

2026 Transmission Annual Planning Report



Acknowledgement of Country

We acknowledge the long-standing connection to Country shared by the Traditional Custodian of the lands, skies and waterways on which we live and work.

We recognise that Country is rich in tens of thousands of years of history and culture and that every community we work in has its own unique connection with the land. We honour this in the actions we take — and pay our respects to Elders past and present.

Scan the QR code for more information about Transgrid's cultural heritage and reconciliation



Colo River, Central Tablelands, New South Wales



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Purpose of the Transmission Annual Planning Report

As the Transmission Network Service Provider in NSW, Transgrid leads the forward planning of the state’s transmission system.

Each year, we undertake a rigorous planning review in line with the National Electricity Rules – ensuring critical transmission infrastructure is delivered when it is needed, without costing consumers any more than necessary. This work is essential to unlocking the full benefits of the energy transition.

Our annual planning looks beyond today. We consider future changes in energy use and supply, including demand growth, generation developments and system changes. With rooftop solar and electrification reshaping when and how energy is used, we’re adapting to more complex supply and demand dynamics — including higher peak and lower minimum demand. Our role is to plan, build and maintain a safe, resilient and efficient network that keeps pace with the needs of consumers now and into the future.

- In developing this report we work closely with:
- The Australian Energy Market Operator (AEMO)
 - The Energy Corporation of NSW (EnergyCo)
 - Each distribution network service provider in NSW (Ausgrid, Endeavour Energy, and Essential Energy) and the ACT (Evoenergy)
 - Powerlink in QLD, ElectraNet in SA and VicGrid in VIC.

Together we’re committed to building the network of the future in the most prudent and efficient way.

Each year, we assess what’s changing across the system, from new generation and storage projects, to planned retirements, to shifting demand and asset conditions. This helps us decide where upgrades are needed and how to manage the changing grid to keep it reliable.

- In particular, we look at:
- Emerging network constraints and how best to fix them
 - What to do with assets reaching the end of their serviceable lives
 - New and changing customer connection needs, including how load connections can be supplied safely, reliably and efficiently
 - Power system security needs, including maintaining a stable, reliable network as generation, demand and operating conditions change.

In all cases, the information in the Transmission Annual Planning Report helps third parties come up with options, including non-network solutions, to meet these needs.

We put all the options on the table through our investment framework to find the best solution. We’re looking for options that support system strength and reliability while keeping multiple pathways open as the energy system evolves. This allows us to both respond to changing stakeholder needs and deliver our capital program efficiently.

Transgrid makes sure long-term transmission planning meets Australia’s national needs by contributing to AEMO’s Electricity Statement of Opportunities and Integrated System Plan. These publications also feed into the Transmission Annual Planning Report, and we report on relevant matters arising from them.

We work closely with EnergyCo to ensure Renewable Energy Zones (REZs) can connect to the national transmission backbone without undermining system security — a critical element of achieving a stable and sustainable energy transition.

This is not only how we build the infrastructure needed now, but also how we prepare for future demand and net-zero goals beyond 2035.

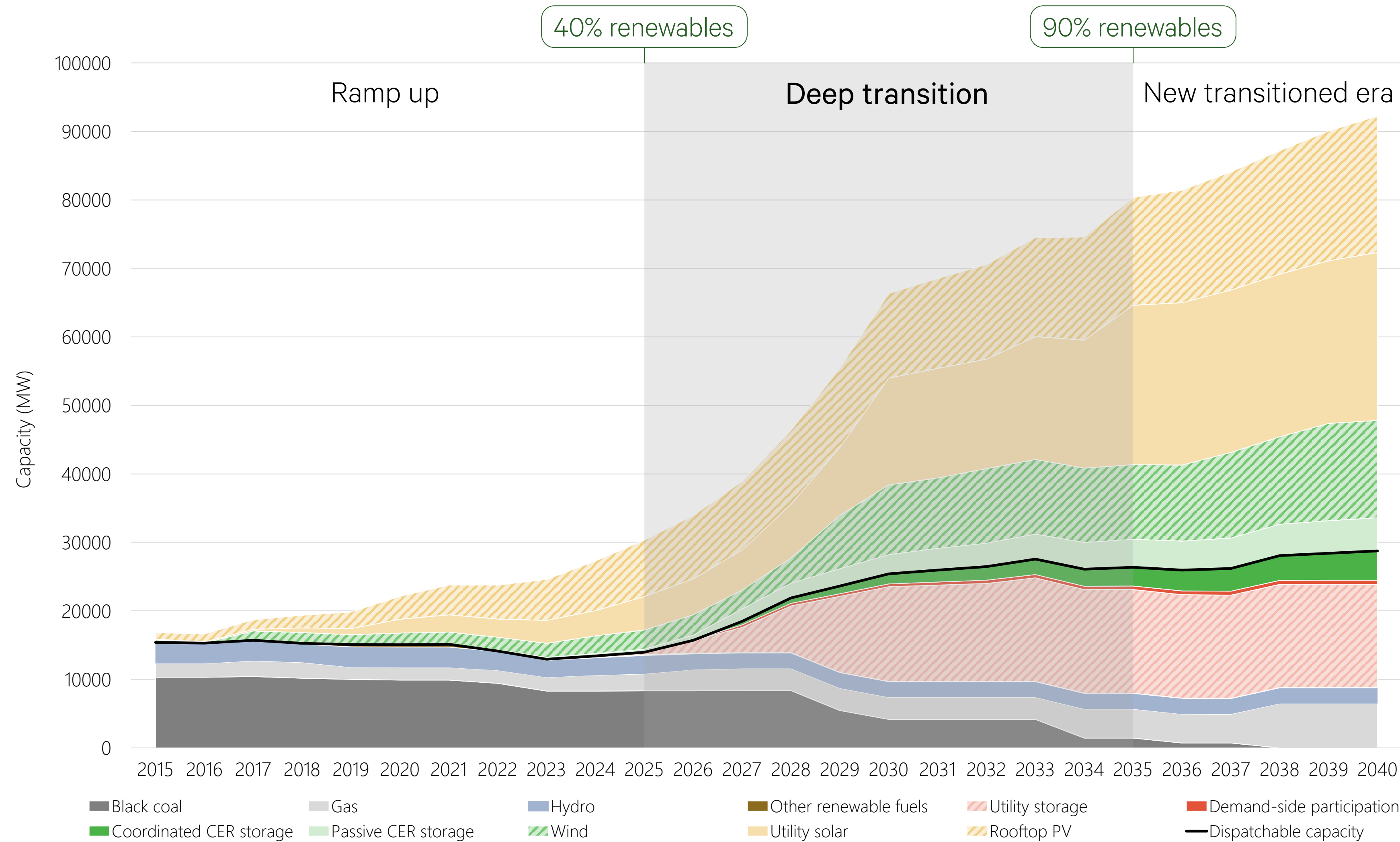


Christian Johane - Secondary Systems Technician Grade 1
Amy Longmuir - 4th Year Substation Technician Apprentice

NSW capacity by year, 2026 ISP Step Change scenario

The NSW power system is in the middle of a period of profound change. This deep transition is reshaping how electricity is generated, stored and supplied, creating the foundations for a new transitioned era from 2035.

Figure 1: Historical and forecast electricity capacity in NSW.¹



¹ AEMO 2026 ISP, AER State of the Electricity Market (various historical), AEMO Generation Information, Transgrid analysis.

Foreword

New South Wales is in deep transition. As we progress from around 40 per cent renewable energy today to around 90 per cent by 2035, Transgrid is delivering the system needed to underpin a modern economy with reliable, affordable and cleaner energy and support the government's plan for the energy transition.

By the time we reach 2035 in the new transitioned era, NSW's energy system will look fundamentally different. With more than 80 per cent of NSW's coal-fired generation retired and new industries emerging, our responsibility is to ensure the grid continues to deliver value, reliability and security to households, businesses and communities.

A fundamentally different energy system is emerging after the ramp-up phase: one that is cleaner, smarter and more connected, with more moving parts than ever before. It will support more than 26 GW of new large-scale wind and solar generation and 11 GW of storage, much of it in new parts of the state. Power is flowing in new directions. Consumers are playing a more active role, investing in a further 6 GW of rooftop solar and 7 GWh of batteries. And as many more interconnected parts of the system interact, maintaining security increasingly depends on their coordinated operation.

Our planning and delivery activities are guided by the long-term interests of consumers. That means maintaining reliability and resilience, supporting economic growth, managing costs carefully and ensuring the network is ready for the opportunities and challenges of a rapidly changing energy system.

Demand is evolving in new and unexpected ways

As both supply and consumption is reshaped in the deep transition, the demand assumptions that underpinned our transmission planning only a few years ago have been rewritten. As this year's report explains, large, continuous loads from hyperscale data centres will dramatically change the profile of electricity demand, with data centres growing from around 3 per cent to 20 per cent of NSW peak load by 2035. This, combined with the growing impact of household batteries, means peak demand is emerging, not just at new locations, but in new seasons. Across NSW, autumn demand is increasing, and some parts of the network, including the ACT, are experiencing peak

demand in winter. Minimum demand is also following a different path. Initially, it will continue to fall as previously expected, but our forecasts show it will drop to 2 GW in 2029 before rebounding as data centre demand outweighs the impact of rooftop solar.

Demand is no longer changing in one simple direction. Data centres, electrification, rooftop solar, household batteries and changing industrial loads are reshaping where and when electricity is used. This requires planning that is more adaptive, more coordinated and increasingly focused on delivering value for NSW electricity consumers under a range of future scenarios.

Rapid change demands flexibility

As the above examples demonstrate, our long-term planning can no longer rely on a single view of the future. We must continually update our forecasts, test multiple scenarios and ensure the system we are building today is flexible, adaptable and capable of supporting a range of plausible outcomes in the years ahead.

We know that the timing of new generation, storage and major industrial loads will continue to evolve – and technology may advance in unpredictable ways. This is why, in 2026, adaptability has become one of our most important planning principles. We are identifying investments that deliver value under multiple scenarios and, as with our system strength portfolio, building optionality into our plans so we can respond to changes in energy, regulatory and financial systems.

We are also placing greater emphasis on coordinated, whole-of-system planning, supported by clearer roles and a stronger 'one system' approach across Transgrid, AEMO, EnergyCo, Distribution Network

Service Providers (DNSPs), government, generators and major loads. We are mindful that, while different energy players have different responsibilities and perspectives, consumers experience one electricity system and a single bill. This is why we are working to improve the quality of shared planning assumptions and forecasts, including developing a coordinated NSW-wide view of future data centre demand with distribution network businesses.

Consumers expect and deserve more

As we travel through the deep transition, our responsibility remains clear: every decision must deliver value for money for NSW electricity consumers. But we also recognise that consumers do not all have the same priorities or opportunities. Some are actively participating in the energy transition through rooftop solar and home batteries; others depend on the broader electricity system to deliver affordable, reliable power. Our role at Transgrid is to balance these interests, make transparent trade-offs and ensure decisions are guided by the long-term interests of NSW households, businesses and communities.

In some areas, consumers are largely in lockstep. The people of NSW expect – and deserve – the transition to be delivered efficiently, for electricity to be affordable and reliable, and for projects to be delivered in consultation with communities. We are responding to these expectations by continuing to earn and maintain social licence – project by project, conversation by conversation. We make prudent investment decisions to keep long-term costs as low as possible – ensuring every dollar invested delivers the greatest possible

benefit. That means building new transmission only where it creates long-term value. It means prioritising timely investments that avoid higher future costs. Sydney Ring South, for example, is expected to deliver \$3.2 billion in net market benefits and reduce average annual bills by \$51 for a typical NSW household and \$110 for an average small business from 2034 to 2043. Where possible, this means making better use of the network we already have. One example is our System Integrity Protection Scheme, which will use up to 700 MW of capacity from the Waratah Super Battery to unlock greater capacity from 36 existing transmission lines.

Managing data centre demand fairly

The rapid growth in data centre demand presents a significant economic opportunity for NSW, but it must be managed in a way that protects energy consumers. Transgrid is making additional capacity available for these large new loads only after the future needs of homes, businesses and existing industries have been safeguarded. We are working with the industry to progress a rule change that will ensure new large users pay for their full connection capacity – whether they use it or not. This will spread the fixed costs of the network across a much larger base, with the potential to reduce like-for-like transmission costs of consumers by up to 15 per cent. Pleasingly, data centre proponents have indicated their support for this approach as a demonstration of their long-term commitment to investing in NSW.

Planning that supports a transitioned future NSW economy

In the deep transition to 2035, Transgrid’s planning approach is not to predict the future perfectly, but to prepare for it wisely: continually testing our assumptions; adapting as conditions change; and making disciplined investment decisions that remain robust across a range of possible futures.

Ultimately, the energy transition will be judged by the outcomes it delivers for consumers. If we plan and deliver well, flexibly meeting demand as it evolves, households and businesses will enjoy a cleaner, more reliable and more affordable electricity system. Just as importantly, we will be supporting 38 GW of new generation and storage for NSW by 2035 – 27 GW of which will be located in REZs – supporting a modern, increasingly digital economy – one powered by renewable energy, capable of attracting new industries and creating long-term prosperity after coal-fired generation has retired.

This report sets out how we are working to ensure we make the right decisions today so costs are kept as low as possible for consumers and shared fairly, as we continue to deliver a modern energy grid capable of cleanly powering the NSW economy tomorrow and enabling the government’s vision for the energy transition.



B. Redman
Brett Redman
Chief Executive Officer
Transgrid Group

Transgrid’s approach through the deep transition



About Transgrid

Transgrid operates and manages the high-voltage electricity transmission network across NSW and the ACT, connecting generators, distributors and major energy users. We deliver power to more than three million homes and businesses, working to keep it safe, reliable and affordable.

Our network transports electricity from diverse generation sources – wind, solar, hydro, gas and coal – to large industrial customers and the distribution networks that deliver power to homes and businesses.

It is the backbone of the National Electricity Market (NEM), keeping electricity flowing across regions, enabling energy trading and building a more resilient power system for Australians.

Our NSW and the ACT network includes:

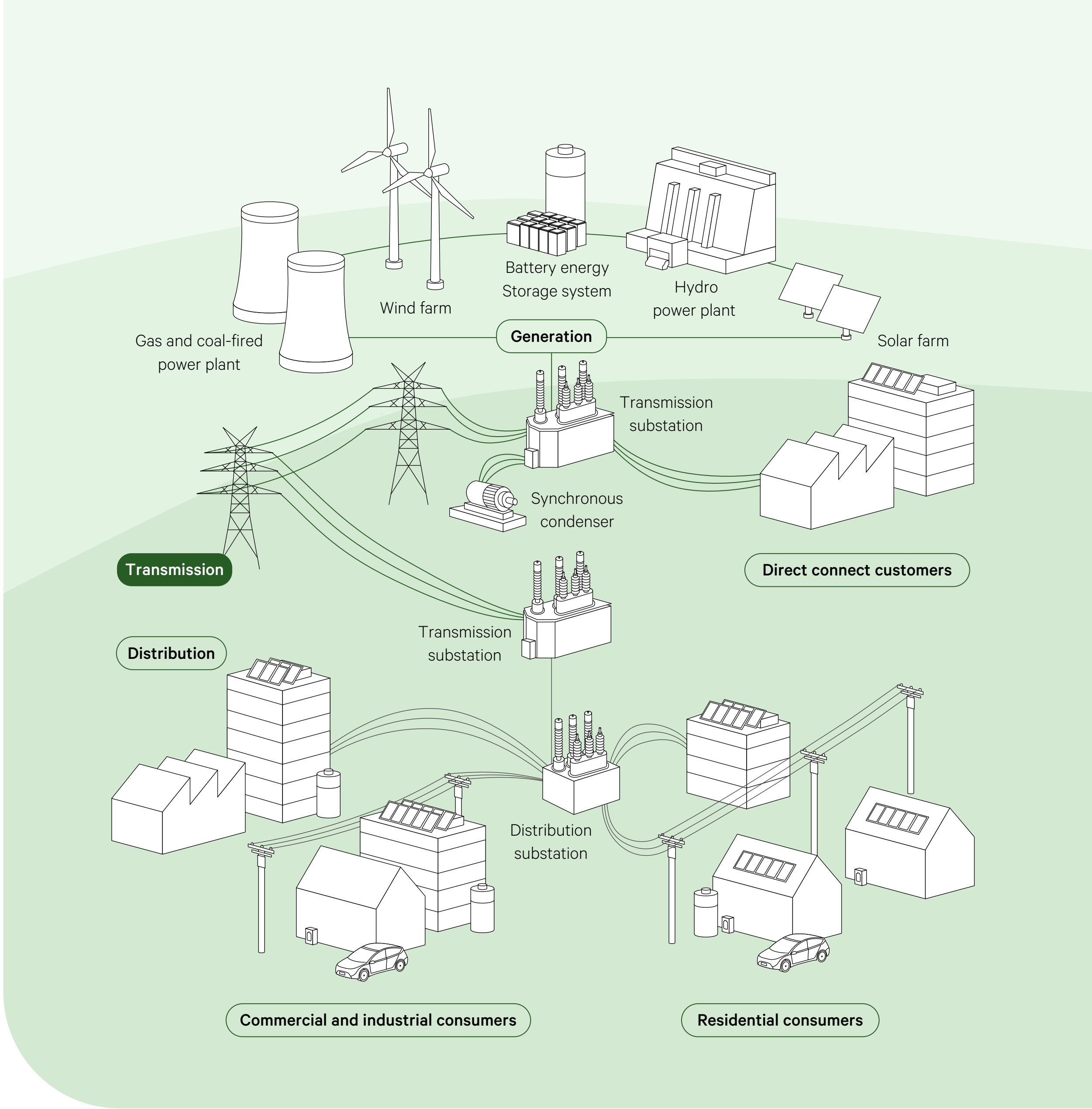
- 134 substations and switching stations
- 12,168 kilometres of high-voltage transmission lines²
- 95 kilometres of underground cables³
- 6 key interconnectors linking NSW to QLD, VIC and SA.

State interconnectors are an important part of Australia’s clean energy future. We need them to move renewable power from where it’s generated to where it’s needed.

Transgrid is investing in new transmission infrastructure and adopting innovative technologies to modernise the grid, connect more renewable sources and, support electrification of homes, transport and industry on the path to net zero.

Figure 2 illustrates Transgrid’s role in the electricity supply chain. Figures 3 and 4 show our transmission network and key interconnections.

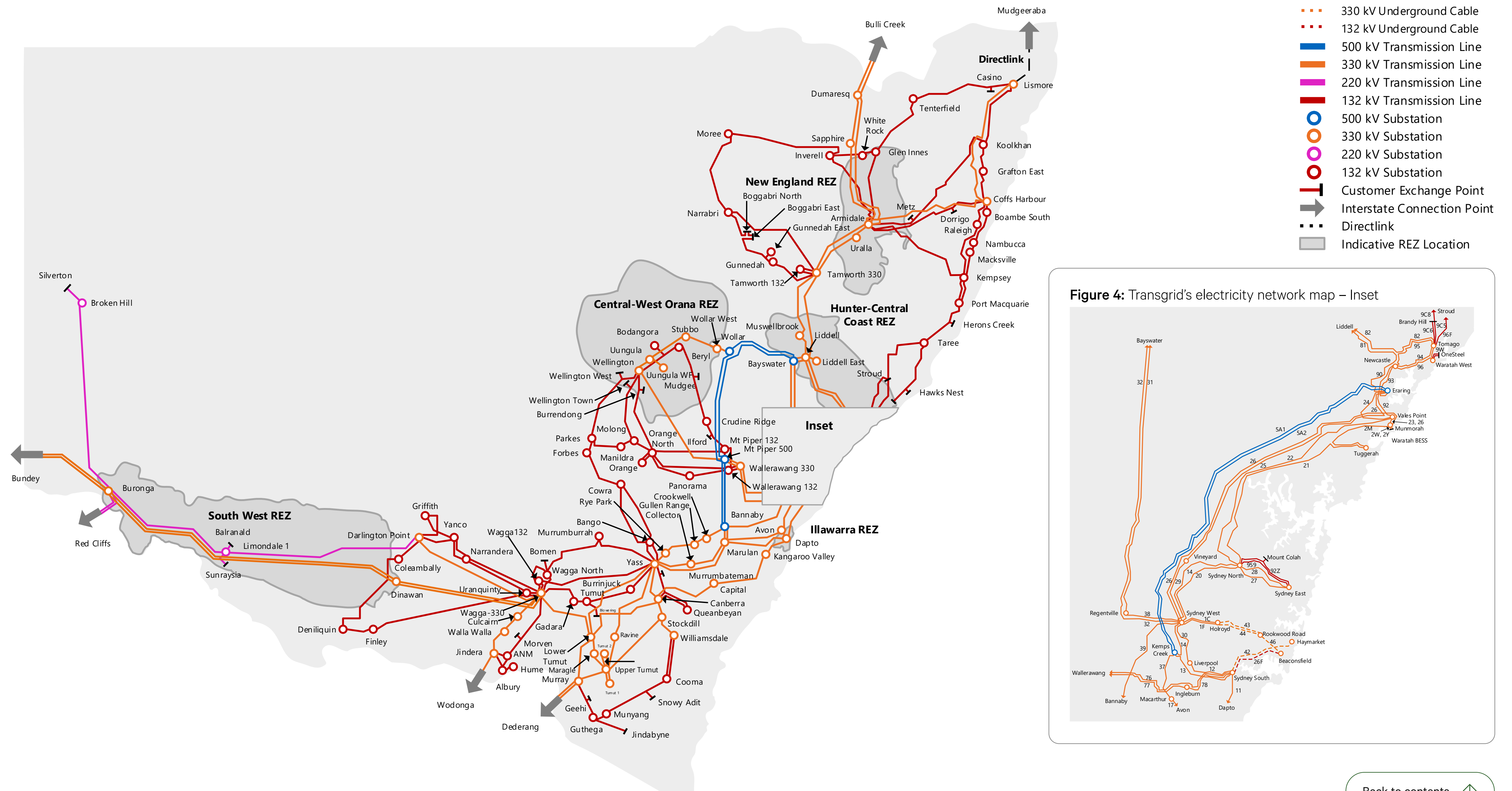
Figure 2: Transgrid within the electricity supply chain



² Based on route length. Includes overhead and underground as well as prescribed and non-prescribed transmission lines. Circuit length is 14,636 km. Both numbers include EnergyConnect.
³ Based on route length. Includes prescribed and non-prescribed cables. Circuit length is 110 km.



