper bound of system strength cost.

For the efficient level requirements, the remediation costs use a weighted cost trajectory approach that approximates a blended percentage of the solution built per year that could leverage grid-forming. Grid-forming BESS technology is assumed to be available to provide efficient level services immediately[37].

AEMO has also considered high-level cost estimates for provision of inertia services across the NEM based on deficits identified in each region. AEMO has estimated costs based on the incremental cost of fitting high inertia flywheels to synchronous condensers, as an existing, commercially viable, technology that has been demonstrated at scale. This is estimated at $6,000 per megawatt second (MWs)[38].

System strength outlook

Figure 18 shows the system strength remediation costs to address system strength remediation projected under the *Step Change* scenario across the NEM. This includes both the system strength remediation cost for the forecast IBR generation connection towards the efficient level[39] and the cost of replacing the fault current contributions of retiring thermal generation towards the minimum fault level requirements. These estimates assume a cost of approximately $163,000 per megawatt (MW) as a baseline[40]. Approximately $2.8 billion[41] is required across the NEM out to 2049-50 to provide system security services (upper bound).

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[37] See Section 3.11.1 of the 2025 *Inputs, Assumptions and Scenarios Report* (IASR) for further information, at https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/2025-inputs-assumptions-and-scenarios-report.pdf?rev=63268acd3f044adb9f5f3a32b6880c27&sc_lang=en.

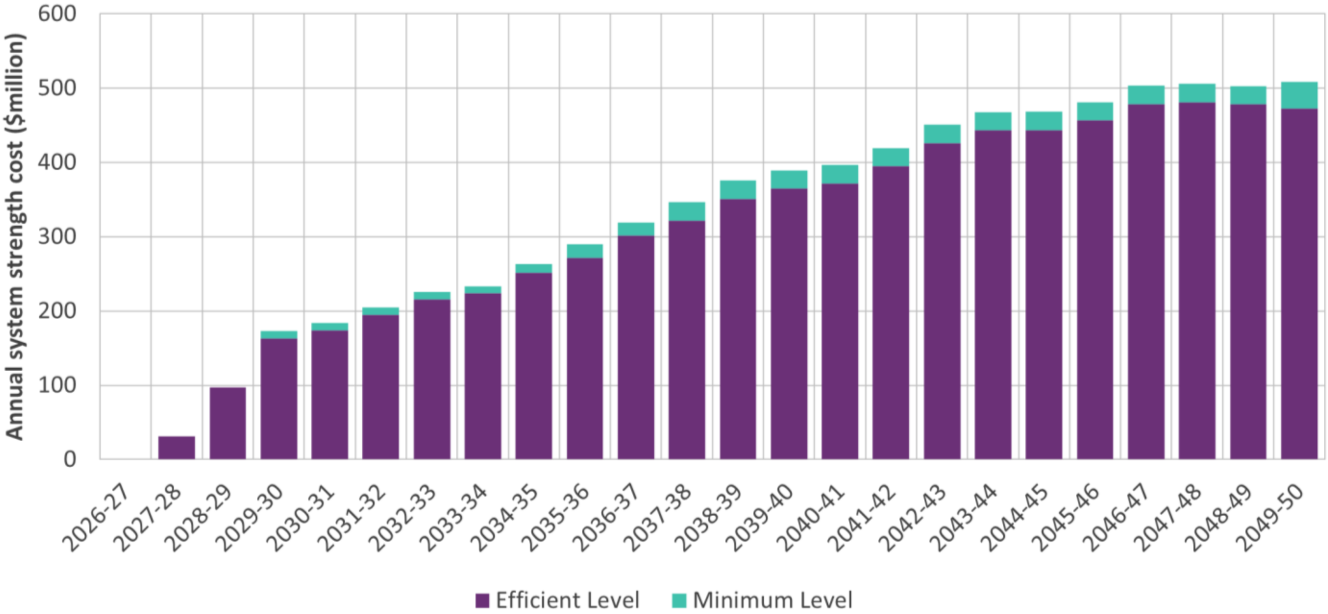
[38] Cost based on $9 million per 1,500 MWs high inertia flywheel. See AEMO's 2025 *Electricity Network Options Report*, August 2025, Section 6.2, at https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2025/2025-electricity-network-options-report/final/2025-electricity-network-options-report.pdf.