Figure 3: Transgrid's electricity network map



Executive summary

Transgrid’s 2026 Transmission Annual Planning Report reflects the dynamic nature of the deep transition. In this sustained period of delivery, the system is evolving rapidly and at scale, and we are adapting with it.

As Chapter 1 describes, data centres, electrification, rooftop solar, household batteries and changing industrial loads are reshaping where and when electricity is used. In this environment, Transgrid is using an adaptive planning approach to support multiple development pathways and technologies while maintaining flexibility in decision-making beyond the current delivery horizon. This approach will help our network deliver reliable, affordable and sustainable outcomes for consumers both through the deep transition and into the new transitioned era from 2035 and beyond.

To connect renewable generation to the NSW major load centres, we are building a new, greatly expanded transmission backbone. Chapter 2 presents the completed, ongoing and new transmission projects that will make up the future grid. In an important milestone, Stage 1 of EnergyConnect is now fully operational, with 150 MW of capacity released in both directions, marking the successful transfer of energy between NSW, SA and VIC. Stage 2 of EnergyConnect has been energised, with

all capacity expected to be in service by the end of 2026. Chapter 2 also details progress on our augmentation projects and our collaborative work with AEMO, EnergyCo and Distribution Network Service Providers.

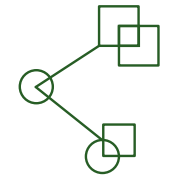
Our forecasts continue to suggest that new thermal and voltage constraints will continue to appear and grow in additional regions. As Chapter 3 describes, Transgrid is responding to these challenges by using non-network solutions, operational innovation and connection process improvements to unlock capacity, manage increasing operational complexity, reduce constraints and deliver lower-cost outcomes for consumers.

Meanwhile, our demand forecasts in Chapter 4 show structural shifts in supply and demand. New and changing loads, including data centres, other large single-site loads and electrification-driven demand, are reshaping both peak and minimum demand. Peak demand is rising faster than previously anticipated as these loads continue to connect. But the trajectory of

minimum demand is different from previous projections. Due to the rapid growth in electrification and large loads with relatively continuous demand profiles such as data centres, we now expect the long-term decline in minimum demand to reverse by around 2029, although not before minimum demand falls below 2,000 MW as the net impact of consumer energy resources reduces household grid energy consumption.

The changing generation mix as well as shifts in structural demand and supply make the task of meeting Transgrid’s system security responsibilities extremely complex. Chapter 5 explains how we are satisfying our system strength obligations and outlines progress against our plan for enhancing Transgrid’s control room systems. Horizon 1 is complete, and we are awaiting a funding decision for Horizon 2, which will improve situational awareness, helping ensure the network remains secure under the broader range of operating conditions outlined in this report.

The Transmission Annual Planning Report helps us:

-  Understand and balance the interests of NSW and the ACT electricity consumers
-  Maintain a safe, secure and reliable electricity network
-  Enable a system powered by more renewables
-  Meet new and changing demand
-  Deliver the best value for money

What we are forecasting in the 2026 Transmission Annual Planning Report

Additional **data centre load growth** by 2035 now forecast at

4x

2025 Transmission Annual Planning Report data centre forecasts

Data centre load accounts for

66%

of the growth in end-use energy consumption from FY26 to FY35

5x

as many **small batteries** in FY35 compared to FY26

2029

minimum demand falls below 2,000 MW before trending back up due to data centre load growth

6 GW

of additional **rooftop solar** capacity from FY26 to FY35

26 GW

of additional **utility-scale solar and wind** from FY27 to FY35

11 GW

of additional **utility-scale storage** from FY27 to FY35

Delivering value for consumers during the deep transition

We are navigating the deep transition through coordinated, one system planning — focusing on investments that deliver near-term savings and long-term value for consumers by reducing transition risk and avoiding higher future costs.



This chapter describes how Transgrid is prioritising affordability and value for consumers as we plan how to keep the grid reliable and secure amid the many moving and changing parts of the deep transition.

A year into the deep transition — by far the most dynamic phase of the energy transition between the initial ramp-up and the new transitioned era — the system is changing fast. Our forecasts have discovered many new loads emerging in new places. The largest are being driven by the explosion of energy-hungry data centres, requiring constant, high-baseline continuous load. In parallel, system outcomes are also being shaped by electrification, the addition of new generation and grid-scale batteries, and accelerating consumer investment in household batteries.

These intersecting, evolving factors may change the lowest-cost pathway to a reliable modern grid. But delivery confidence remains critical. Multiple credible futures are possible. Regardless of which one eventuates, we must ensure the network remains capable of delivering stable, secure and resilient outcomes as system conditions evolve. And we must do so while prioritising affordability and customer value. As Section 1.2 explores, this requires us to both manage costs tightly and also invest in mitigating the community impacts of our works.

Section 1.3 explains how growing demand from data centres is reshaping transmission planning and how Transgrid is working to support investment in the digital economy while protecting affordability and reliability for consumers.

For consumers, the system-wide coordination across planning and operation outlined in Section 1.4 has never been more important. Good planning helps reduce costs by ensuring the right investments are made at

the right time. Major infrastructure projects are facing increasing pressure from supply-chain constraints and workforce availability. Failure to coordinate across project delivery and system services could increase both consumer costs and risks to system reliability.

Where possible, the lowest-cost solution is often making better use of the network we already have. As Section 1.4 notes, and Chapter 3 explains in detail, Transgrid has identified where existing network capacity can be used more effectively, where operational or non-network solutions can defer more expensive infrastructure, and where timely investment will avoid higher costs in the future. We are also working to coordinate transmission, generation, storage and customer connections so infrastructure develops in step, reducing duplication, avoiding unnecessary constraints and supporting a more competitive wholesale energy market to reduce power bills.

The developments highlighted in this chapter make it essential for planning to become even more adaptive. Section 1.5 describes how we have evolved scenario planning to identify no-regrets investments that will deliver consumer value under all outcomes. We also explain how our asset renewal programs are protecting communities by supporting safety and energy reliability. Well-planned renewal of our infrastructure reduces the risk of unplanned outages, avoids higher long-term costs and makes better use of existing infrastructure.



Keeping costs down also requires the timely connection of renewable generation and storage to the grid. Generator connections are at historically high levels. But as more elements are added, transmission connections are becoming more complex. We need to speed up the process for assessing each application against system security, stability, operability, fault level and network impact requirements. Section 1.6 presents the changes Transgrid is making to improve connection efficiency and certainty as we go through the deep transition.

Looking beyond 2035, we are continuing to plan for the new transitioned era, when additional renewable development may be required to power the electrified

NSW economy. Section 1.7 examines remote renewable energy opportunity areas to support the next wave of transmission development beyond the deep transition.

As this chapter demonstrates, Transgrid’s planning approach remains adaptive, supporting multiple development pathways and technologies while preserving flexibility in decision-making beyond the current delivery horizon. At a time of intense cost-of-living pressures, our approach is designed to provide relief as quickly as possible and avoid higher than necessary future costs for consumers.

1.1 Planning must become more flexible

Unlike the earlier ramp-up phase, planning in the deep transition must account for an electricity system reshaped by a series of concurrent structural shifts in supply and demand, increasing system interdependencies and operational requirements.

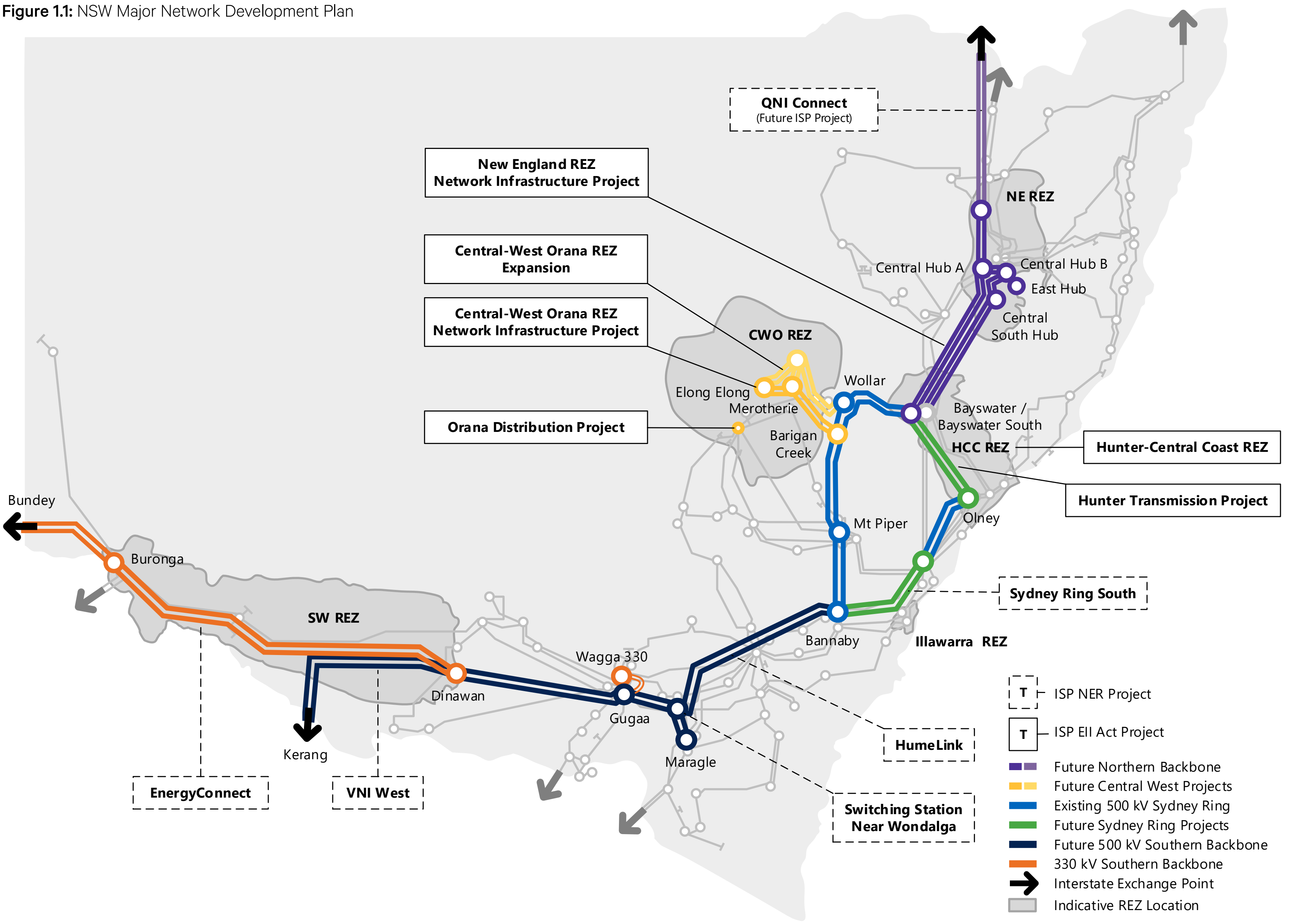
1.1.1 A fundamentally changing system

The exit of coal-fired power stations continues to evolve in response to policy settings and as Transgrid delivers major and minor transmission upgrades to meet the network's system strength needs. The ageing thermal fleet is experiencing declining reliability, with increasing forced outage risks as assets near retirement. This places growing pressure on system reliability and reinforces the need for timely replacement capacity.

As Chapter 2 explains in detail, the transmission buildout is accelerating, with major projects essential to connect renewable energy to load centres and manage demand spikes across the network. The expanded transmission backbone will connect NSW with energy from the state's new REZs, as well as from SA, VIC and QLD.

The deep transition is the period in which renewable generation, storage and consumer energy resources scale simultaneously while coal generation progressively exits the system. Our plans account for the fact that, by the new transitioned era in 2035, NSW will require more than 26 GW of additional utility-scale wind and solar capacity, supported by a stronger transmission backbone and 11 GW of additional utility storage.⁴

Figure 1.1: NSW Major Network Development Plan



4 AEMO 2026, AEMO 2026 ISP generation and storage outlook, 2026 ISP - Step Change - Core, Optimal Development Path, Transgrid analysis
13 | Transgrid | 2026 Transmission Annual Planning Report | 1.1 Planning must become more flexible

Figure 1.2: NSW Major Network Development Plan

Southern Backbone (2026–early 2030s)

1,150 km

3 GW

Line

Renewables plus Snowy 2.0

2026

EnergyConnect Stage 2

In-service 2026*, enabling the progressive sharing of energy and unlocking renewables between NSW, SA and VIC.

2027

HumeLink

In-service by late 2027, enabling the integration of new, clean energy from South West REZ and unlocking the capacity of Snowy 2.0 to reach the Sydney Ring.

2029–early 2030s

VNI West

Transgrid is examining a staged approach to VNI West delivery. Stage 1 in-service in 2029 to unlock clean energy from South West REZ, and the full interconnector in-service by the early 2030s*, facilitating greater energy sharing between NSW and VIC and connecting into EnergyConnect.

*Capacity will be released to market progressively following successful inter-network testing, which is dependent upon market conditions

Sydney Ring (2029–2034)

220 km

10 GW

Line

Renewables

2029

Hunter Transmission Project

Transgrid is supporting delivery of this Priority Network Infrastructure Project, which is being planned by EnergyCo in its role as Infrastructure Planner. The project, targeted for an in-service date of November 2029, will reinforce supply to the Sydney, Newcastle and Wollongong load centres and facilitate the transfer of electricity between the Central-West Orana and New England REZs and Sydney. Transgrid is also supporting the role of the 850 MW Waratah Super Battery in unlocking additional transmission capacity into the Sydney region until the Hunter Transmission Project is complete.

2034

Sydney Ring South

Transgrid is considering multiple options, including staged approach to delivery, through the RIT-T. The expected in-service dates range from 2030 for new or upgraded substations, to 2034 for a new transmission line, which would give the Sydney region greater access to energy flows from southern NSW.

Northern Developments (2034–2042)

400–500 km

8 GW

Line

Renewables

2034

New England REZ Network Infrastructure

Enabling New England REZ Stage 1 and 2 capacity to reach the Sydney Ring. This project is being delivered by EnergyCo as the Infrastructure Planner via a contestable process to appoint a network operator. Transfer capacity is planned to increase to 6 GW by 2034, with a longer-term target of up to 8 GW.

2042

Future QNI Connect

Identified as a Future project in the 2026 Final ISP. In-service by 2042, enabling greater sharing of renewable energy between NSW and QLD.



NSW households and businesses are set to invest in 15 GW of rooftop solar and 10 GWh of small battery storage by 2035. Total rooftop solar capacity is forecast to grow from 9 GW today to 15 GW by 2035, reaching about 20 GW by 2045.⁵

These consumer energy resources (CER) reduce demand from the grid at times, but they don’t remove the need for transmission. The network is still essential to effectively manage variability, maintain system strength and coordinate across a wider range of assets and locations to deliver system stability.

This is why our Sydney Ring South modelling demonstrates that transmission investment will be needed, even as CER continue to grow.⁶ This position will continue to be reassessed as CER adoption evolves and new data becomes available.

CER are an important part of the energy transition, allowing consumers opportunities to lower their power bills and, potentially, to reliably reduce peak demand. But their presence makes the grid more complex, requiring careful planning and coordination to enable consumers to continue to invest in CER.

CER and grid-scale renewable generation are both expanding rapidly. Alongside growing household investment in rooftop solar and batteries, Transgrid has a significant connections pipeline of renewable energy sources and supporting infrastructure underway. But far more generation of all types will be needed to power the future electricity system.

Demand is increasing and changing shape

Energy demand is growing right across the network – not only in traditional industrial centres – driven by electrification, population growth, industrial decarbonisation and large, concentrated new loads, particularly data centres (see Section 1.3 and Chapter 4). New demand is emerging in new locations and becoming more variable as households, businesses and industries change how they use electricity.

Demand patterns are also becoming more complex and less predictable as we move through the deep transition. While summer is expected to remain the time of highest electricity demand across NSW, autumn demand is increasing and some parts of the network, including the ACT, are experiencing peak demand in winter.⁷

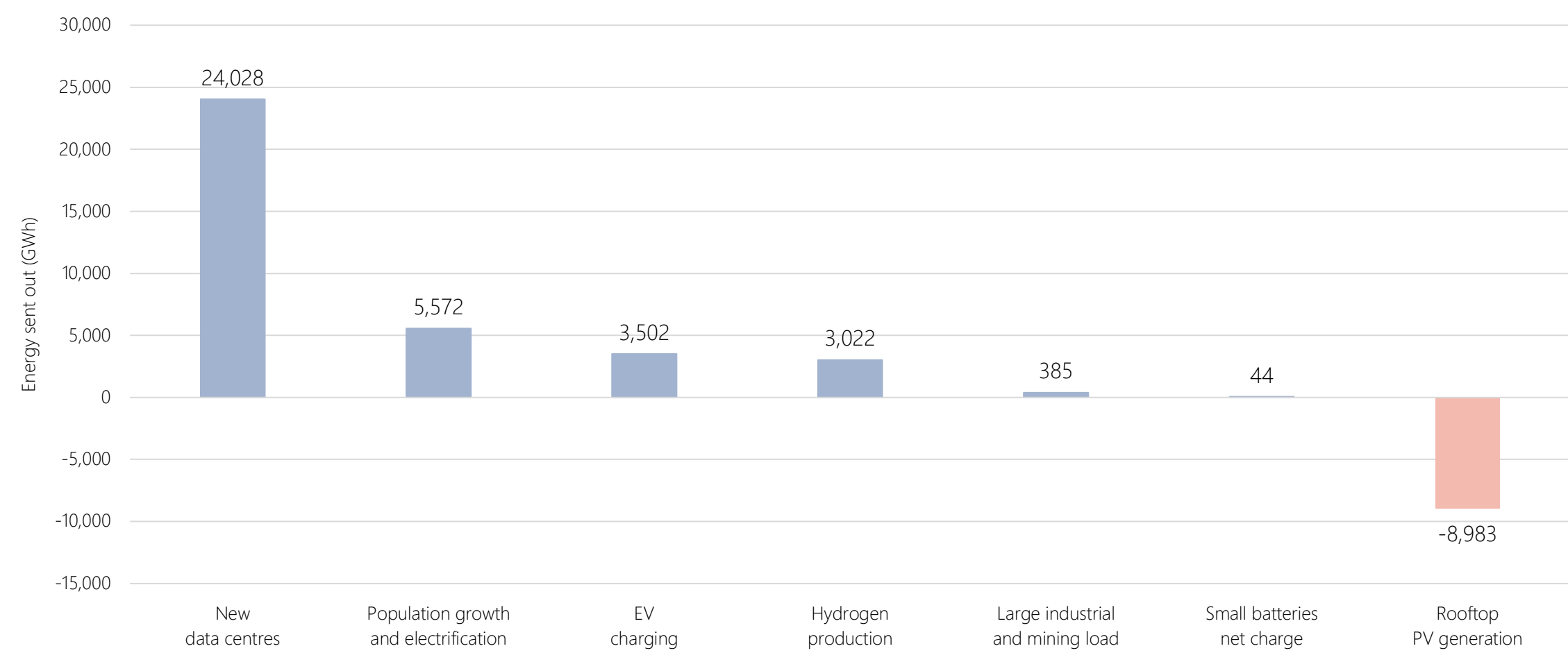
CER are continuing to reshape residential grid demand. Minimum demand is projected to fall to 2,000 MW (PoE50) by 2029, before beginning to rise again as growing demand from data centres and other large loads outweighs the impact of rooftop solar. But this trend will not be consistent across the network. Most regional bulk supply points are forecasting periods of negative demand, highlighting the increasingly dynamic and ever-evolving nature of demand in the deep transition.

Data centre development represents a step change in both the scale and concentration of demand (see Table 4.2), with dramatic increases in data centre demand projections (see Figure 1.3). Forecasts by Baringa show that, under the most-likely scenario, existing data centre projects are expected to reach approximately 696 MW peak demand in 2035 – a 69 per cent increase from 2026 existing levels. In parallel, new committed projects

are projected to grow to approximately 2,796 MW by 2035. Data centres present an important opportunity to grow Australia's digital economy, and this growth must be realised while safeguarding the interests of all energy consumers and the reliability of the system. Section 1.3

explains Transgrid’s approach to ensuring data centre investment is shared fairly while protecting consumers, supporting the energy transition and safeguarding the NSW digital economy.

Figure 1.3: Change in energy sent out FY26 to FY35, Transgrid modelling



5 Energia 2026, Transgrid Solar and Battery Uptake and Impact Forecasting Report
6 Sydney Ring South Regulatory Investment Test for Transmission - Project Assessment Draft Report, page 63
7 Bulk supply point projections, Appendix 2

The evolving system changes operability and planning requirements

The structural shifts in demand and supply will present challenges for both operability and system security. Their consequences are already evident in day-to-day operations, with the number of notifications received by control room operators per shift expected to nearly double between 2025 and 2030 as more generators connect to the network.

As system interdependencies increase, the cost of fragmented planning also rises. A more dynamic and operationally complex system needs more advanced and granular forecasting.

Transgrid is responding by coordinating more closely with all system proponents and taking a more flexible approach to network investment. We are placing greater emphasis on coordinated, whole-of-system planning, supported by clearer roles and a stronger “one system, one plan” approach across Transgrid, AEMO, EnergyCo, DNSPs, government, generators and major loads (see Section 1.4).

1.1.2 Outlook on deliverability

Transgrid uses a structured, evidence-based approach to planning while drawing from our experience delivering major projects, including EnergyConnect. Delivery confidence comes from:

- Incorporating insights from delivery and engineering teams
- Testing timing, resourcing and portfolio interactions through a deliverability plan
- Actively managing peak delivery periods using optimised outage planning and alternative delivery approaches.

As a result, our assumptions better reflect practical constraints, such as supply-chain capacity, workforce availability, outage windows and project sequencing. This provides a more realistic view of what can be delivered and when. Various factors contribute to assessing deliverability of projects in the deep transition.

- **Global and Australian supply chain pressure**
The global and Australian transmission supply chain is under sustained pressure from concurrent infrastructure expansion, with cost increases and delivery challenges now evident across multiple asset classes. Transmission line and substation costs in Australia have increased by 25–55 per cent and 10–35 per cent respectively since the 2024 ISP driven by material and equipment price escalation, workforce shortages and the volume and complexity of projects under development.⁸
- **Workforce capacity and capability constraints**
Delivery can be challenged by the availability of specialised skills, particularly in commissioning, technical and senior construction roles. Transgrid’s



Christian Johane - Secondary Systems Technician Grade 1

workforce assessment indicates that the deep transition can be supported through a combination of internal capability, targeted capability development and external delivery partners, with the remaining constraints actively managed through various delivery approaches.

- **Long-lead equipment and procurement timing**
Transgrid’s supply chain assessment identifies long-lead equipment, OEM production-slot availability, warehousing and logistics as material deliverability constraints. Critical equipment, including transmission-class transformers, reactive plant, GIS/switchgear, HV/ EHV cable and protection/control equipment, has extended lead times and limited OEM production capacity. Procurement timing is a sequencing

constraint, requiring early commitment based on required delivery dates rather than design maturity to avoid programme delays.

- **Sequencing and delivery capacity constraints**
Sequencing is an integrated position that combines the four deliverability dimensions into a single year-by-year profile for the portfolio. Constraints that determine procurement trigger dates include outage windows, workforce and delivery partner capacity, and supply chain lead times. The need to maintain reliable system operation places hard limits on when projects can be delivered, shaping the feasible delivery schedule.

Together, these four dimensions and the system planning priorities determine how the delivery project is sequenced.

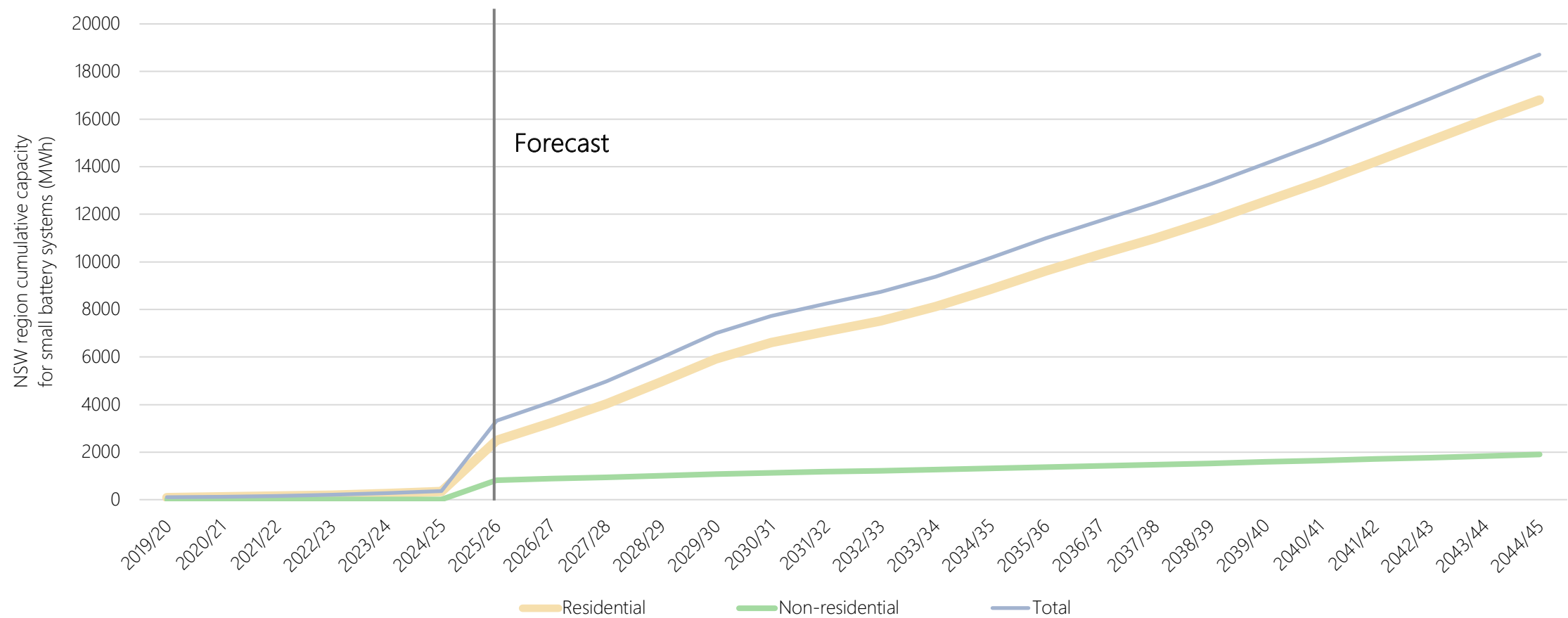
1.2 Delivering long-term value for consumers

1.2.1 Consumer expectations are evolving

The energy system may be changing rapidly, but consumer expectations remain constant. As the energy system evolves, consumers expect the transition to be delivered efficiently, with minimal impacts and at the lowest possible cost, while ensuring the network stays safe, secure and reliable — for everyone from renters in tiny studios to our largest commercial and industrial customers.

- These expectations guide every stage of Transgrid's planning and delivery:
- Making prudent investment decisions to keep long-term costs as low as possible
 - Maximising the participation of generator and storage customers to support competition in the national energy market and put downward pressure on wholesale energy costs for all consumers
 - Building just ahead of need so new supply and demand can connect without unnecessary delays
 - Delivering responsibly by minimising impacts on customers, landowners and communities.

Figure 1.4: NSW Region cumulative capacity (MWh) for small battery systems - historical and forecast (residential and non-residential)⁹



Helping households take advantage of energy resources

The uptake of rooftop solar, home batteries and electric vehicles continues to accelerate faster than previous forecasts (see Chapter 4). If Transgrid is to enable consumers to benefit from these opportunities, the timing and connection of major transmission investments must be coordinated. Coordination helps prevent constraints, outages or network changes from limiting export capability — or reducing the value of consumer-led generation and storage.

Working efficiently to manage costs tightly

Consumers expect the transition to be delivered with cost discipline, ensuring growing investment needs are managed efficiently while minimising impacts on consumer bills. Transgrid applies a robust sequencing approach for projects to ensure that expenditure is justified and timely, delivering long-term value.

Delivering projects responsibly to maintain social licence

Delivering the energy transition depends on building and keeping the trust and support of the communities hosting new infrastructure.

The scale and pace of the transmission build places real demands on landowners and communities. Maintaining social licence is therefore essential – not only for those living near projects, but for consumers across NSW and the ACT. When projects are delayed because community trust is lost, the impacts are felt across the electricity system. Costs increase, reliability can come under pressure, and the benefits of new, lower-cost generation take longer to reach homes and businesses.

Building trust is an ongoing responsibility, earned through early engagement, transparent decision-making and a commitment to delivering lasting benefits alongside new infrastructure.

For example, in HumeLink, in partnership with Lumea, Transgrid is using existing and new transmission infrastructure to improve mobile coverage in regional areas that have historically had limited service. Responding to residents' needs identified through community engagement, these upgrades support emergency response during bushfires, medical incidents and road accidents, while providing residents, landowners and visitors with more reliable access to digital services. By looking beyond construction, we aim to leave a positive legacy for the communities helping to enable the energy transition.

⁹ AEMO's DER dashboard (2026); Energeia forecast (2026).



1.2.2 Navigating key decisions with cost discipline

As investment scales through the deep transition, the choices we make now about when and how to invest in network infrastructure will shape consumer bills, reliability, resilience and safety over the long term. Transgrid chooses the best path for consumers by considering:

- **Where investment is truly necessary**

All consumers — large and small — expect affordable electricity today, but they also expect the network to be ready for the future. Transgrid's planning balances the cost of investment today against the higher costs and reliability risks that can arise if essential infrastructure is delayed or not delivered. We test to make sure each investment is essential and will deliver long-term value to consumers.

- **What must happen to keep our electricity safe, secure and reliable**

All consumers — large and small — expect the lights to stay on, even as the energy system changes. Our planning supports reliable, day-to-day operation while strengthening the network to withstand future challenges, including more extreme weather, an increase in cyber attacks, changing demand patterns and a more complex power system.

- **Which solution is the best value for money**

Consumers benefit when the right solution is used for the right problem. Transgrid considers both network investments and alternative approaches, selecting the option that delivers the best long-term value while maintaining reliability and security.

- **Whether we are delivering at the right pace**

Consumers want the benefits of the energy transition delivered as quickly as possible — but not at any cost. Transgrid balances the need to deliver projects efficiently with thorough planning, testing and community engagement, recognising that well-planned projects are more likely to be delivered on time, at lower cost and with lasting community support.

This Transmission Annual Planning Report sets out system needs, risks and potential investment pathways that inform our investment decisions, helping stakeholders understand how different choices are likely to affect consumer outcomes.



1.3 Data centres and the transmission network

Data centres have emerged as one of the largest new sources of electricity demand in NSW. The growing adoption of artificial intelligence (AI), cloud computing and digital services is driving unprecedented global investment in digital infrastructure, with considerable interest in Australia as a data centre destination. NSW is well positioned to capture this opportunity due to its large customer base, established telecommunications infrastructure and skilled workforce.

At the same time, the scale, pace and concentration of proposed data centre developments are fundamentally shifting the shape of electricity demand growth, requiring a different approach to transmission planning. NSW is already home to roughly 100 data centres of varying sizes. However, these facilities have traditionally connected to the distribution network. Now, the industry’s shift to very large facilities, at times adding more than 1 GW of demand in a single location, has pushed some data centres to seek direct connection to the transmission grid.

Under the National Electricity Rules (NER), the grid is "open access", meaning Transgrid must process all applications to connect. This represents a challenge for transmission planning. Multiple, large data centre projects often seek to connect in the same area and within relatively short timeframes. But whereas a data centre can develop a new site in two to three years, delivering major transmission infrastructure can take up to a decade. Planning is further complicated by the reality that many projects are developed simultaneously by proponents who ultimately compete for the same customers (e.g. Microsoft, Amazon Web Services, Google), making traditional forecasting approaches redundant.

Well-planned data centre development will not only support the continued growth of the NSW digital economy, but also unlock broader benefits for electricity consumers. More demand means the network is used more efficiently, costs are spread across more users. But these benefits will only be delivered in full if data centres contribute appropriately to the required network upgrades – and adhere to technical performance standards to support reliability.

Transgrid recognises that, as well as careful management of network capacity and robust demand forecasting, new commercial and regulatory arrangements will be required to protect energy affordability and reliability as large data centres connect to the grid. The rest of this chapter highlights how Transgrid is working with government stakeholders to protect NSW consumers while facilitating the growth of this important industry.

1.3.1 Response to the evolving data centre industry

Transgrid is working closely with governments, regulators, network businesses and industry participants to ensure regulatory frameworks evolve in response to the changes large-scale data centre demand will make to electricity consumption patterns. We support policy settings that allow NSW to capture the economic benefits of data centre investment, while protecting affordability and reliability, in accordance with three principles:

1

It is a major economic opportunity NSW should actively support it

Data centres are a major opportunity, and NSW should remain an attractive place to invest. Clear and predictable policy settings can help new network capacity become available sooner, while maintaining appropriate safeguards.

2

Consumers must be no worse off

Data centre growth should not increase electricity network costs or reduce reliability for households and businesses. New developments should pay their fair share of the network infrastructure needed to connect them.

3

Speed matters – rules must be practical to implement now

The data centre industry is growing rapidly, so reforms need to be introduced without unnecessary delay. Wherever possible, they should build on existing regulatory frameworks and network processes rather than create new complexity.

To support efficient investment, Transgrid is working with governments and regulators on a range of reforms, including:

- Stronger commitment mechanisms for large-load connections
- User-pays approaches for network augmentations
- Commercial arrangements that better align contracted capacity with actual network utilisation
- Improved planning coordination across transmission and distribution networks.

Transgrid is also investigating opportunities to better integrate renewable electricity supply, on-site energy storage and demand-side flexibility into future data

centre developments. Flexible operation during periods of system stress – through BESS or intelligent load scheduling – has the potential to unlock additional room for growth while protecting other network users.

As the data centre industry evolves and grows, Transgrid will continue updating its demand forecasts, planning assumptions and connection frameworks. This will help ensure the transmission network supports both the energy transition and the growth of the NSW digital economy. And it will do so in a way that is efficient, reliable and in the long-term interests of electricity consumers.

1.3.2 Data centre demand

Interest in developing data centres in NSW has increased substantially over the past two years. In that time, Transgrid has received connection enquiries totalling ~20 GW of demand, roughly twice the current NSW current peak demand. However, only a proportion of these projects are expected to proceed to energisation as some enquiries are speculative or duplicated across networks.

Most enquiries seek connection in Sydney, with particular interest in Western Sydney, an area with substantial industrial zoning and power infrastructure close to the major businesses and consumers that data centres aim to serve. Some enquiries have also been received for the Riverina, Hunter and Central West regions as proponents start to respond to network and other limitations in the Sydney metropolitan area.

Project maturity varies considerably, ranging from advanced developments with secured land, financing and end customers through to early-stage speculative proposals. In July 2026, Transgrid had signed connection agreements with proponents representing 1.5 GW of demand, within the Greater Sydney region.

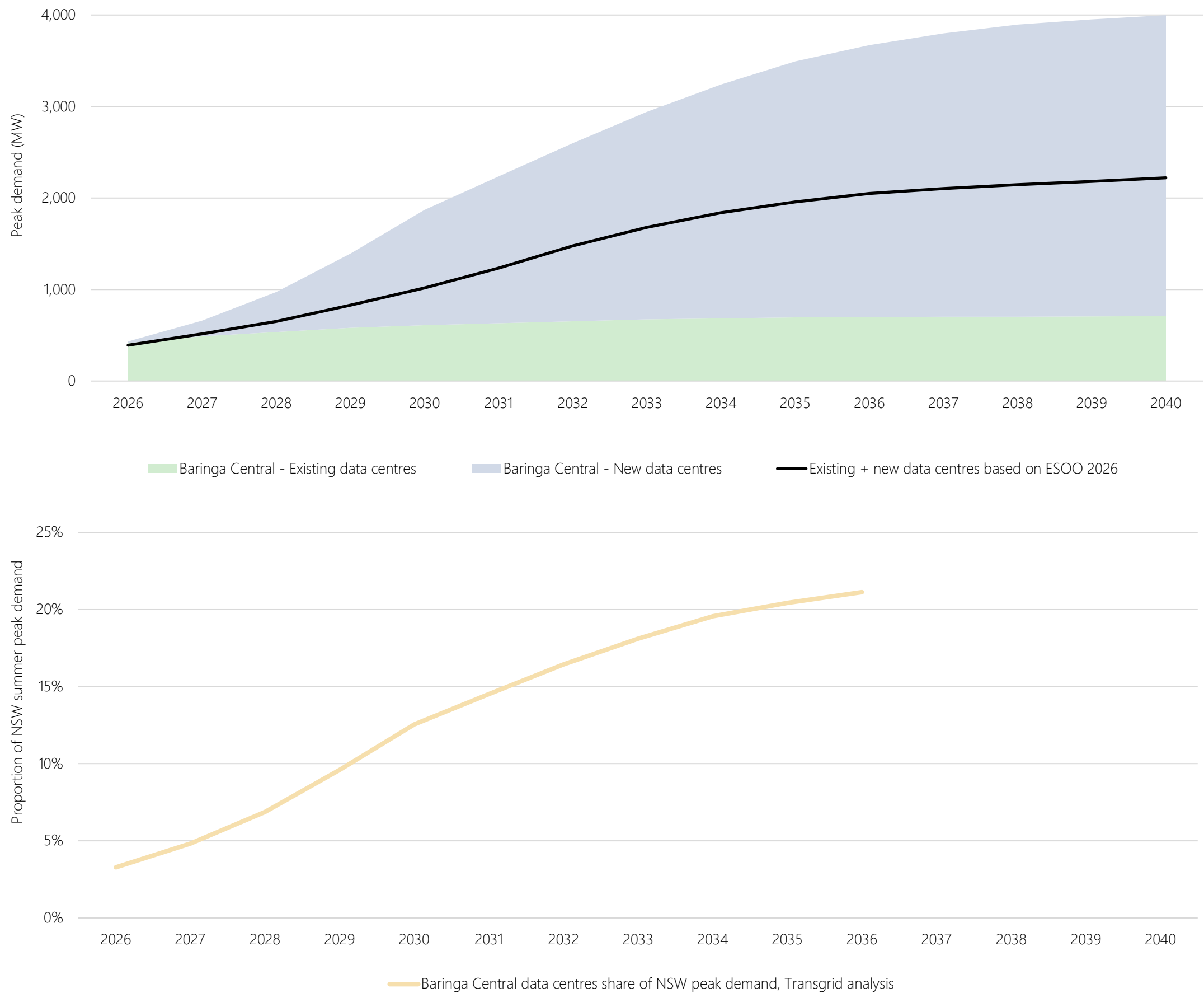
The underlying trends driving data centre development are expected to continue over the coming decade. Growth in both the training of AI and its household and business use, increasing adoption of cloud computing and continued digitalisation across the economy will all contribute to sustained investment in data centre capacity. Thus, data centres will become an increasingly important component of NSW electricity demand over the next 10 years.

1.3.3 Forecasting data centre load

Forecasting data centre demand presents unique challenges. To improve forecast accuracy, Transgrid has collaborated with our planning partners, Ausgrid, Endeavour Energy and Evoenergy, to develop a consistent, NSW-wide forecast of future data centre demand. This work has been undertaken by independent consultants, Baringa Partners, who have extensive experience forecasting data centre growth across the world. The Baringa forecasting methodology combines connection data from each network with detailed assessments of project maturity, duplication across networks and best-practice assumptions on load factors and ramp-up rates to produce a single, coordinated forecast for NSW and the ACT.

This 2026 Transmission Annual Planning Report adopts the Central Scenario from the Baringa forecast as the primary planning assumption for future data centre demand, with some minor adjustments.¹⁰ The Scenario reflects Transgrid's current assessment of the most likely pathway for demand growth. Compared with previous forecasts, Baringa's analysis indicates materially higher energy consumption from data centres, growing to around 3.5 GW of peak demand by 2035. Baringa estimates this is approximately two times the equivalent peak demand represented in AEMO's 2026 ESOO Step Change scenario, which Baringa derived by converting AEMO's published energy forecasts into peak demand using its assumptions. The difference between the two illustrates both the increasing importance of data centres in driving overall electricity demand growth and the uncertainty surrounding the pace of industry development.

Figure 1.5: Baringa Central scenario forecast of data centre peak demand compared to AEMO 2026 ESOO estimates¹¹



¹⁰ Transgrid applies an adjustment to ensure data centre growth is not double-counted across the data-centre and broader economic inputs to the TAPR forecast. Data centres with a rated capacity <30MW are assumed to be captured in the standard industrial load growth that underpins the economic input to the forecast. This is therefore stripped out of the Baringa Central forecast when incorporated into the TAPR.

¹¹ Baringa applied assumptions to transform AEMO 2026 ESOO's data centre energy forecast from TWh to peak demand MW.

Differences between forecasts may create uncertainty for renewable generation developers and weaken investment signals. To support timely generation development, Transgrid is working closely with AEMO to improve forecast alignment and with government stakeholders to ensure new data centre demand is accompanied by the development of generation capacity needed to meet that demand.

The use of a coordinated NSW-wide forecast provides a more robust basis for system-scale transmission planning than the combination of Transgrid and distributor forecasts, which may include duplicative demand and varying commercial and technical assumptions.

1.3.4 Planning and operating a reliable power system

Maintaining reliability remains a key priority as data centre loads connect to the transmission network. Data centres differ from many traditional industrial loads because they typically exhibit relatively stable electricity consumption throughout the day (though AI-training facilities, not currently common in Australia, can exhibit more fluctuations in demand). While the stable data centre load has positive consequences, such as enabling more use of solar power, it also means that data centres will raise peak demand considerably unless appropriate flexibility or on-site generation is available. Accordingly, Transgrid assesses connection applications against conservative peak demand assumptions to ensure reliability for existing customers.

Transgrid also makes sure that data centres provide the additional voltage support required to accommodate their large, concentrated loads and maintain stable operating voltages of the network. Connection

agreements with data centres include provisions that preserve network security and reliability, such as the ability to curtail load in the event of system stress and agreed technical performance standards that allow data centres to ride through network disturbances. This planning approach will ensure the transmission network continues to deliver reliable electricity to households, businesses and industry while accommodating the growth of this new industry.

1.3.5 Supporting sustainable data centre development in NSW

Transgrid supports continued investment in data centres as an important contributor to economic growth, innovation and the digital economy. However, the location of future developments will play a significant role in determining both connection timeframes and overall infrastructure costs.

Existing capacity within the Sydney region is now largely committed. This does not affect Transgrid's continued planning for forecast growth and reliability needs of existing households and businesses. Meaningful additional capacity will not become available until major transmission projects such as Sydney Ring South (currently seeking regulatory approval) are completed in the mid-2030s. The limited remaining capacity is due to growing demand, driven by population growth and electrification of households and businesses, and other commercial and industrial loads. It also reflects the addition of 1.5 GW of new data centre projects connecting to the transmission network.



As a result, Transgrid has advised data centre proponents seeking to connect to the transmission network in the Sydney region that they will need to fund local augmentations and, subject to regulatory arrangements, contribute to larger upstream network investments to increase network capacity. In doing so, we are setting expectations that, in NSW, the costs of network upgrades to support data centre connections will be borne by those who drive the need for them — and consumers will be protected. Where data centres fund the incremental infrastructure they require, their additional demand can benefit consumers by improving network utilisation and spreading largely fixed costs across a broader customer base.