[39] The system strength remediation costs for the efficient level considers only modelled projects beyond the existing, committed and anticipated projects.

[40] AEMO, 2025 IASR Assumptions Workbook, August 2025, at https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/2025-inputs-and-assumptions-workbook.xlsm.

[41] Present value of annualised capital costs to 2050 based on year of entry and 7% discount rate.

Figure 18 Projected total yearly annualised system strength remediation costs by year, *Step Change* scenario ($ million)



Inertia outlook

Across the studied periods, AEMO's regional projections indicate inertia deficits[42] which, in aggregate across all regions, peak at approximately 6,400 MWs in 2031-32. To fully meet these deficits across the horizon, it would cost approximately $27 million[43] by adding high inertia flywheels to synchronous condensers (where such synchronous condensers were already required to be built for system strength or other purposes). However, there could be efficiency gains in designing solutions holistically to fill gaps for multiple services or regions.

For example, work is being progressed to deliver the first round of system strength investment, as RIT-Ts have now been completed in all NEM regions. These system strength investments may also provide an opportunity to supplement regional inertia levels using the same technical resource and with minimal incremental cost. For example, flywheels could be added to new synchronous condensers and system security services may be available from grid-forming batteries or gas turbines fitted with clutches.

To support co-optimised investment, the AEMC aligned the existing inertia and system strength frameworks procurement timeframes under the 2024 ISF final rule[44]. This alignment is intended to allow TNSPs to better deliver and coordinate system security investment opportunities.

Well-coordinated joint planning between AEMO, NSPs and jurisdictional bodies will be required to support timely investments that address identified system security gaps most efficiently. This joint planning process must recognise that timing solutions to meet identified shortfalls 'just in time' carries an inherent risk associated with project lead time

[42] Regional inertia deficits are measured against sub-network allocations of the secure inertia level for all mainland regions, and against the secure inertia level for Tasmania.

[43] Cost presented based on $9 million per 1,500 MWs (real 2025) high inertia flywheel, discounted at 7% from year of entry, with these costs included as part of the candidate development plans. Consequently, the approximate $27 million is incorporated into the total cost of the ODP for system security. See AEMO's 2025 *Electricity Network Options Report*, August 2025, Section 6.2, at https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2025/2025-electricity-network-options-report/final/2025-electricity-network-options-report.pdf.

[44] See https://www.aemc.gov.au/rule-changes/improving-security-frameworks-energy-transition.

uncertainty. Given the critical nature of maintaining system security and reliability, AEMO considers it prudent to plan the delivery of system security infrastructure (or contract with system strength service providers) well ahead of when shortfalls are expected to occur.

Emerging challenges for maintaining system security and reliability present a range of new risks and opportunities for project developers. Investors need to balance a range of complex technical and economic considerations across both geographical and electrical locations, including security requirements. AEMO's *Enhanced Locational Information* (ELI) report provides locational metrics which may be used to inform investment decisions[45]. Decisions made by investors at the design stage may mitigate system security risks or leverage the opportunities of the technology to contribute to security in the NEM – for example, choosing grid-forming technology for inverters or fitting gas turbines with clutches.

[45] See https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/enhanced-locational-information.

Glossary

This glossary has been prepared as a quick guide to help readers understand some of the terms used in the ISP. Words and phrases defined in the National Electricity Rules (NER) have the meaning given to them in the NER. This glossary is not a substitute for consulting the NER, the Australian Energy Regulator's (AER's) Cost Benefit Analysis Guidelines, or AEMO's *ISP Methodology*.