Transgrid’s position on data centres is aligned with the NSW Government’s Data Centre Guidelines, released in August 2026.¹² These guidelines cover a broad range of topics, including environmental standards, job creation and local community enhancements. The Guidelines also reinforce that, while the Government supports data centre development, this should “impose no net cost to consumers and communities”. It specifically calls upon energy utilities such as Transgrid to ensure any augmentations required for data centres’ connection to the grid are paid for by the data centres, and not by consumers, which aligns with our existing approach.

Transgrid continues to work proactively with proponents to identify suitable connection locations, communicate emerging network constraints and provide greater transparency regarding available capacity through planning publications and online network information. In addition, [Transgrid’s Network Capacity Allocation policy](#) sets a clear standard for when transmission capacity is allocated to specific load applications for planning purposes.

1.3.6 Regional NSW data centre connection opportunities

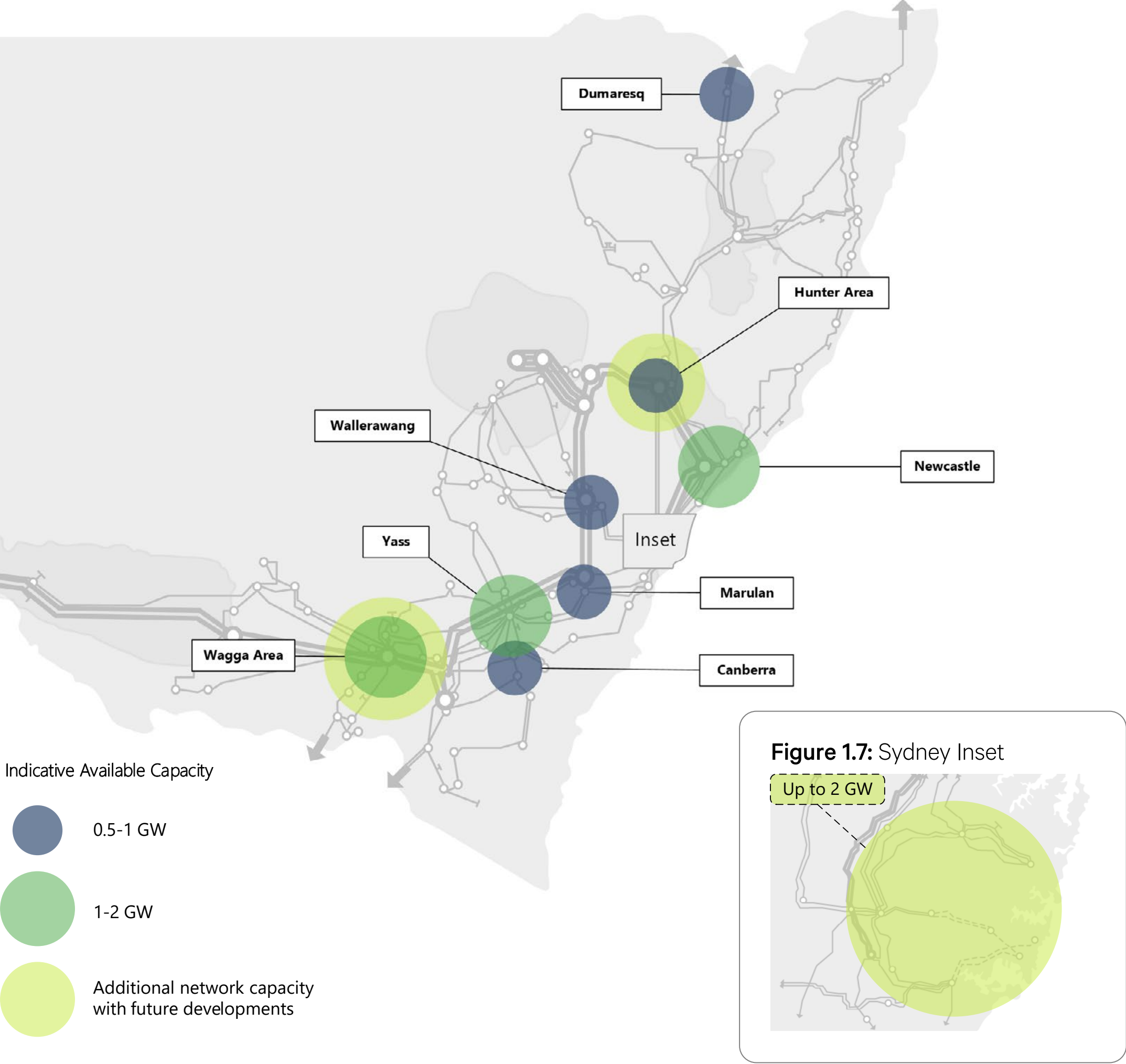
Another way of ensuring that data centres develop in a way that does not impose additional costs on the network is to look at other areas of NSW beyond Sydney. Locating new data centres closer to renewable generation, such as near Renewable Energy Zones (REZs), can reduce transmission congestion, improve utilisation of existing infrastructure and more efficiently integrate new renewable energy into the power system while supporting regional economic growth.

Figure 1.6 provides an overview of potential large load development zones, based on August 2026 data, determined by availability of sufficient transmission capacity. The figure should be considered an indicative forecast of available network capacity. It does not account for availability of generation or other factors necessary for large-load development. Additional network capacity is expected to emerge in regional NSW as major network developments, including HumeLink and the Hunter Transmission Project, are delivered. With these projects, and where supported by targeted network augmentations, regions such as Wagga Wagga and the Hunter could offer large-load connection opportunities comparable to those available in the Sydney region.

Transgrid is separately working to ensure transmission infrastructure stimulates the development of generation in step with data centre growth, for example through its projects connecting the New England and Central-West Orana REZs to the network. Transgrid is advocating for new legislation to ensure data centres invest in generation equivalent to their demand – an important requirement to prevent unnecessary increases in wholesale power prices.

Regional NSW data centre connection opportunities

Figure 1.6: Indicative large-load hosting capacity in NSW (2026 and 2030 outlook). Comparison of indicative transmission capacity available for large-load connections as at August 2026 and following the delivery of major network developments, including HumeLink and the Hunter Transmission Project (2030 outlook).¹³



¹² https://www.infrastructure.nsw.gov.au/media/4jlictae/id0073_nsw-data-centre_guidelines.pdf

¹³ Preferred large-load development zones in NSW based on a snapshot using data from August 2026. Available capacities are subject to change due to the evolution of Transgrid’s connection pipeline, developments in the distribution networks and in renewable generation, and regulatory approval of major transmission projects. The figure is a guide and does not constitute a guarantee that capacity will be available at the highlighted locations. Available capacities across locations are not necessarily cumulative, as they may be constrained by common transmission network limitations. Information on how to connect to the Transgrid network can be found on the [Transgrid network connections website](#).

1.4 Working together to enable a reliable, integrated energy system

Our energy system is becoming increasingly integrated, with outcomes no longer determined by individual components, but by how effectively the system operates as a coordinated whole.

1.4.1 A coordinated "one system" approach

Consumers rely on one electricity system, not separate transmission, distribution and generation networks. Delivering the lowest-cost, most reliable outcomes therefore requires planning and investment to be coordinated across the entire system.

Transgrid works closely with AEMO, EnergyCo, DNSPs, governments and regulators, developers, investors and major customers to ensure generation, storage, transmission and demand develop together. This coordinated approach helps improve investment certainty, avoid unnecessary costs and support the timely delivery of new infrastructure.

The NSW Transmission Planning Review reforms are strengthening this approach by clarifying planning roles and introducing a coordinated NSW System Plan led by EnergyCo to guide long-term network development. Within this framework, Transgrid continues to play a central planning and delivery role, maintaining its core network, connections and system security functions (see Appendix 3).

We will also continue to work with other planning bodies to translate "one system" planning into coordinated delivery by aligning project sequencing and timing, managing system interdependencies, and supporting efficient connection of generation and load.

In practice, this includes:

- Coordinating the sequencing of transmission projects with REZ development to ensure network capacity is available in line with generation buildout
- Working closely with DNSPs to manage interactions between transmission and distribution networks as increasing volumes of CER connect
- Aligning the connection of large loads, generation and storage with network capability
- Coordinating outage planning and access to the network to support both construction and commissioning activities while maintaining system security
- Ensuring that transmission development is aligned with the delivery of generation and storage projects to avoid network constraints or underutilisation of assets.

Transmission enables a whole-of-system approach to the transition by connecting REZs, facilitating efficient connection of generation, storage and large loads, enabling consumers and CER, and aligning network capability with evolving system needs. This coordination ensures that investment decisions contribute to an integrated and least-cost outcome for consumers.



Amy Longmuir - 4th Year
Substation Technician
Apprentice
Trent Gillespie - Substations
Field Coordinator
Jess Evans - 3rd Year
Substation Technician
Apprentice
Taylor Madden - Substations
Technician Grade 1

Figure 1.8: New build system strength solutions required out to 2033/34 in the preferred portfolio option

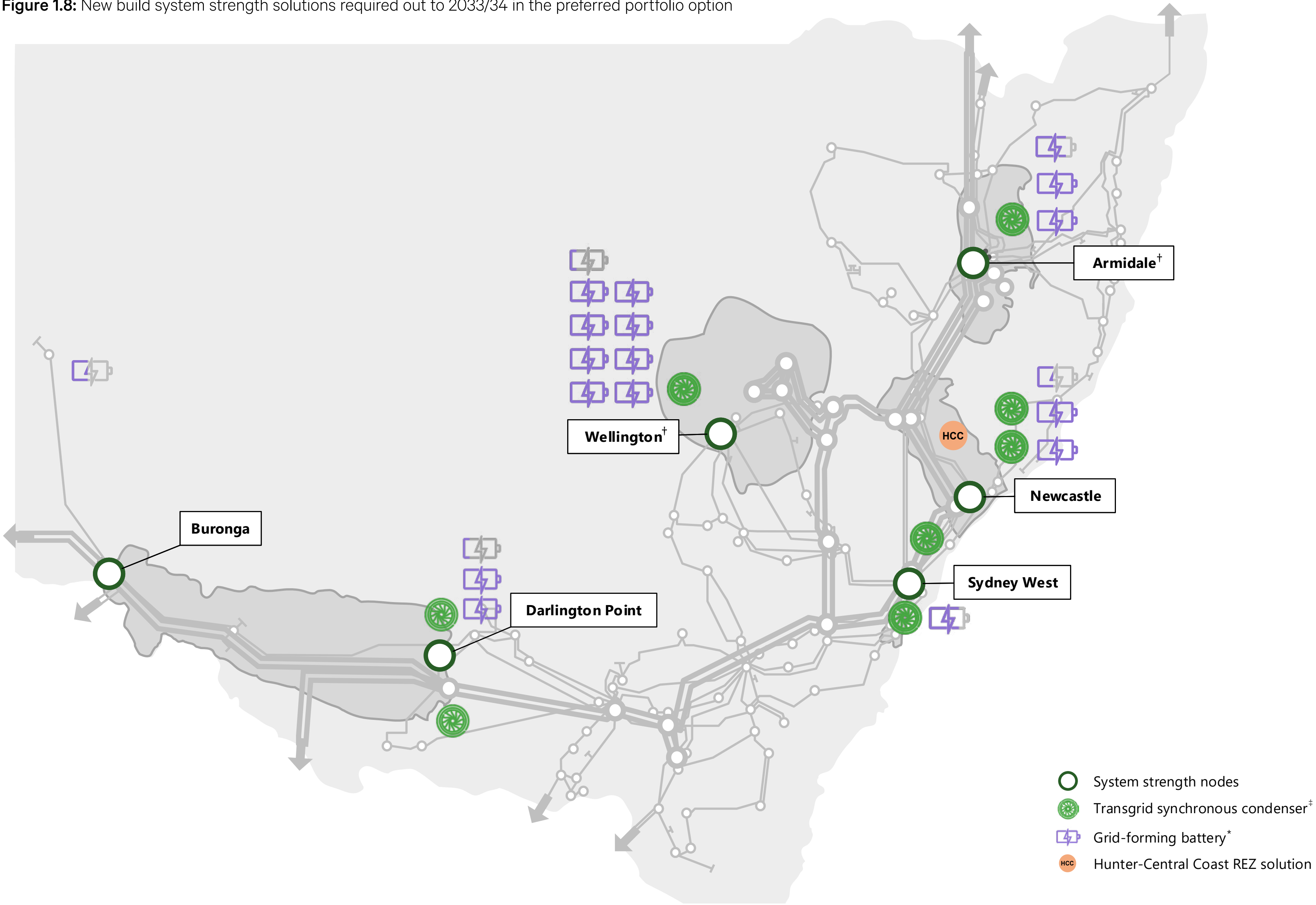
As the energy system evolves coordination becomes even more important. Without it, costs can rise, projects can be delayed and consumers can wait longer to see the benefits of new energy infrastructure. Taking a system-wide view helps ensure the transition remains reliable, efficient and affordable.

1.4.2 Maintaining system strength, reliability and resilience

In December 2025, the NER introduced a system-wide framework to plan and provide system strength services. This change supports a more coordinated approach to maintaining system security as the generation mix evolves, reducing the risk of system strength shortfalls and enabling more timely and reliable connection of renewable generation.

Under the new framework, Transgrid is the System Strength Service Provider for NSW, responsible for planning, procuring and delivering system-strength services to meet standards set by AEMO. Our obligation is to ensure that minimum requirements are met and to support the stable connection and operation of new renewable generation.

Transgrid has undertaken a Regulatory Investment Test for Transmission (RIT-T) to identify an optimal portfolio of network and non-network solutions to meet these requirements. This portfolio includes synchronous condensers, grid-forming battery energy storage systems (BESS), services procured outside the energy market, and the contribution of existing and committed synchronous generators dispatched in the energy market (see Chapter 5).



*Each grid-forming battery icon represents the equivalent contribution to the efficient level of system strength as one synchronous condenser.
*System strength remediation for Central-West Orana and New England REZ is being coordinated by EnergyCo. Transgrid is involved with joint planning on these REZs.
*The inclusion of 'Phase 2' synchronous condensers in the preferred portfolio is conditional on their commercial feasibility being resolved.

1.5 Adaptive planning to drive a resilient, future-ready network

Transgrid is responding to changing demand and connection patterns across the NSW network through adaptive planning that integrates operational and planning considerations to maintain a stable, secure and resilient system.

1.5.1 Planning under dynamic system conditions

Section 1.1 outlined changes in demand and connection patterns through the deep transition. At the same time, the network faces more frequent extreme weather, increasing bushfire risk and rising cyber threats. In response, we are taking a more flexible planning approach that encompasses a broader range of demand scenarios, connection pathways, technologies and solutions.

Adaptive planning helps us respond to evolving system needs throughout the deep transition, test alternative future pathways and make timely, flexible investment decisions. Scenario planning allows us to explore a range of plausible futures for the NSW energy system, identify no-regret and low-regret options, and inform long-term network planning.

Testing a range of future pathways informs Transgrid's understanding of external impacts on network performance and system resilience, supports early identification of emerging risks and constraints, and drives investment strategies that will deliver value to consumers no matter what shape the future takes. With high-quality forecasting, we can identify which future scenarios are becoming more or less likely as new information emerges. This allows Transgrid to adjust plans in response to changing conditions.

Transgrid also uses a range of future scenarios to test how the NSW energy system could evolve under different economic, social and energy transition conditions. These include both most likely and high-growth scenarios for data centre demand, which are applied to stress test demand, connection patterns and emerging risks. Collectively, these elements enable structured comparison across pathways and support robust, flexible investment decisions throughout the deep transition.

1.5.2 Identifying no-regret, staged and optional investments

Given the scale, complexity and delivery constraints of the deep transition, investment decisions must balance commitment with flexibility. Transgrid's adaptive planning approach identifies:

- **No-regret investments that deliver value across all scenarios.** For example, network augmentations that support the integration of REZs and maintain system security
- **Staged investments that can be progressed as system needs become clearer.** For example, incremental expansion of transmission capacity aligned with the timing of REZ development, generation and storage connections
- **Optional investments that preserve flexibility and can be advanced if required.** For example, large-load connections that can be progressed in response to changes in demand or emerging system security requirements.

This approach ensures that investment pathways remain adaptable, while continuing to manage execution risk and preserve consumer value under real-world delivery constraints, including supply chain capacity, workforce availability and construction complexity. Transgrid is building on established project delivery insights while recognising that future outcomes will also be influenced by external uncertainties. By embedding deliverability considerations into planning, Transgrid is better positioned to manage risk, improve project outcomes and deliver critical infrastructure in a timely and efficient manner.

Beyond core investments, Transgrid maintains a broader pipeline of no regrets, staged and optional initiatives that provide additional flexibility. These investments can be brought forward, deferred or adapted in response to changing system needs, supporting a responsive and resilient approach to network development.

1.5.3 Asset renewal to protect communities

Renewing assets before they fail protects consumers and costs less in the long run. Well-planned renewal reduces the likelihood of unplanned outages, mitigates the risk of higher long-term costs associated with potential asset failure and enables the effective use of existing infrastructure.

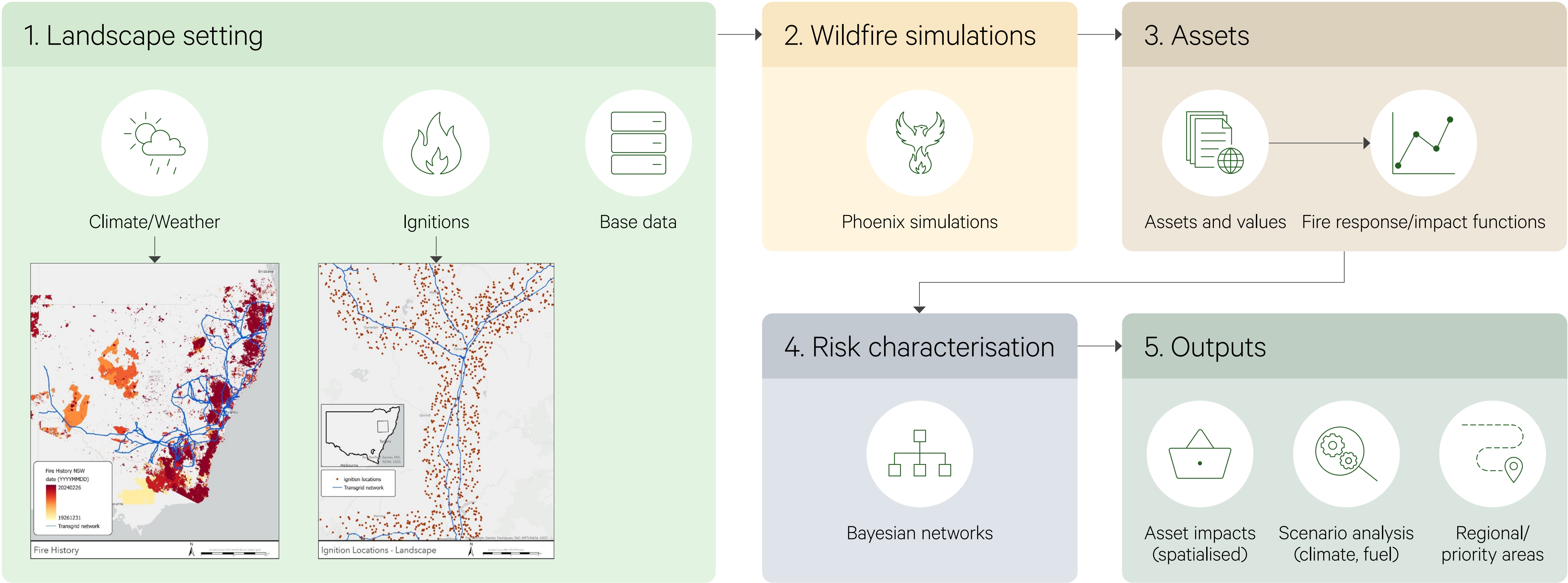
Our asset renewal program delivers community safety, avoids outages, provides resilience to bushfires and extreme weather and promotes lower long-term costs through better renewal timing (see Figure 1.9 for an example of how we prioritise asset renewal).

Our Replacement Expenditure Program supports a safe, secure and reliable electricity network at the lowest, practical cost by:

- Reducing the risks associated with ageing infrastructure and equipment failure
- Ensuring the network remains fit for purpose as new infrastructure is integrated
- Strengthening resilience to bushfires, high winds and other extreme weather events
- Supporting emissions compliance by progressively replacing higher emissions equipment
- Protecting existing assets from physical and cyber-security threats.



Figure 1.9: Transgrid's methodology for bushfire risk assessment to support asset renewal prioritisation



Methodology

Transgrid assessed bushfire risk to and from its network assets using climate data, historical bushfire records, and advanced fire behaviour modelling. The Phoenix RapidFire model was used to identify vulnerable network locations by analysing factors such as topography, vegetation, fuel load, fire history, and asset characteristics.

Industry-developed loss functions were used to estimate damage severity based on factors including ember attack, flame height, and asset material. A Bayesian network was then applied to quantify ignition likelihood and estimate annual bushfire losses.

The bushfire risk methodology has enhanced the ability to prioritise capital and operational funding, enabling the development of optimised programs of work that efficiently manage bushfire risk to as low as reasonably practicable (ALARP).

1.6 Improving connections to enable a timely and efficient energy transition

1.6.1 Reimagining connection

Forecast load and generation growth, combined with coal retirements, are driving a sharp increase in the volume and diversity of connection applications across the network.

This reflects both continued renewable development and the emergence of large new loads, including data centres and electrified industrial demand. As a result, connections have become an increasingly important part of delivering the energy transition.

Transmission connections must be managed carefully. Renewable generation, batteries, inverter-based technologies and large, new loads all require detailed assessment to ensure the network remains secure, stable and reliable. This increases the effort required to assess applications and reinforces the need for connection processes that are timely, transparent and predictable.

At the same time, new generation and major loads must be connected — with the objective of little to no disruption to network operations. Careful planning and coordination are needed to minimise outages and maintain reliable supply for consumers as the network continues to evolve.

In response, Transgrid is working to:

- Improve the current connections framework by streamlining and enhancing the existing end-to-end process to make it more flexible, efficient and capable of managing increasing complexity. This includes process redesign, earlier provision of information and screening, clearer pathway segmentation, improved transparency, and greater standardisation to enable more timely and predictable connections of new renewable generation

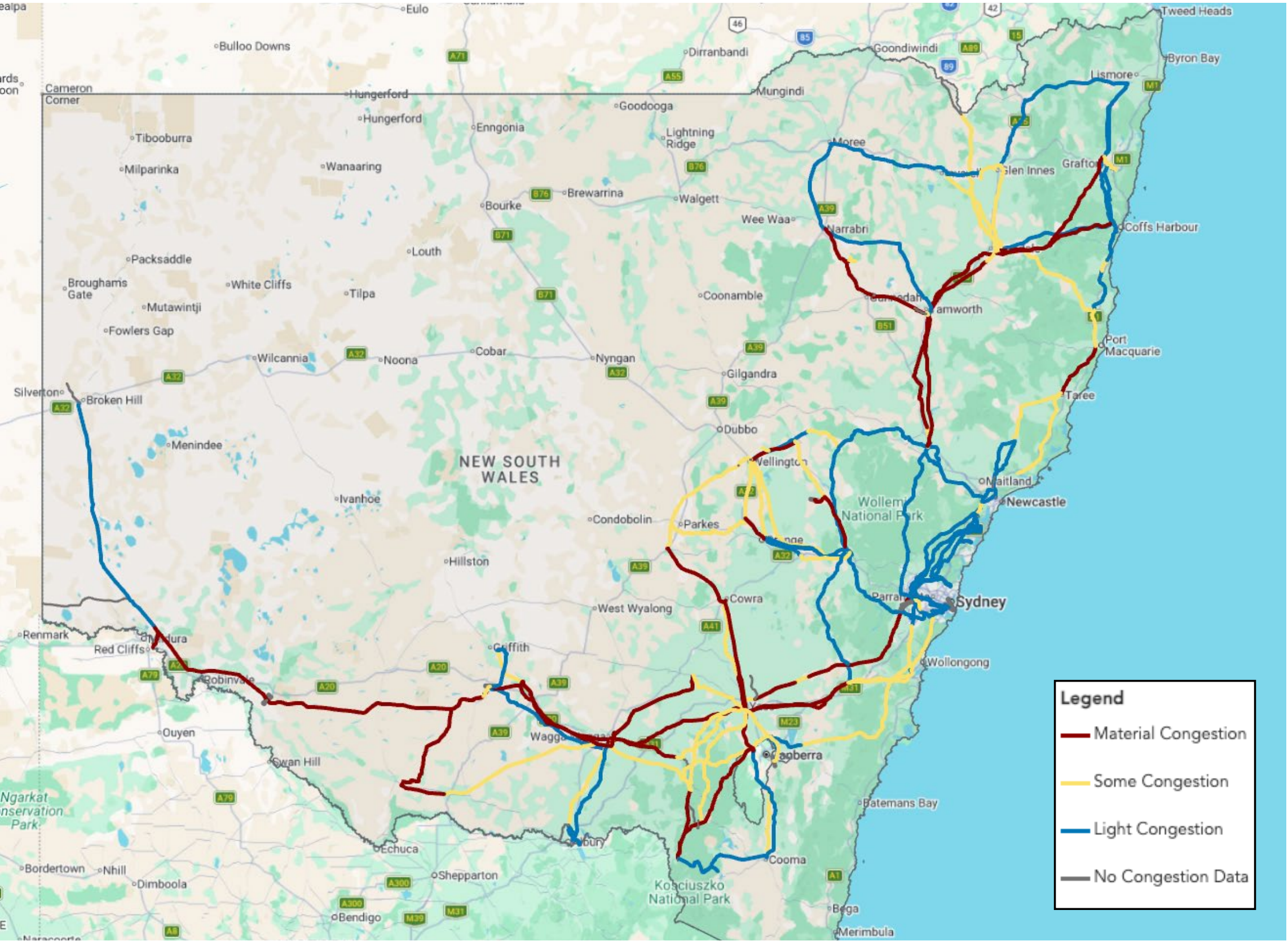
- Adopt best practice by assessing international benchmarks and leading approaches to identify opportunities for broader reform and ensure Transgrid’s framework evolves in line with global developments
- Unlock existing network capacity by identifying and implementing approaches to maximise utilisation of the current network, supporting faster and more cost-effective connections without compromising system security and reliability
- Change the connection process to minimise disruption to projects already progressing through the system.

Transgrid is working with industry to manage these changes while maintaining an efficient delivery program. The outcome will be a clearer, more efficient connections process that gives developers greater certainty and supports faster delivery of new generation and major loads. For consumers, this means new supply can connect sooner, reducing delays in lower-cost generation and maintaining reliability throughout the energy transition.

1.6.2 Transgrid Connection Opportunities Portal

Transgrid supports generation, storage and load developers with rich data in the Transgrid Connection Opportunities Portal, powered by Rosetta. This portal provides an interactive data visualisation and mapping tool that gives proponents direct access to spatial and temporal insights across the NSW transmission network.

Figure 1.10: Existing line congestion visualisation example from the Transgrid Connection Opportunities Portal



Proponents and customers can access this portal and its data to inform investment decisions, including where to connect to the network depending on project size, technology type, timing and the strength and capacity of the local transmission system.

The portal plays a role in early-stage planning by providing clear, detailed information on transmission infrastructure and system conditions. Proponents can

assess risk, compare location options and better justify their investment decisions.

The portal is part of our broader commitment to transparency and collaboration – helping our customers plan with confidence and contribute to a faster, more coordinated transition to a low-carbon grid.

Chapter 3 explores additional detail on how the Transgrid Connection Opportunities Portal can support planning.

1.7 Delivering and evolving the plan

Adaptive planning ensures that decisions made during the deep transition not only address immediate system needs but also position the network to operate reliably, effectively and efficiently over the longer term.

In the new transitioned era beyond 2035, Australia's energy demand will continue to increase due to population growth, industry and transport electrification, as well as the development of emerging industries. Most of this new capacity is expected to be provided by renewables, requiring significant investment in additional renewable generation capacity, and transmission and storage infrastructure.

1.7.1 Transmission development in the new transitioned era

Transmission projects being delivered today are not simply enabling the energy transition. They are creating the long-term enabling infrastructure to support the NSW economy as it benefits from surging investment in data centres and new electrified industries. The assets we are building over the next nine years are expected to remain in service for many decades, supporting new industries, population growth and technologies that cannot yet be fully anticipated.

Planning therefore extends well beyond the current major project buildout. While today's priority is replacing retiring coal-fired generation and connecting renewable energy, the network must also be capable of supporting the next phase of economic growth.

Beyond 2035, the transmission network will continue to play a central role by connecting new generation, supporting emerging industries — and the jobs that come with them — and enabling electricity to move efficiently across a more diverse and dynamic grid.

The network we are developing during the deep transition will provide the foundation for the new transitioned era, which will continue to evolve amid changing technologies, demand patterns and market needs. Maintaining flexibility will therefore remain essential as we ensure future investment decisions are guided by evolving consumer expectations, new industries and emerging technology.

Remote Inland Renewable Energy Opportunity Areas

With data centre loads pushing the Greater Sydney network near capacity, meeting future demand will require additional generation as well as the major transmission projects outlined in this report.

While the 2026 ISP focuses development on candidate and declared REZs and the existing project pipeline, longer-term demand growth may require NSW to access additional, geographically diverse renewable resources. This is why Transgrid is investigating opportunities such as Remote Inland Renewable Energy Opportunity Areas (REOAs, see Figure 1.11). Global and local investors have already identified the inland renewable energy regions depicted in Figure 1.11 as a nationally significant opportunity to unlock a large, inland renewable corridor in far north-west and western NSW. These regions have some of the best solar and wind resources available anywhere in the NEM and could provide a valuable longer-term option as demand grows and the capacity of established REZs is progressively developed. Proponents suggest these regions could support more than 10 GW

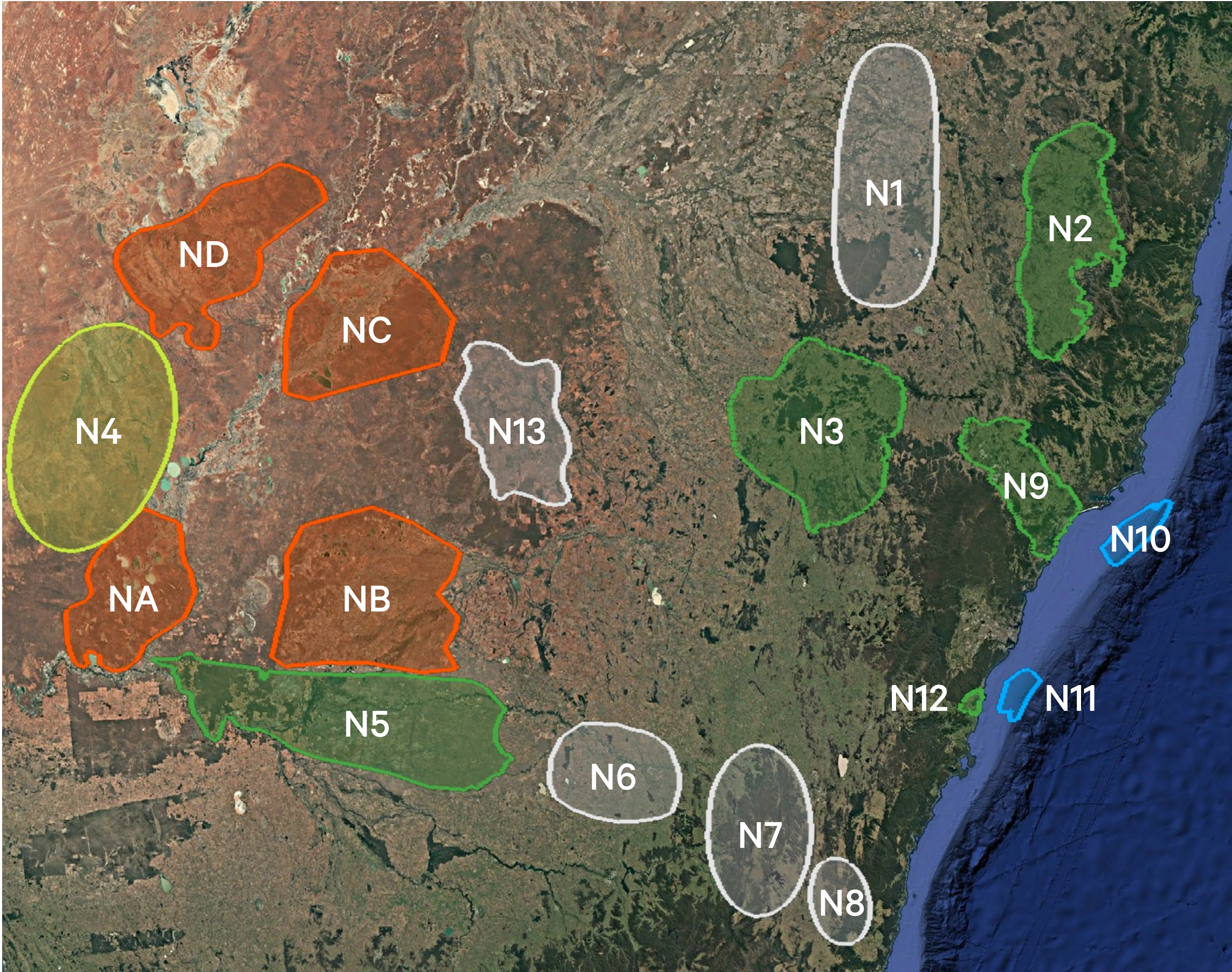
of new renewable power at full scale, with a stage one capacity of between 2 and 4 GW achievable by 2035, and 6 GW by 2040.

Transgrid has previously identified Broken Hill, Noona and Northwest Horizon as potential REOAs, reflecting their high-quality and geographically diverse wind and solar resources, low population and landowner density, and limited competing land uses. While unlocking these areas would require substantial transmission investment, their diverse renewable output could reduce exposure to renewable energy droughts, complementing storage and other firming resources, while providing the capacity needed for the next generation of industries and consumers. Over time, these benefits could also place downward pressure on electricity prices and reduce the frequency of extreme price events.

Transgrid remains committed to maintaining a flexible, technology-neutral approach to the next phase of the energy transition, beyond the current transmission build-out. We will continue to work with AEMO, EnergyCo, distribution network businesses and industry to assess the role of REOAs and ensure they remain a viable option to support the energy needs of NSW as its economy continues to electrify over the coming decades.



Figure 1.11: NSW Renewable Energy Zones and Renewable Energy Opportunity Areas



	ID	REZ / REOA Name
Candidate REZs	N1	North West NSW
	N6	Wagga Wagga
	N7	Tumut
	N8	Cooma-Monaro
	N13	South Cobar
Offshore candidate REZs	N10	Hunter Coast
	N11	Illawarra Coast
Inland candidate REZs	N4	Broken Hill
Inland REOAs	NA	Western NSW
	NB	Corrong-Booligal-Mossgiel
	NC	Noona
	ND	Northwest Horizon
Declared REZs	N2	New England
	N3	Central-West Orana
	N5	South West NSW
	N9	Hunter-Central Coast
	N12	Illawarra

1.7.2 Ongoing monitoring and review to maintain alignment with broader planning and engagement frameworks

Transgrid will continue to monitor changes in demand, generation development, system performance and broader market conditions. The Transmission Annual Planning Report plays an important role in this process, providing an annual update that incorporates new information, reassesses system needs and adapts investment pathways where required.

This report is part of a broader planning and regulatory framework, including the Integrated System Plan and Transgrid’s Revenue Proposal, all of which are produced with input from ongoing engagement with stakeholders. This cycle of monitoring, review and adaptation ensures that planning remains responsive to changing conditions while maintaining a clear direction for network development.

Alignment with these frameworks ensuring consistency in assumptions, coordination of investment decisions and a shared understanding of system needs. Engagement with government, AEMO, customers, communities and industry is also critical to ensure that planning reflects stakeholder priorities and supports coordinated outcomes across the energy system.

Transmission network developments

In the deep transition, the transmission buildout is accelerating to connect renewable energy to load centres and manage demand spikes across the network.



Drew Angel - Substations
Technician Grade 1



To meet the additional growth in demand forecast and to enable renewable generation and storage projects, NSW will require a greatly expanded transmission backbone capable of connecting more than 26 GW of additional utility-scale wind and solar capacity to increasingly widespread demand centres.

This expansion, detailed in Section 2.1, includes a portfolio of transmission projects that add new capacity to and relieve constraints on the existing network. In planning this portfolio, we are working alongside AEMO, EnergyCo, Distribution Network Service Providers (DNSPs) and other Transmission Network Service Providers (TNSPs). This is essential to ensure transmission and distribution investments are aligned, enabling the efficient connection of renewable energy and making the best use of existing infrastructure. Combined with major transmission developments underway across NSW, our collaborative, coordinated approach will support the timely connection of Renewable Energy Zones (REZs).

The rapid growth in renewable generation is changing how the system operates, with more variable and bi-directional power flows. This requires new approaches to maintaining system strength, stability and operability. At the same time, energy demand is evolving rapidly and in unexpected directions. It's now apparent that increases in household rooftop generation will be dramatically outpaced by growth in data centre demand which by 2035 is forecast to be approximately four times higher than anticipated in the 2025 Report. Due to this rapid growth in data centre load, the long-term decline in minimum demand is now expected to reverse by around 2029.

Section 2.3 explores how we are developing our 2028-33 Revenue Proposal to reflect these significant changes and meet the evolving needs of the deep transition. The scale and pace of the energy transition are creating pressure on labour, materials and supply chains, increasing the cost and complexity of delivering infrastructure. As this section describes, we are incorporating these risks into our planning and focusing on delivering a program that is achievable and efficient.

In areas of new demand, we must upgrade subsystems to keep the network reliable. At the same time, right across the network, ageing assets must be replaced and some elements must be strengthened to withstand more severe weather events and rising cyber threats. Section 2.4 presents our proposed capital works for subsystems to meet our network performance requirements, while Section 2.5 explores the replacement projects proposed to keep the grid safe and reliable.

In all these projects, our approach is to carefully balance investment decisions to maintain reliability and enable the transition, while minimising long-term costs and avoiding unnecessary bill impacts.

Front and centre of managing transmission projects is the knowledge that projects with community trust are delivered more efficiently, at lower cost and with greater long-term benefits for consumers. To build trust, we engage early and openly with communities, are transparent about the trade-offs being managed and make sure we look beyond construction to leave behind legacy investment that the community values.

2.1 Proposed major developments

Transitioning to a renewable future

The transmission network supplying the Sydney, Newcastle and Wollongong region was established in the 1960s around a small number of large, centralised generation sources and has remained largely unchanged for more than 60 years. Since then, the region's population has more than doubled from less than 3 million people to more than 6 million. In parallel, the modern economy has become significantly more energy intensive, with the rapid emergence of new large-scale electricity users, including data centre developments in Western Sydney.

As coal-fired generators retire, generation will increasingly be sourced from REZs across NSW and interstate. Lower-cost renewable energy will be transported from these zones to major population centres and emerging industries by a new transmission backbone extending from SA and VIC to QLD. This strengthened network will provide increased transfer capability, enabling the efficient delivery

*Existing transfer capability from Central NSW to the Sydney, Newcastle and Wollongong (SNW) load centres is approximately 7 GW. The combined transfer capability uplift delivered by the Hunter Transmission Project and a 500 kV transmission line option for the Sydney Ring South Project increases this capability to more than 15 GW. Source: 2026 ISP Inputs, Assumptions and Scenarios Workbook.

of more than 15 GW of power from REZs and other regional locations to our load centres*, maintaining reliable electricity supply as 8.3 GW of coal-fired generation retires by 2040.

As the primary Transmission Network Service Provider (TNSP) for NSW and the ACT, Transgrid is responsible for planning the shared transmission network. Our plans must maintain system safety, security and reliability, while supporting efficient long-term network development to deliver affordable power to consumers and businesses. This work is closely aligned with the development pathway set out in AEMO's 2026 Integrated System Plan.

Major project delivery in NSW is regulated by either the National Electricity Rules (NER) or the Electricity Infrastructure Investment (EII) Act framework. Under the NER, major projects are guided by the Integrated System Plan. While the EII Act framework enables the delivery of REZs and Priority Network Infrastructure Projects, such as the Waratah Super Battery and the Hunter Transmission Project.

Transgrid is responsible for planning and delivering the NER major projects outlined in this Chapter, working closely with AEMO to align network development with the Integrated System Plan. We work in close partnership with EnergyCo, supporting its role as Infrastructure Planner, in planning and delivering REZs and their transmission connections, as well as Priority Network Infrastructure Projects. This collaboration supports the development of the NSW System Plan, that outlines projects and options to meet the objectives of the EII Act and the NSW Electricity Infrastructure Roadmap. The EII Act:

- Sets firm delivery targets that include constructing at least 12 GW of generation and 2 GW and 16 GWh of long duration storage by 2030 in addition to Snowy 2.0.
- Allows for the declaration of Priority Network Infrastructure Projects and REZs to meet transmission and capacity targets to maintain a reliable and affordable supply of electricity as coal-fired power stations retire.

In parallel, Transgrid supports Distribution Network Service Providers (DNSPs) in planning distribution projects across NSW. Working together, we are leveraging existing infrastructure to cost-effectively facilitate renewable connections and respond to evolving demand patterns.

Our ongoing collaborations with AEMO, EnergyCo and DNSPs are good examples of the one system planning discussed in Chapter 1. Partnership with our industry peers is essential to ensure network augmentations are coordinated and efficient across both the transmission and distribution systems.

As we plan our major projects, Transgrid also continues to work closely with landowners, communities, First Nations peoples, regulators and local councils to minimise environmental and community impacts. Our engagement is resulting in planning approaches, including route changes, that reduce visual and physical impacts, protect agricultural land and biodiversity, and preserve Aboriginal heritage. We are also listening to and acting on local preferences where we can create economic and social benefits for the communities hosting new transmission infrastructure.

This section details the major transmission developments, aligned with AEMO's 2026 Integrated System Plan and the NSW Electricity Infrastructure Roadmap, which are progressing to address emerging constraints, facilitate REZ connections and deliver a secure, reliable and affordable energy system. These developments span the central, northern and southern regions of the transmission network (see Figure 2.1).