Term	Acronym	Explanation
Actionable ISP project	-	Actionable ISP projects optimise benefits for consumers if progressed before the next ISP. A transmission project (or non-network option) identified as part of the ODP and having a delivery date within an actionable window. For newly actionable ISP projects, the actionable window is two years, meaning it is within the window if the project is needed within two years of its earliest in-service date. The window is longer for projects that have previously been actionable. Project proponents are required to begin newly actionable ISP projects with the release of a final ISP, including commencing a RIT-T.
Actionable project progressing under a jurisdictional framework	-	A transmission project (or non-network option), other than an actionable ISP project, which optimises benefits for consumers if progressed before the next ISP, is identified as part of the ODP, and which will progress under a jurisdictional policy that AEMO considers under NER 5.22.3 (b) and includes in the ISP.
Anticipated project	-	A generation, storage or transmission project that is in the process of meeting at least three of the five commitment criteria (planning, construction, land, contracts, finance), in accordance with the AER's Cost Benefit Analysis Guidelines. Anticipated projects are included in all ISP scenarios.
Candidate development path	CDP	A collection of development paths which share a set of potential actionable projects. Within the collection, potential future ISP projects are allowed to vary across scenarios between the development paths. Candidate development paths have been shortlisted for selection as the ODP and are evaluated in detail to determine the ODP, in accordance with the ISP Methodology.
Capacity	-	The maximum rating of a generating or storage unit (or set of generating units), or transmission line, typically expressed in megawatts (MW). For example, a solar farm may have a nominal capacity of 400 MW.
Committed project	-	A generation, storage or transmission project that has fully met all five commitment criteria (planning, construction, land, contracts, finance), in accordance with the AER's Cost Benefit Analysis Guidelines. Committed projects are included in all ISP scenarios.
Consumer energy resources	CER	Generation or storage assets owned by consumers and installed behind-the-meter. These can include rooftop solar, batteries and electric vehicles (EVs). CER may include demand flexibility.

Term	Acronym	Explanation
Consumption	-	The electrical energy used over a period of time (for example a day or year). This quantity is typically expressed in megawatt hours (MWh) or its multiples. Various definitions for consumption apply, depending on where it is measured. For example, underlying consumption means consumption being supplied by both CER and the electricity grid.
Cost-benefit analysis	CBA	A comparison of the quantified costs and benefits of a particular project (or suite of projects) in monetary terms. For the ISP, a cost-benefit analysis is conducted in accordance with the AER's Cost Benefit Analysis Guidelines.
Counterfactual development path	-	The counterfactual development path represents a future without major transmission augmentation. AEMO compares candidate development paths against the counterfactual to calculate the economic benefits of transmission.
Demand	-	The amount of electrical power consumed at a point in time. This quantity is typically expressed in megawatts (MW) or its multiples. Various definitions for demand apply, depending on where it is measured. For example, underlying demand means demand supplied by both CER and the electricity grid.
Demand-side participation		The capability of consumers to reduce their demand during periods of high wholesale electricity prices or when reliability issues emerge. This can occur through voluntarily reducing demand, or generating electricity, and is a form of 'demand flexibility'.
Development path	DP	A set of projects (actionable projects, future projects and ISP development opportunities) in an ISP that together address power system needs.
Dispatchable capacity	-	The total amount of generation that can be turned on or off, without being dependent on the weather. Dispatchable capacity is required to provide firming during periods of low variable renewable energy output in the NEM.
Distribution network service provider	DNSP	A business which owns, controls or operates a distribution system (including a distribution network).
Distribution project	-	A distribution project that is part of the ODP and forecast to be needed in the future. The project is an ISP development opportunity and does not address an identified need specified in the ISP. The ISP cannot make a distribution project 'actionable' or require commencement of the Regulatory Investment Test for Distribution (RIT-D).
Economic offloading	-	Refers to a VRE generator being dispatched below its maximum availability as its output is offered at a higher price bands greater than the regional reference price. This may also be referred to as economic 'spill' or 'spilled energy'.
Firming	-	Grid-connected assets that can provide dispatchable capacity when variable renewable energy generation is limited by weather, for example storage (pumped-hydro and batteries) and gas-powered generation.
Future ISP project	-	A transmission project (or non-network option) that addresses an identified need in the ISP, that is part of the ODP, and is forecast to be actionable in the future.