Central Region

- Sydney Ring North - Hunter Transmission Project
- Sydney Ring South
- Central-West Orana Renewable Energy Zone
- Hunter-Central Coast Renewable Energy Zone
- Orana Distribution Project

Northern Region

- New England Renewable Energy Zone Network Infrastructure Project

Southern Region

- EnergyConnect (NSW-South Australia Interconnector)
- HumeLink
- Switching Station Near Wondalga
- Victoria - NSW Interconnector West
- South West Renewable Energy Zone

Future ISP developments

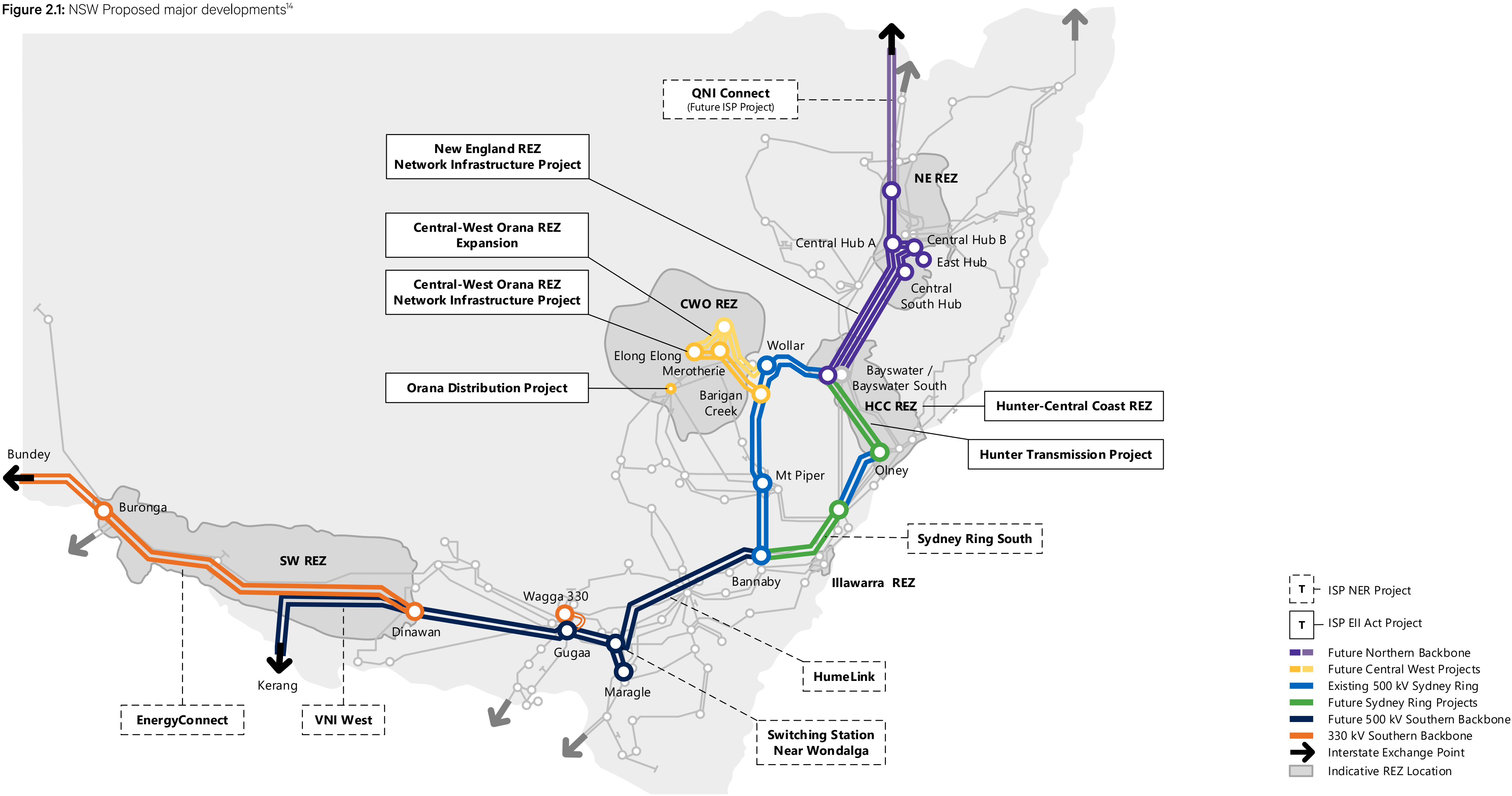
- Queensland-NSW Interconnector Connect

Future strategic developments

- Sydney Ring North - Hunter Transmission Project 2
- Illawarra Renewable Energy Zone
- Dinawan - Darlington Point Transmission Project



Figure 2.1: NSW Proposed major developments¹⁴



¹⁴ Includes transmission projects delivered contestably under the NSW EII Act framework, which will not be constructed, owned or operated by Transgrid.

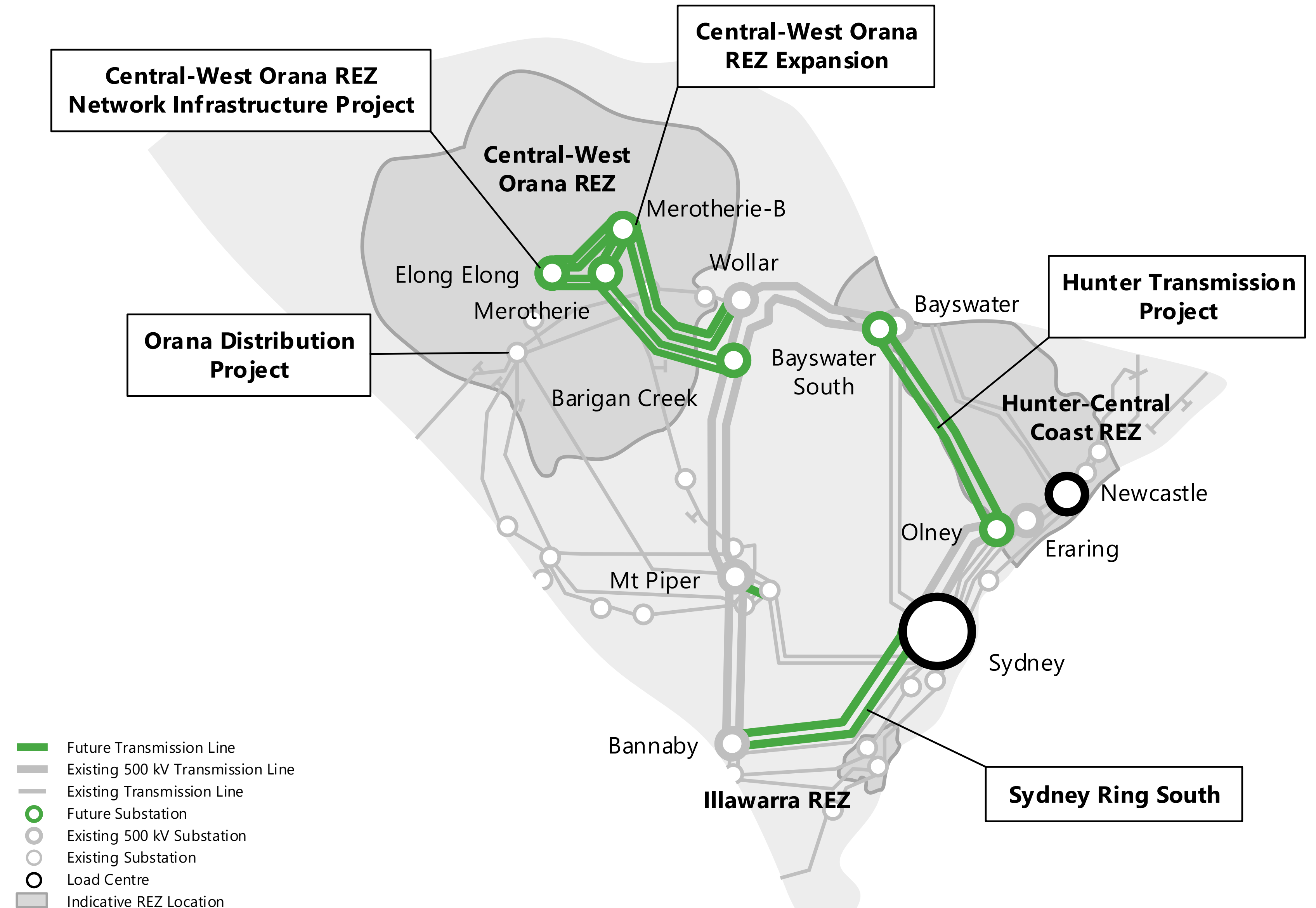


Figure 2.2: The Central Region map¹⁵

2.1.1 Central Region

The Central Region extends from Bayswater substation in the north to Bannaby substation in the south and includes Greater Sydney. Major developments in this region, shown in Figure 2.2, include the completion of the 500 kV Sydney Ring and the Central West Orana REZ.

The 500 kV Sydney Ring will form the backbone of the future NSW transmission system. Rather than relying on a small number of traditional supply corridors, it will provide geographically diverse, high-capacity pathways into Sydney from the west, north and south. Collector points at Barigan Creek (Central-West Orana REZ), Bayswater (New England REZ and QNI Connect) and Bannaby (EnergyConnect, HumeLink and VNI West) will enable renewable generation, storage and interstate energy flows to be shared more efficiently across the network. This diversity of supply will strengthen system resilience, reduce congestion, improve wholesale market efficiency and support the long-term growth of Sydney and the NSW economy.



¹⁵ Includes transmission projects delivered contestably under the NSW EII Act framework, which will not be constructed, owned or operated by Transgrid.

Figure 2.3: Reinforcement to Sydney/Newcastle/Wollongong load centres¹⁶

Sydney Ring Project

The Sydney, Newcastle and Wollongong (SNW) region accounts for approximately three-quarters of electricity demand in NSW, reflecting its concentration of urban, commercial and industrial load.

As coal-fired power stations at Vales Point and Eraring retire, supply to the SNW region will increasingly be sourced from generation outside the Hunter and Central Coast.

The existing transmission network supplying the SNW load centres is primarily constrained by the thermal capacity of:

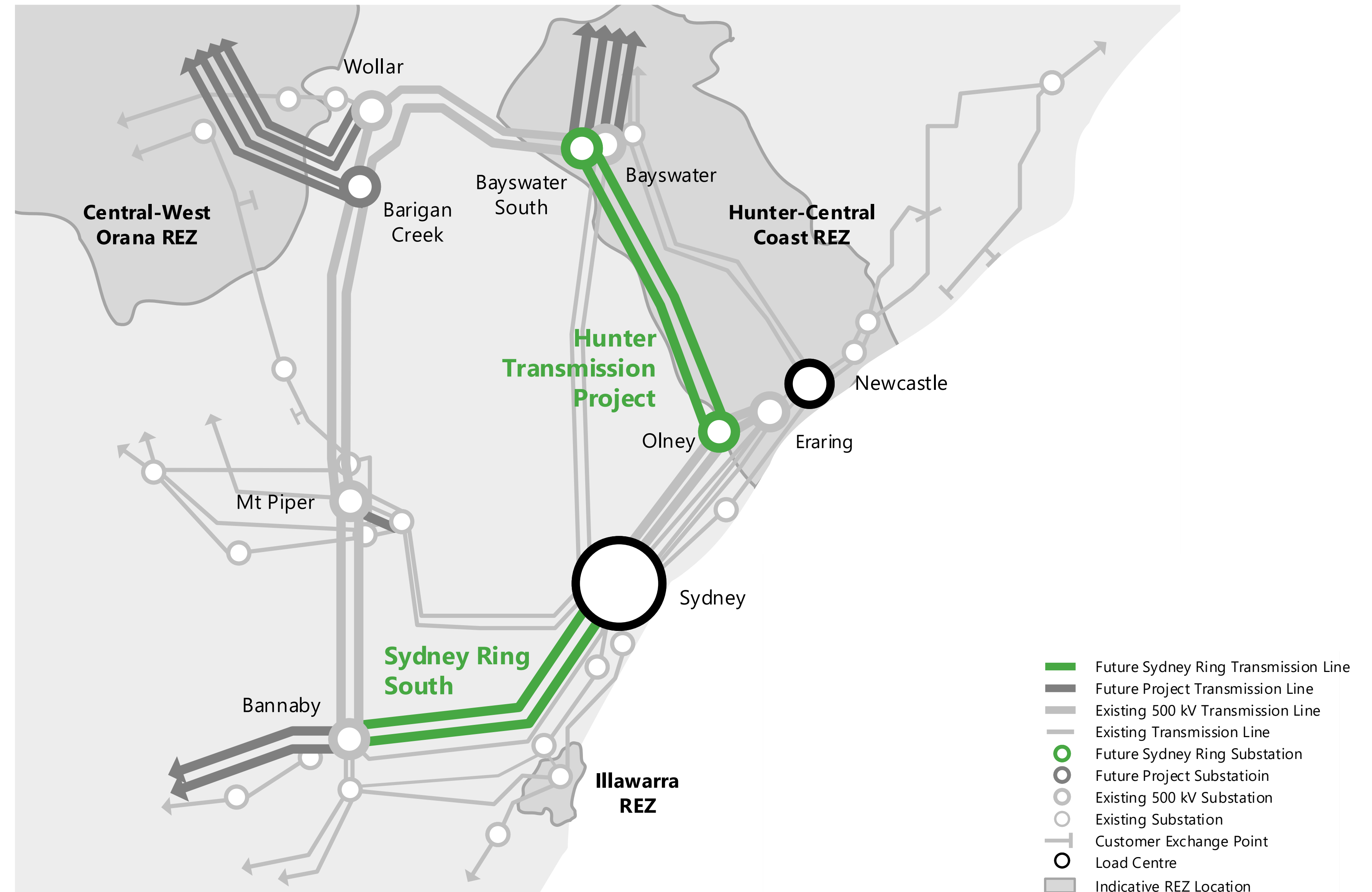
- 330 kV transmission lines between the Upper Hunter and the Central Coast
- 330 kV transmission lines from Bannaby/Marulan into Sydney and the South Coast

These assets were designed for historical generation and are not sufficient to support the forecast increase in transfers from remote renewable generation sources. Without coordinated generation, storage and network development, the network will have insufficient capacity to reliably supply SNW load centres.

The Sydney Ring Project comprises a coordinated set of investments to increase transfer capacity into the SNW region.

Key components include:

- Waratah Super Battery Project (commissioned)
- Hunter Transmission Project (HTP)
- Sydney Ring South



¹⁶ Includes transmission projects delivered contestably under the NSW EII Act framework, which will not be constructed, owned or operated by Transgrid

Hunter Transmission Project (HTP)

- **Planner:** EnergyCo
- **Network Operator:** Transgrid
- **Transgrid’s role:** Non-contestable works
- **ISP Status:** Actionable

The Hunter Transmission Project (HTP), led by EnergyCo, is a key component of the Sydney Ring, providing additional 500 kV transfer capacity between the Upper Hunter and the Central Coast.

HTP comprises a new double-circuit 500 kV transmission line connecting two new switching stations at Bayswater South and Olney. The project will connect the Central-West Orana and New England REZs into the existing 500 kV network that currently transfers power from Eraring on the Central Coast to Sydney.

HTP is a Priority Network Infrastructure Project, with completion scheduled for November 2029.

The scope includes:

- Establishing a new Bayswater South 500 kV switching station adjacent to the existing Bayswater substation, connected into the existing 500 kV network
- Establishing a new 500 kV switching station at Olney, near Eraring, connected into the existing 500 kV network
- Constructing approximately 100 km of new 500 kV double-circuit transmission line between Bayswater South and Olney
- Installing 2 x 500/330 kV, 1,500 MVA transformers at Eraring substation
- Installing line reactors at Bayswater South on the new transmission lines

Sydney Ring South

- **Planner:** Transgrid
- **Network Operator:** Transgrid
- **Transgrid’s role:** Planner/Integrated System Plan Actionable
- **ISP Status:** Actionable

Currently, the transmission network supplying the Sydney Basin from the south relies on three single circuit 330 kV transmission lines. As the economy electrifies and electricity demand grows, these lines will constrain the transfer of renewable generation from South West NSW into the SNW demand centres.

As an Actionable ISP project, Sydney Ring South is progressing through the Regulatory Investment Test for Transmission (RIT-T). The preferred option identified in the [Project Assessment Draft Report \(PADR\)](#) published in May 2026 includes:

- A new 500 kV transmission line from Bannaby to South Western Sydney (planned for 2033/34)
- A new 500/330 kV substation at South Creek with three transformers connecting to existing 500 kV and 330 kV lines, and duplication of the existing 330 kV Line 39 between the new South Creek substation and Transgrid’s existing Sydney West substation (planned for 2030/31).
- Series reactors on the 330 kV network south of Sydney (planned for 2030/31)

This option, as outlined in the PADR, is estimated to provide \$3.2 billion in net market benefits in present value terms (\$2024/25) and is expected to lower average household bills by \$51 per year between 2034 and 2043, and average small business bills by \$110 per year over the same period (real \$2024/25).

Delivering the project will not be easy, with the proposed new 500 kV transmission line extending more than 100 km from Bannaby in the Southern Tablelands to South Western Sydney. Any pathway to South Western Sydney will traverse areas from semi-rural landscapes to the new City of Bradfield, Australia’s third-largest and fastest-growing economy, home to more than 2.5 million people, as well as the Western Sydney International Airport. These diverse communities are experiencing rapid population growth, significant infrastructure investment, land-use transformation and new industrial development

Strong engagement will be crucial to get this project right. We are seeking community views before decisions are made, not after. We are starting early engagement on the project now, allowing more time to work with communities, government planners and developers. We encourage communities and stakeholders to participate, challenge assumptions and share concerns and ideas.

[Sydney Ring South RIT-T Project Assessment Draft Report](#)



NSW Roadmap project – Central-West Orana Renewable Energy Zone (CWO REZ)

- **Planner:** EnergyCo
- **Network Operator:** ACERENZ
- **Transgrid's role:** Non-contestable works
- **ISP Status:** Committed

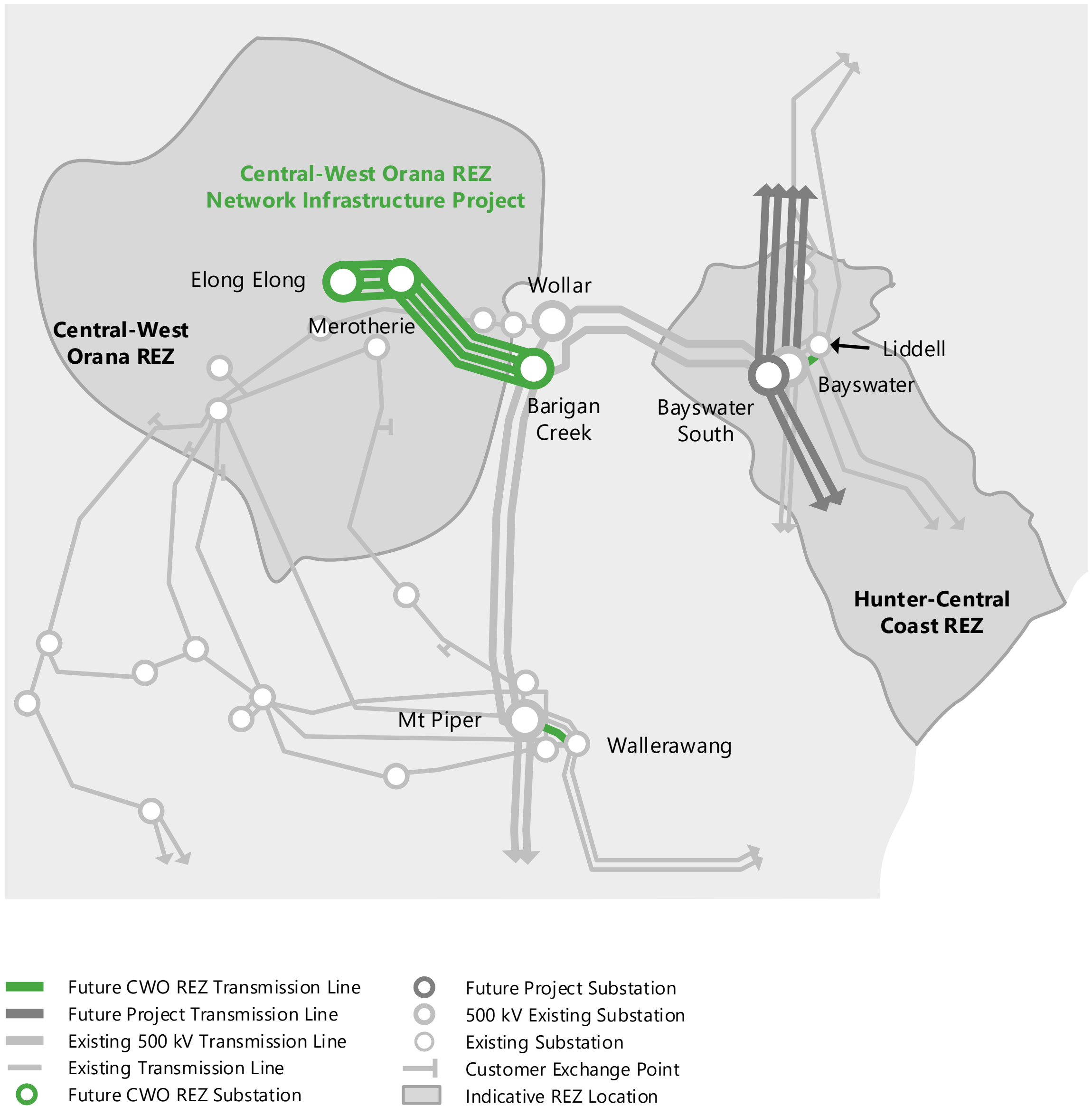
The CWO REZ was chosen for its proximity to the existing backbone transmission network and strong mix of renewable energy resources.

In May 2025, the NSW government granted approval¹⁷ for 10 renewable energy projects – totalling 7.15 GW of wind, solar and grid-scale batteries – to connect within CWO REZ. The projects are expected to start connecting by 2028. The CWO REZ Network Infrastructure Project (CWO RNIP), consists of an expandable network, spanning from Wollar to Elong Elong Hub via Merotherie Hub in the Central-West and Orana region of NSW.¹⁸ The high-level scope for ACERENZ's CWO RNIP (at least 4.5 GW transfer capacity) includes:¹⁹

- A 500 kV network (with some components operated at 330 kV), including a new switching station at Barigan Creek and energy hubs at Merotherie and Elong Elong.
- System strength infrastructure, including a system strength solution for an installed 1,750 MVA to ensure the network has adequate system strength to enable output from the renewable energy generation and storage projects from day one.

- Transgrid's collaboration with EnergyCo to develop the transmission to support this REZ is a Committed 2026 Integrated System Plan project, expected to be completed by 2028. The scope of network augmentation includes:
- Cutting Line 81 Liddell – Newcastle into Bayswater to form a third line between Bayswater and Liddell and a Newcastle to Bayswater line.
 - Forming a third 330 kV line from Mt Piper to Wallerawang, by replacing existing section of 132 kV Line 94E near Mt Piper and Wallerawang with a new double circuit line.
 - Cutting in new 500 kV Barigan Creek Switching Station into lines 5A3 and 5A5.
 - Augmenting the existing Bayswater, Liddell, Mt Piper and Wallerawang substations to accommodate additional lines and upgrade protection systems where required.
 - Installing line transpositions, at 6 locations on each of the 500 kV circuits between Bayswater – Wollar/ Barigan Creek - Mt Piper - Bannaby to fulfil NER S5.1.7 Planning requirements.
 - Potentially installing a Remedial Action Scheme for non-credible contingency of double-circuit outage to fulfil NER S5.1.8 Planning requirements. Joint Planning with EnergyCo is underway.

Figure 2.4: CWO REZ Network Infrastructure Project²⁰



¹⁷ <https://www.energyco.nsw.gov.au/news/multi-billion-renewables-investment-private-sector-power-2-7-million-nsw-homes>

¹⁸ CWO REZ – public report – FINAL DRAFT.docx (nsw.gov.au)

¹⁹ Option 1A for CWO REZ in EnergyCo 2023 NIS. Note that the total available downstream capacity for NE REZ, HCC REZ and CWO REZ combined is approximately 3,000 MW until Hunter Transmission Project Stage 1 is commissioned.

²⁰ The CWO REZ project includes transmission projects delivered contestably under the NSW EII Act framework, which will not be constructed, owned or operated by Transgrid



Figure 2.5: Central-West Orana REZ Expansion²¹

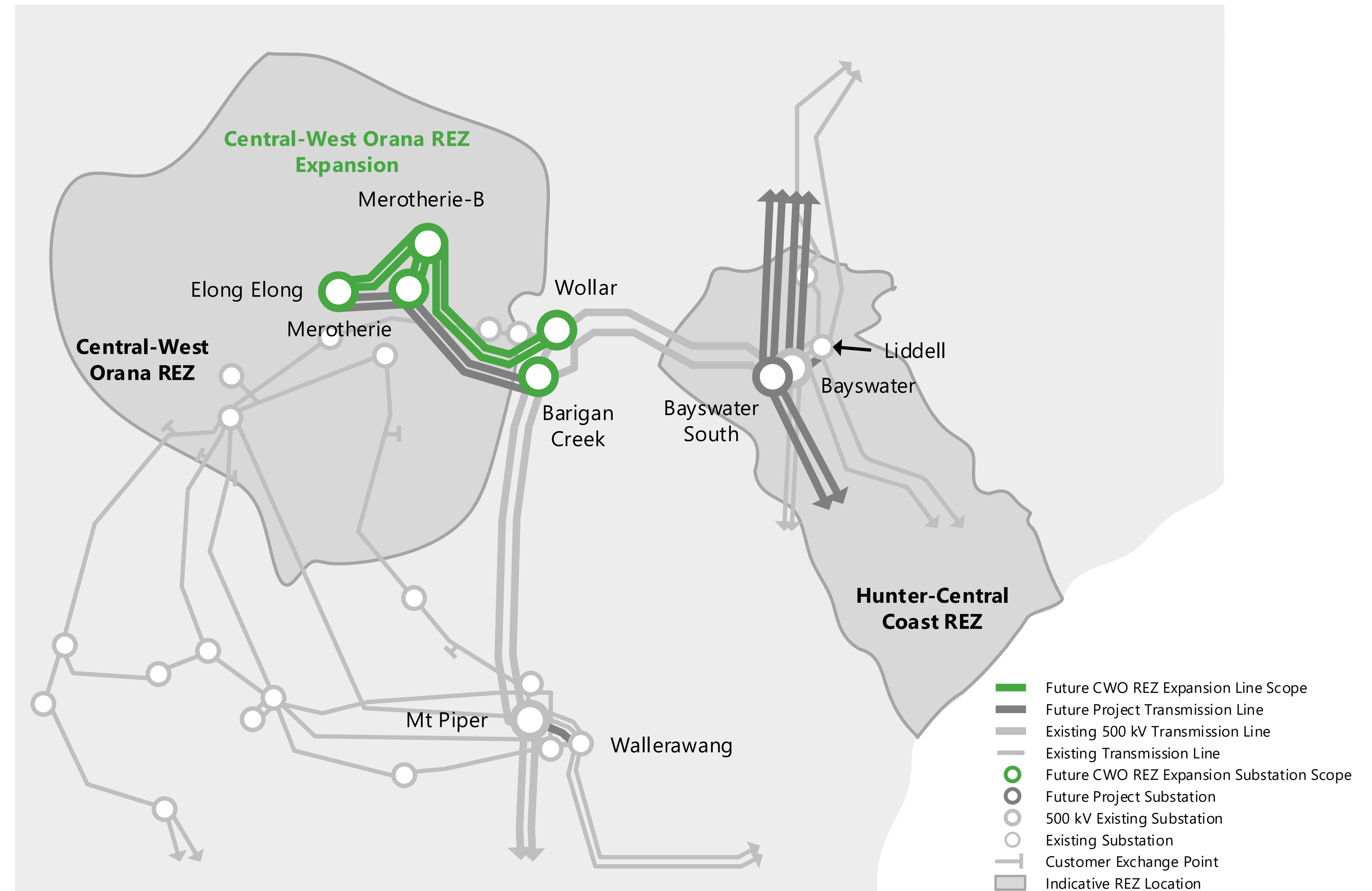
NSW Roadmap project – Central-West Orana Renewable Energy Zone Expansion

- **Planner:** EnergyCo
- **Network Operator:** To be determined
- **Transgrid's role:** Non-contestable works
- **ISP Status:** Actionable

CWO REZ Expansion has progressed from a future project to an actionable NSW project in the final 2026 ISP. This project further expands the committed CWO RNIP and allows more renewable generation to supply NSW load centres.

Further network development is planned to increase total transfer capacity of the CWO REZ from 4.5 GW to 6 GW to support the safe connection of new generation. This will require:

- Constructing Merotherie-B 500/330 kV substation with 3 x 500/330/33 kV 1,500 MVA transformers.
- Terminating one of the existing 500 kV double circuit transmission lines between Merotherie – Barigan Creek at Merotherie-B and Wollar 500 kV substations respectively.
- Constructing a double circuit 500 kV transmission line between Merotherie and Merotherie-B 500 kV substations.
- Expanding Elong Elong as 500/330 kV substation with 3 x 500/330/33 kV 1,500 MVA transformers.
- Operating Merotherie – Elong Elong transmission lines at 500 kV.
- Terminating one of the 500 kV double circuit transmission lines from Merotherie – Elong-Elong at Merotherie-B.



²¹ Includes transmission projects delivered contestably under the NSW EII Act framework, which will not be constructed, owned or operated by Transgrid

NSW Roadmap project – Hunter-Central Coast Renewable Energy Zone (HCC REZ)

- **Planner:** EnergyCo
- **Network Operator:** Ausgrid
- **Transgrid’s role:** Non-contestable works
- **ISP Status:** Committed

The HCC REZ has been chosen for its proximity to significant existing network infrastructure and solar and wind renewable resources near the major demand centres in Newcastle and Sydney. Thanks to its location in a region served by excellent port and transport infrastructure, and with access to a skilled workforce, the HCC REZ will be able to provide access to renewable and storage capacity via smaller, expandable network upgrades. This will be vital to support adaptation to the inherent uncertainty of the deep transition, where demand may well grow faster than forecast.

Ausgrid is currently delivering Stage 1 of the HCC REZ, which is scheduled for completion in July 2028, unlocking network capacity through a combination of upgrades to existing sub-transmission and distribution networks, as well as the addition of new substations to act as energy hubs for new connections. Some of the power generated within the HCC REZ will flow back to the Transgrid network, either via Muswellbrook in the North (approximately 40 per cent) or via the connection points in the Newcastle region (approximately 60 per cent).

Transgrid and Ausgrid are jointly progressing the enabling works to facilitate timely integration with the broader project.

Hunter-Central Coast Renewable Energy Zone Expansion

- **Planner:** To be determined
- **Network Operator:** To be determined
- **Transgrid’s role:** To be determined
- **ISP Status:** Distribution Project

An expansion of HCC REZ (Stage 2) is currently being developed through joint planning between Transgrid, Ausgrid and EnergyCo. This project will unlock a further 1.8 GW of network capacity via further upgrades to Ausgrid’s existing sub-transmission and distribution networks plus upgrades to the transmission network at either end around Muswellbrook (to accommodate 900 MW of additional network capacity) and at Tomago (to accommodate 900 MW of additional network capacity).

Transgrid’s scope of works for the two credible options in the ISP HCC REZ Stage 2 project includes:

- Expanding existing Tomago 330/132 kV substation with one 375 MVA transformer.
- Installing new 330 kV line from Muswellbrook to Liddell
- Expanding existing Muswellbrook 330/132 kV substation with one 375 MVA transformer and busbar reconfiguration
- Upgrading Muswellbrook and Tomago substations to facilitate the new lines/transformers.

Figure 2.6: Hunter-Central Coast REZ Expansion

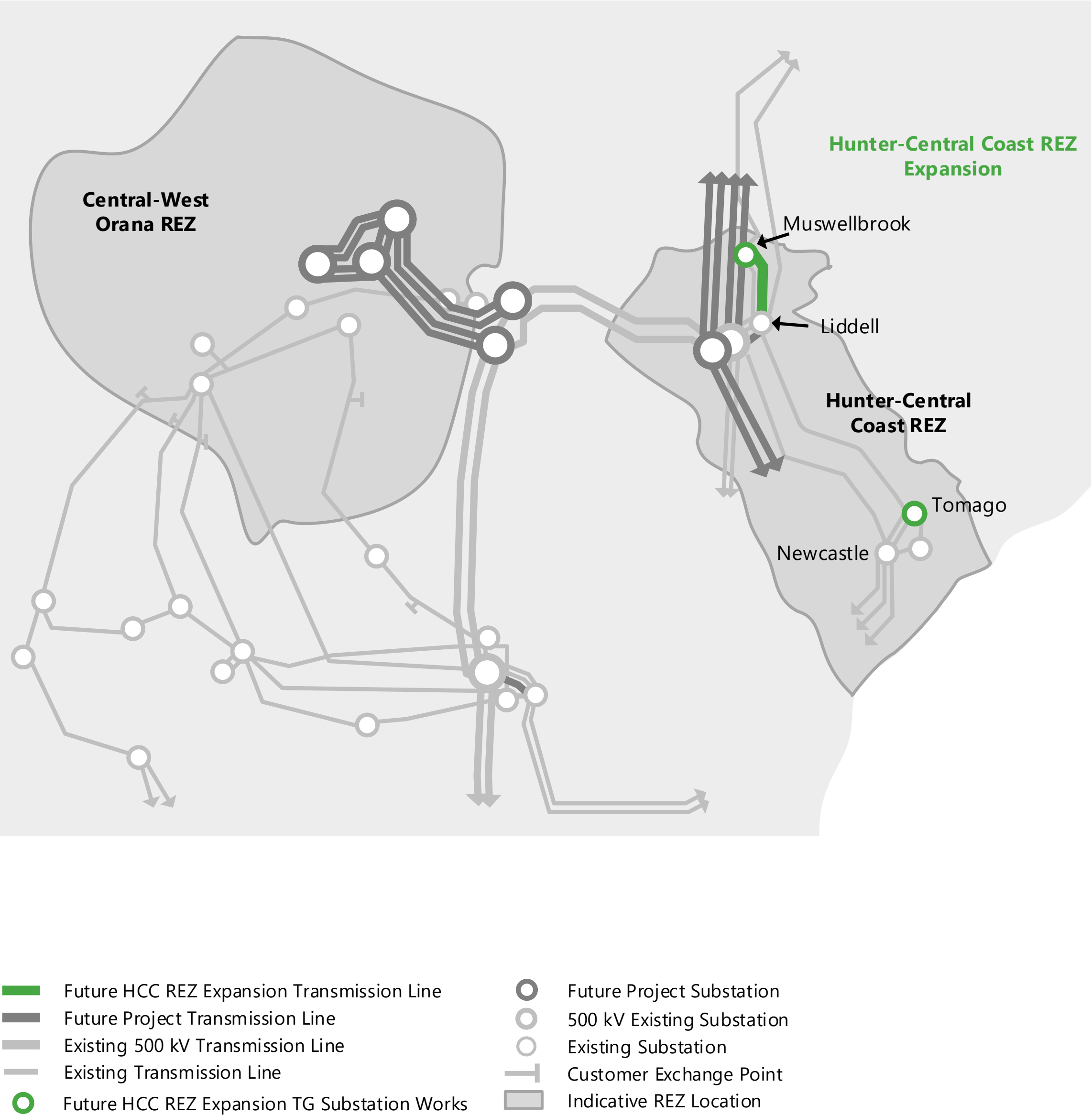


Figure 2.7: Orana Distribution Project

Orana Distribution Project

- **Planner:** EnergyCo
- **Network Operator:** To be determined
- **Transgrid's role:** To be determined
- **ISP Status:** Distribution Project

The Orana Distribution Project (Dubbo Distribution Project), near Dubbo in Central NSW, is proposing to initially connect 2.4 GW of generation and storage to both Essential Energy and Transgrid networks. The project is being jointly planned by EnergyCo, Essential Energy and Transgrid to ensure transmission and distribution network developments are coordinated and that the preferred solution delivers an efficient, reliable and cost-effective outcome for consumers.

Additional network capacity of 700 MW through Wellington 330/132 kV substation is proposed based on:

- Transgrid delivering an additional 375 MVA transformer and associated enabling works at Wellington 330/132 kV Substation.
- Augmenting various lines and substations to establish energy hubs and increase capacity in the Essential Energy network.

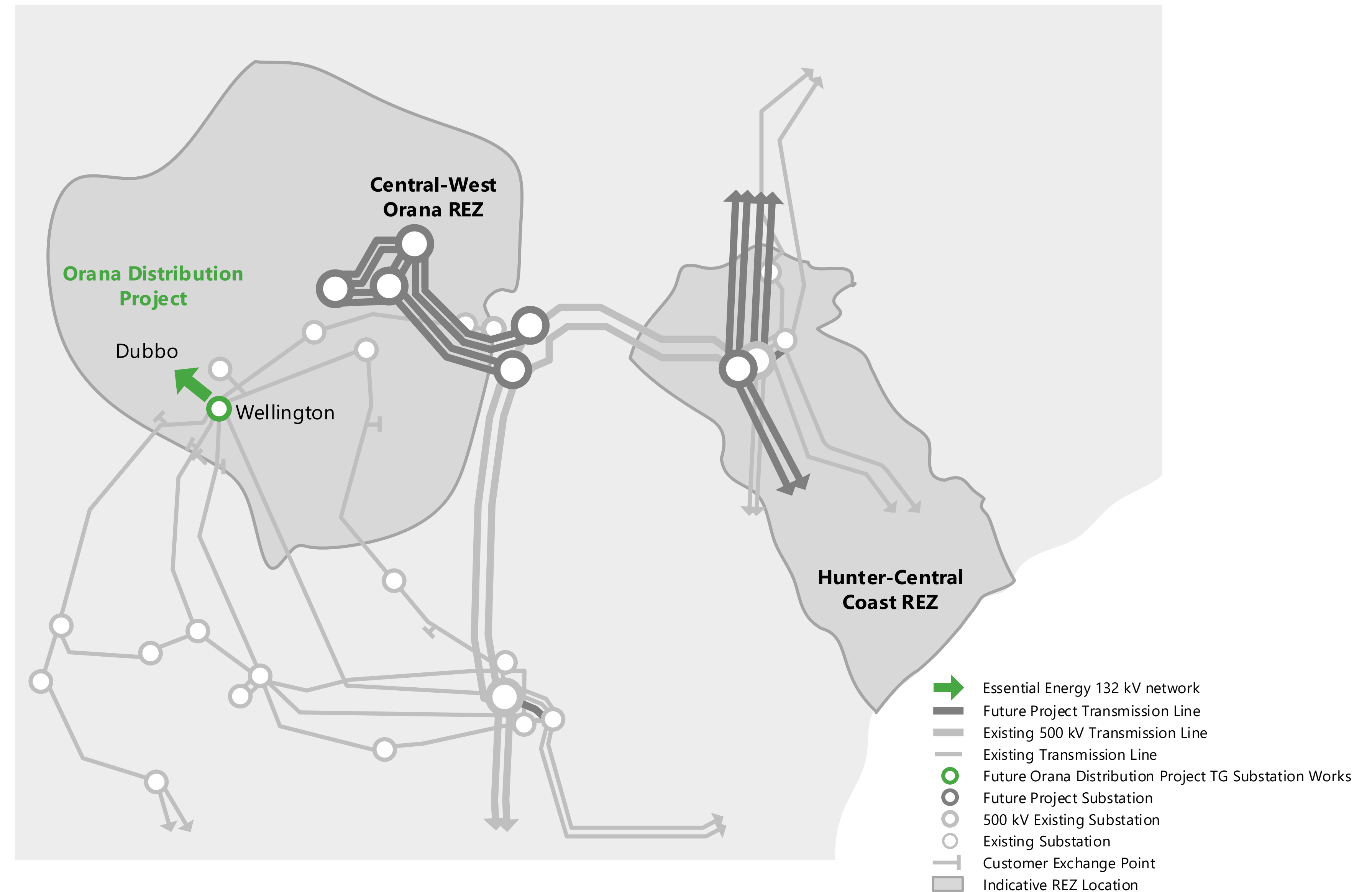
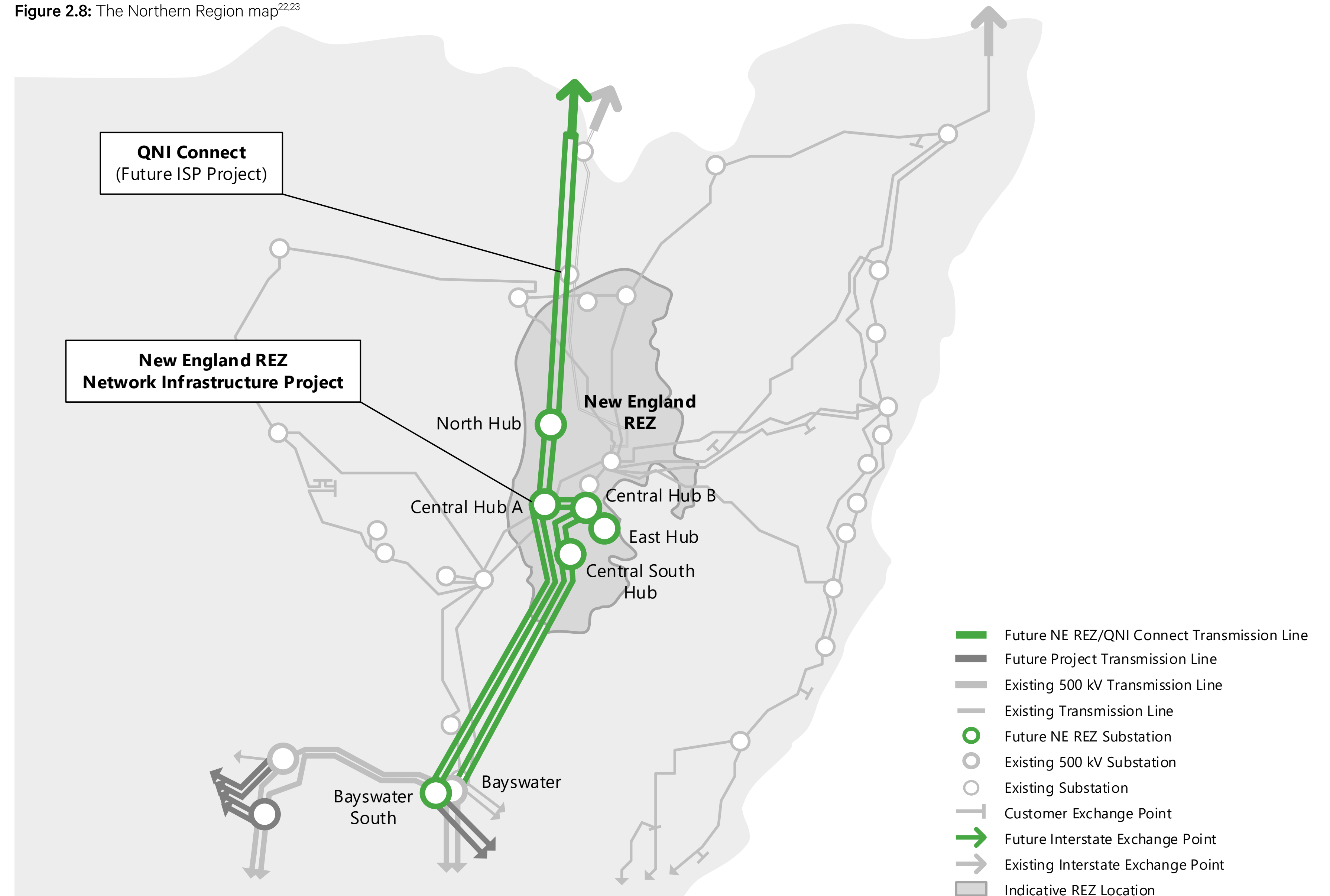


Figure 2.8: The Northern Region map^{22,23}

2.1.2 Northern Region

The Northern Region extends from Bayswater in the north through to the QLD state border. Figure 2.8 depicts its major developments.

The Northern Backbone will become the primary high-capacity transmission corridor linking the Sydney 500 kV Ring with QLD. Comprising a QNI Connect (future ISP project) segment and a New England REZ Network Infrastructure segment (anticipated ISP project), it will create a stronger north-south backbone to facilitate interstate energy sharing, connect lower-cost renewable energy resources in Northern NSW and provide the capacity needed to support growing demand and future economic development. Two alternative routes from North Hub to the border are being investigated as part of QNI Connect (see Section 2.1.4).



²² Includes transmission projects delivered contestably under the NSW EII Act framework, which will not be constructed, owned or operated by Transgrid

²³ Connection of QNI Connect to North Hub is subject to Joint Planning with EnergyCo.