Term	Acronym	Explanation
Identified need	-	The objective a TNSP seeks to achieve by investing in the network in accordance with the NER or an ISP. In the context of the ISP, the identified need is the reason an investment in the network is required, and may be met by either a network or a non-network option.
ISP development opportunity	-	A development identified in the ISP that does not relate to a transmission project (or non-network option) and may include generation, storage, demand-side participation, or other developments such as distribution network projects.
Mid-scale	-	Generation and storage typically connected to the distribution network rather than to either the transmission network or behind the meter at a business or residence. For the 2026 ISP, these resources are assumed to have a generation or charge/discharge capacity of between 5 MW and 30 MW. For ease of reporting in this document, mid-scale generation and storage are sometimes included within the totals for utility-scale generation and storage. In other AEMO documents, such as the *Demand Side Factors Information Guidelines* and the *ISP Methodology*, these resources are sometimes referred to as 'other distributed resources'.
National Electricity Rules	NER	The Rules are legally binding rules made under the National Electricity Law, which govern the operation of the National Electricity Market and the ways in which AEMO manages power system security. The Rules also provide the regulatory framework for network connections and access, national transmission planning and pricing for network services. The Rules are mainly made by the AEMC having regard to the National Electricity Objective.
Net market benefits	-	The present value of total market benefits associated with a project (or a group of projects), less its total cost, calculated in accordance with the AER's Cost Benefit Analysis Guidelines. The net market benefits of the ODP through to 2050 is the difference between the cost of the ODP and the cost of a 'counterfactual' development path which has no new transmission build.
Non-network option	-	A means by which an identified need can be fully or partly addressed, that is not a network option. A network option means a solution such as transmission lines or substations which are undertaken by a Network Service Provider using regulated expenditure.
Optimal development path	ODP	The development path identified in the ISP as optimal and robust to future states of the world. The ODP contains actionable projects, future ISP projects and ISP development opportunities, and optimises costs and benefits of various options across a range of future ISP scenarios.
Regulatory Investment Test for Transmission	RIT-T	The RIT-T is a cost benefit analysis test that TNSPs must apply to prescribed regulated investments in their network. The purpose of the RIT-T is to identify the credible network or non-network options to address the identified network need that maximise net market benefits to the NEM. RIT-Ts are required for some but not all transmission investments.

Term	Acronym	Explanation
Reliable (power system)	-	The ability of the power system to supply adequate energy to satisfy consumer demand, allowing for credible generation and transmission network contingencies.
Renewable energy	-	For the purposes of the ISP, the following technologies are referred to under the grouping of renewable energy: "solar, wind, biomass, hydro, and hydrogen turbines". Variable renewable energy is a subset of this group, explained below.
Renewable energy zone	REZ	An area identified in the ISP as a high-quality resource area where a cluster of large renewable energy projects can be developed using economies of scale.
Renewable drought	-	A prolonged period of very low levels of variable renewable output, typically associated with dark and still conditions that limit production from both solar and wind generators.
Rooftop and other small-scale solar	-	Solar photovoltaic (PV) generation assets that are not centrally controlled by AEMO dispatch. Examples include residential and business rooftop PV as well as larger commercial or industrial "non-scheduled" PV systems.
Scenario	-	A possible future of how the NEM may develop to meet a set of conditions that influence consumer demand, economic activity, decarbonisation, and other parameters. For the 2026 ISP, AEMO has considered three scenarios: *Slower Growth*, *Step Change* and *Accelerated Transition*.
Secure (power system)	-	The system is secure if it is operating within defined technical limits and is able to be returned to within those limits after a major power system element is disconnected (such as a generator or a major transmission network element).
Sensitivity analysis	-	Analysis undertaken to determine how sensitive modelling outcomes are to a change in input or assumption (or a collection of related inputs and assumptions).
Spill	-	Refers to a VRE generator being dispatched below its maximum availability as its output is offered at a higher price, typically during periods of negative prices due to an oversupply of generation. Also referred to as 'economic offloading' or 'spilled energy'.
Transmission network service provider	TNSP	A business that owns, controls or operates a transmission network.
Utility-scale or utility		For the purposes of the ISP, 'utility-scale' and 'utility' refers to technologies connected to the high-voltage power system rather than behind the meter at a business or residence.
Value of greenhouse gas emissions reduction	VER	The VER estimates the value (dollar per tonne) of avoided greenhouse gas emissions. The VER is calculated consistent with the method agreed to by Australia's Energy Ministers in February 2024.
Virtual power plant	VPP	An aggregation of resources coordinated to deliver services for power system operations and electricity markets. For the ISP, VPPs enable coordinated control of consumer-scale batteries.
Variable renewable energy	VRE	Renewable resources whose generation output can vary greatly in short time periods due to changing weather conditions, such as solar and wind.