New England REZ Network Infrastructure Project

- **Planner:** EnergyCo
- **Network Operator:** To be appointed
- **Transgrid's role:** Non-contestable works and facilitate connections to regulated network
- **ISP Status:** Anticipated

The New England Renewable Energy Zone (NE REZ) is being advanced in stages to align with generation investment and system needs through a coordinated planning approach between EnergyCo and Transgrid.

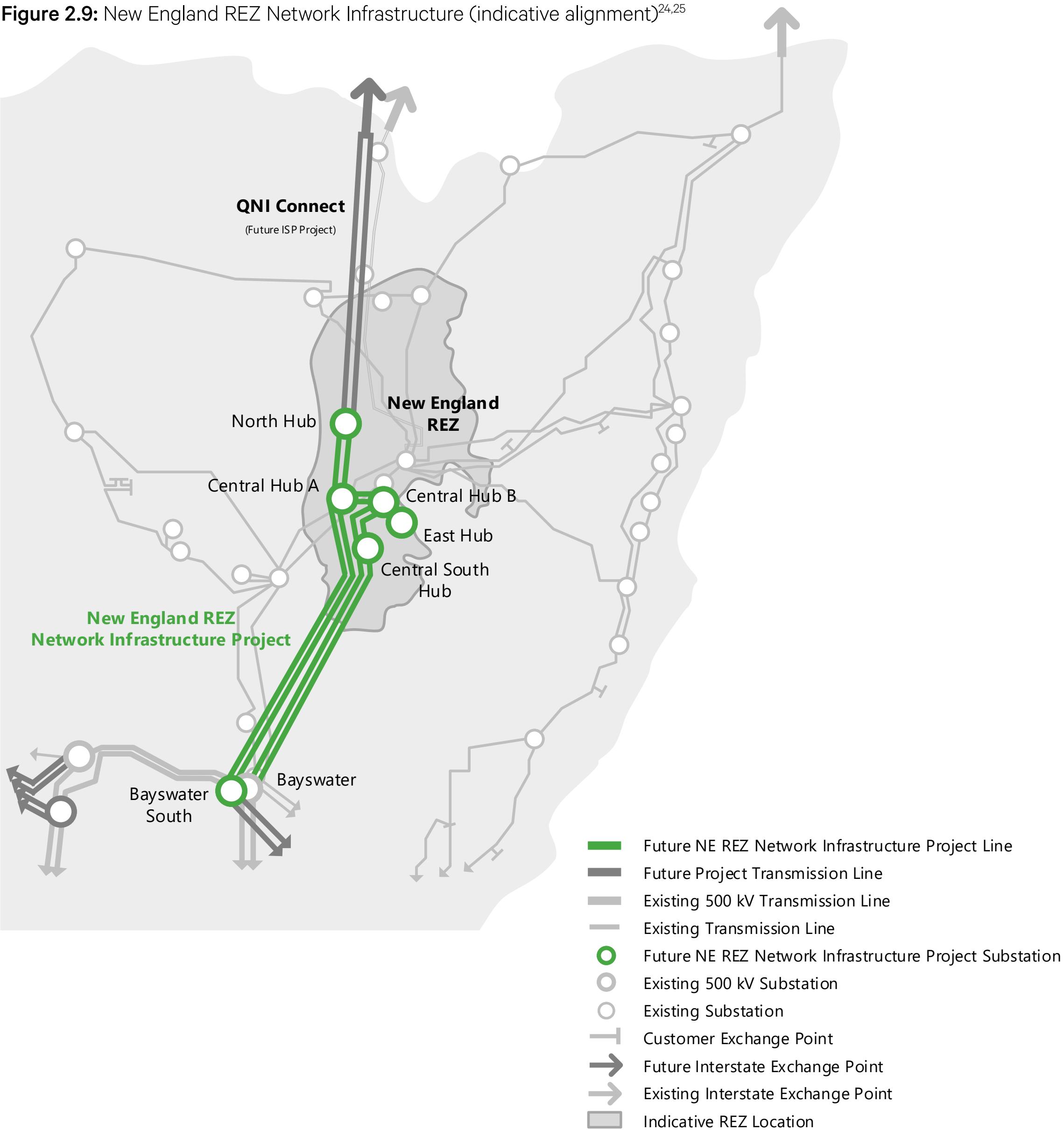
The NE REZ Infrastructure Project will enable the large-scale transfer of renewable energy from this REZ in Northern NSW to the major load centres of Sydney, Newcastle and Wollongong. The project involves developing new high-capacity transmission infrastructure, as well as augmenting the existing network. By strengthening north–south transmission corridors, the project will make the power system more flexible, support inter-regional energy flows and help to improve reliability as coal-fired generation retires.

As part of the program, the new transmission infrastructure includes:

- two new double circuit 500 kV transmission lines between the New England REZ, Bayswater Power Station and Bayswater South switching station developed under HTP Stage 1
- A network of new 500 kV and 330 kV transmission lines and new energy hubs within the zone.

EnergyCo is undertaking a competitive procurement process to appoint a network operator to deliver and operate the NE REZ. The new infrastructure will integrate with Transgrid's network, supported by targeted augmentations to existing infrastructures to accommodate additional generation and storage capacity. The options identified in the 2026 Integrated System Plan are currently being reviewed and developed, including the staging and configuration of the transmission corridor and new energy hubs within the zone. Transfer capacity is expected to reach 6 GW by early 2034, with the ultimate network transfer capacity forecast to increase to up to 8 GW.

Figure 2.9: New England REZ Network Infrastructure (indicative alignment)^{24,25}



²⁴ Includes transmission projects delivered contestably under the NSW EII Act framework, which will not be constructed, owned or operated by Transgrid

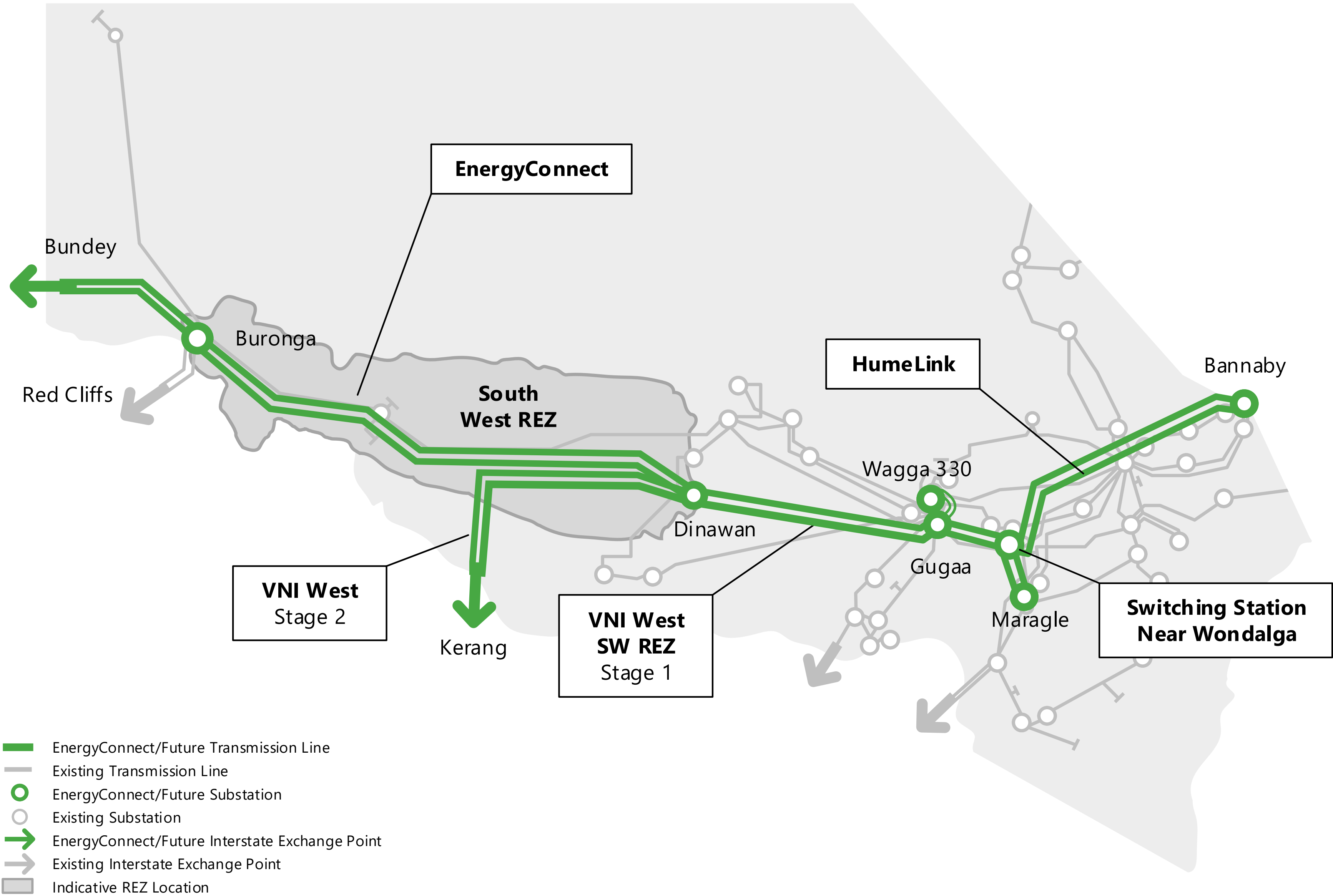
²⁵ Connection of QNI Connect to North Hub is subject to Joint Planning with EnergyCo.

Figure 2.10: The Southern Region map

2.1.3 Southern Region

The Southern Region extends from Bannaby in the south through to the Victorian and South Australian borders. Figure 2.10 shows the major transmission network developments in this region.

The 500 kV Southern Backbone will create a continuous high-capacity transmission corridor linking Victoria to the Sydney 500 kV Ring. Comprising a VNI West segment and a HumeLink segment through to Bannaby, it will enable renewable energy, storage and interstate electricity flows to move efficiently from southern interstate generation sources into NSW. The 330 kV EnergyConnect transmission line feeds into the Southern Backbone at Dinawan. Together, these network developments coordinated with generation and storage will improve reliability, increase access to lower-cost renewable energy and support a more resilient and competitive NEM.



EnergyConnect

- **Planner:** Transgrid/ElectraNet
- **Network Operator:** Transgrid/ElectraNet
- **Transgrid’s role:** Planner/Integrated System Plan
- **ISP Status:** Committed

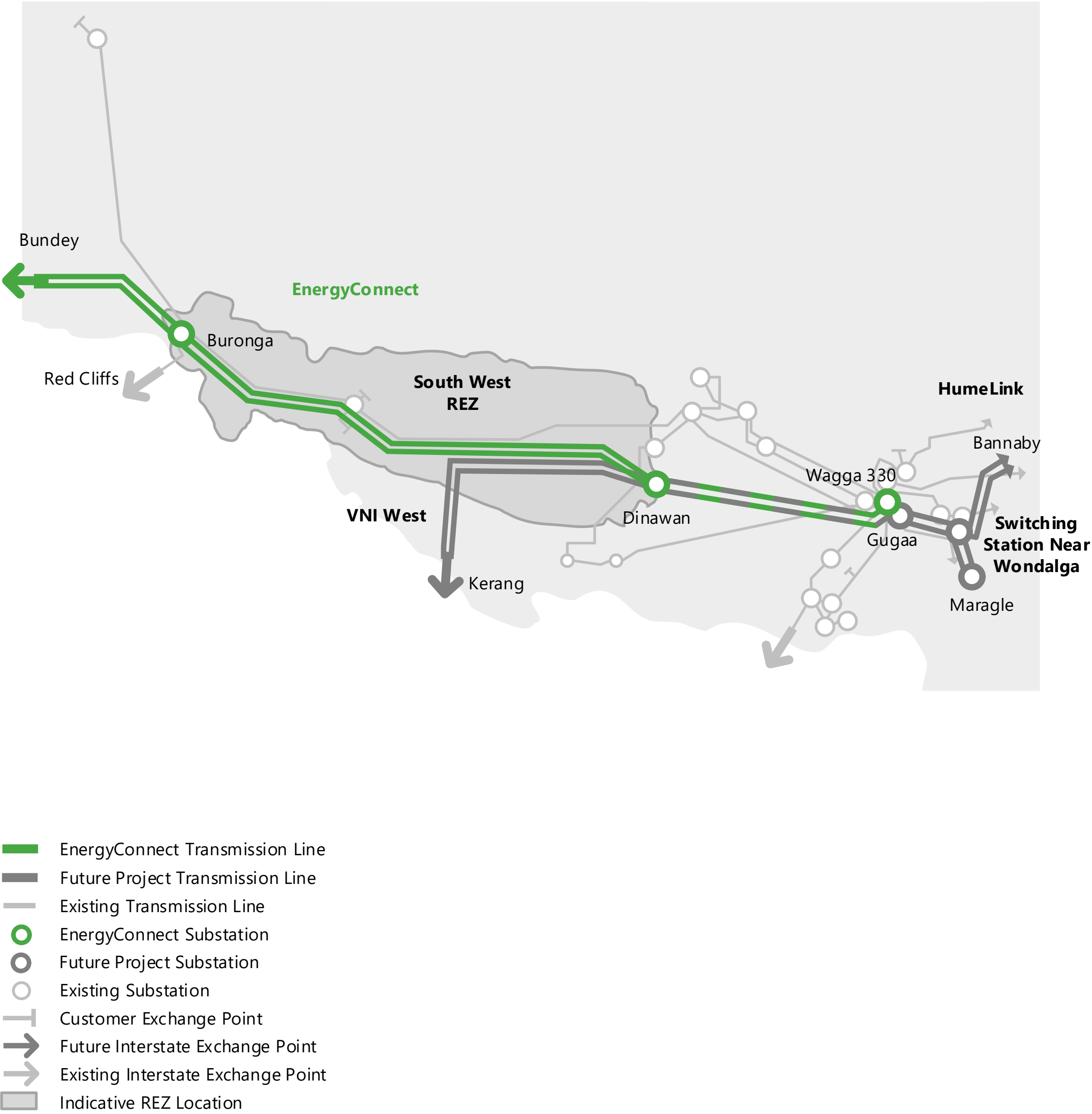
EnergyConnect is a new 330 kV interconnector linking NSW, SA and VIC. Connecting into the Southern Backbone at Dinawan (see Figure 2.11), it enables electricity to flow more efficiently between the three states, giving consumers greater access to lower-cost renewable energy while improving system reliability. During periods of high renewable generation in SA, EnergyConnect allows surplus low-cost electricity to be exported to NSW and VIC. When renewable output is lower, it enables generation from the eastern states to reduce reliance on higher-cost gas-fired generation in SA.

Stage 1 became fully operational in April 2025, releasing 150 MW of transfer capacity in both directions and marking the first operational energy transfers between NSW, SA and VIC.

Stage 2 was energised in mid-2026, followed by inter-network testing, which will increase the interconnector's capacity to 800 MW.

- Additional benefits include:
- Unlocking additional renewable generation resources in South Western NSW
 - Enhancing security of supply for SA
 - Reducing the risk of supply interruptions by creating a more robust and interconnected transmission network.
 - Improving transfer capacity between South West NSW and Wagga
 - Creating shared system inertia and strength to support system security in SA.
- The scope of the project in NSW includes:
- A new 330 kV substation known as Dinawan, located south of Coleambally
 - A new 330 kV double-circuit line between Bunday in SA and Buronga
 - A new 330 kV double-circuit line between Buronga and Dinawan
 - A new 500 kV double-circuit line between Dinawan and Wagga initially operated at 330 kV²⁶
 - A new double-circuit 220 kV line from Buronga to Red Cliffs in Victoria to replace the existing 220 kV single-circuit line
 - New 330 kV phase shift transformers at Buronga
 - New 330/220 kV transformers at Buronga
 - Augmenting existing substations at Buronga and Wagga
 - Static and dynamic reactive plant including synchronous condensers at Buronga and Dinawan
 - A Remedial Action Scheme to cater for non-credible double-circuit trip events.

Figure 2.11: EnergyConnect



26 Commitment by Transgrid (supported by underwriting by the Federal Government) in September 2021 to the Dinawan to Wagga Wagga portion of EnergyConnect being built at 500 kV to lower the subsequent costs for expanding interconnection between VIC and NSW.

Reinforcement of the Southern NSW network (HumeLink)

- **Planner:** Transgrid
- **Network Operator:** Transgrid
- **Transgrid's role:** Planner/Integrated System Plan
- **ISP Status:** Committed

HumeLink is a Committed project feeding into Bannaby on the Sydney Ring, adding an important element of the Southern Backbone that will provide access to renewable and peaking generation in Southern NSW and VIC. It will help meet demand in the major load centres of Sydney, Newcastle and Wollongong at a lower cost than building new generation within these load centres. Construction began in September 2025, with an in-service date scheduled for late 2027.

The existing transmission capacity between Southern NSW and the major load centres of Sydney, Newcastle and Wollongong is already heavily utilised at times of peak demand. HumeLink will:

- Increase the transfer capacity and stability limits between the Snowy Mountains and major load centres of Sydney, Newcastle and Wollongong
- Enable greater access to lower cost generation to meet demand in these major load centres
- Facilitate the development of renewable generation in high-quality renewable resource areas in Southern NSW, as well as the southern states, which will further lower overall cost to consumers
- Increase competitiveness in the wholesale market.

HumeLink is one of the state's largest energy infrastructure projects, with 365 km of proposed new transmission lines, and new or upgraded infrastructure at four locations. The high-level scope includes:

- A new 500/330 kV Substation at Gugaa and two new 330 kV lines connecting to the existing Wagga Substation.
- Three new 500/330/33 kV 1,500 MVA transformers at Maragle Substation and two new 500/330/33 kV 1,500 MVA transformers at Gugaa substation
- New 500 kV transmission circuit built on double-circuit transmission structures between:
 - Maragle and Bannaby 500 kV Substations
 - Maragle and Gugaa 500 kV Substations
 - Gugaa and Bannaby 500 kV Substations.
- Line reactors on each new 500 kV line.
- Augmenting the existing substations at Maragle, Wagga and Bannaby to accommodate the additional transmission lines/transformers.

Figure 2.12: HumeLink

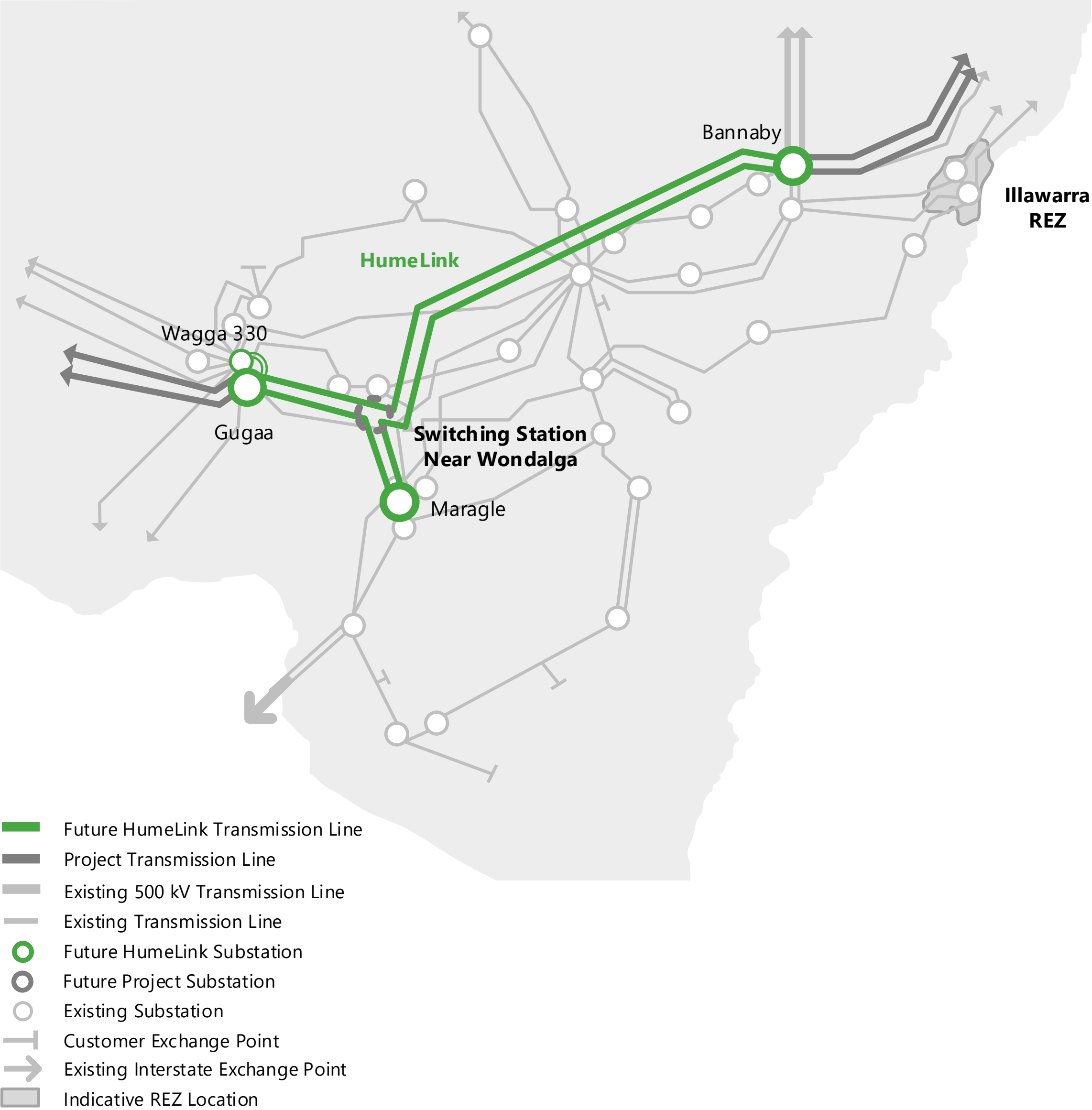


Figure 2.13: Switching Station Near Wondalga

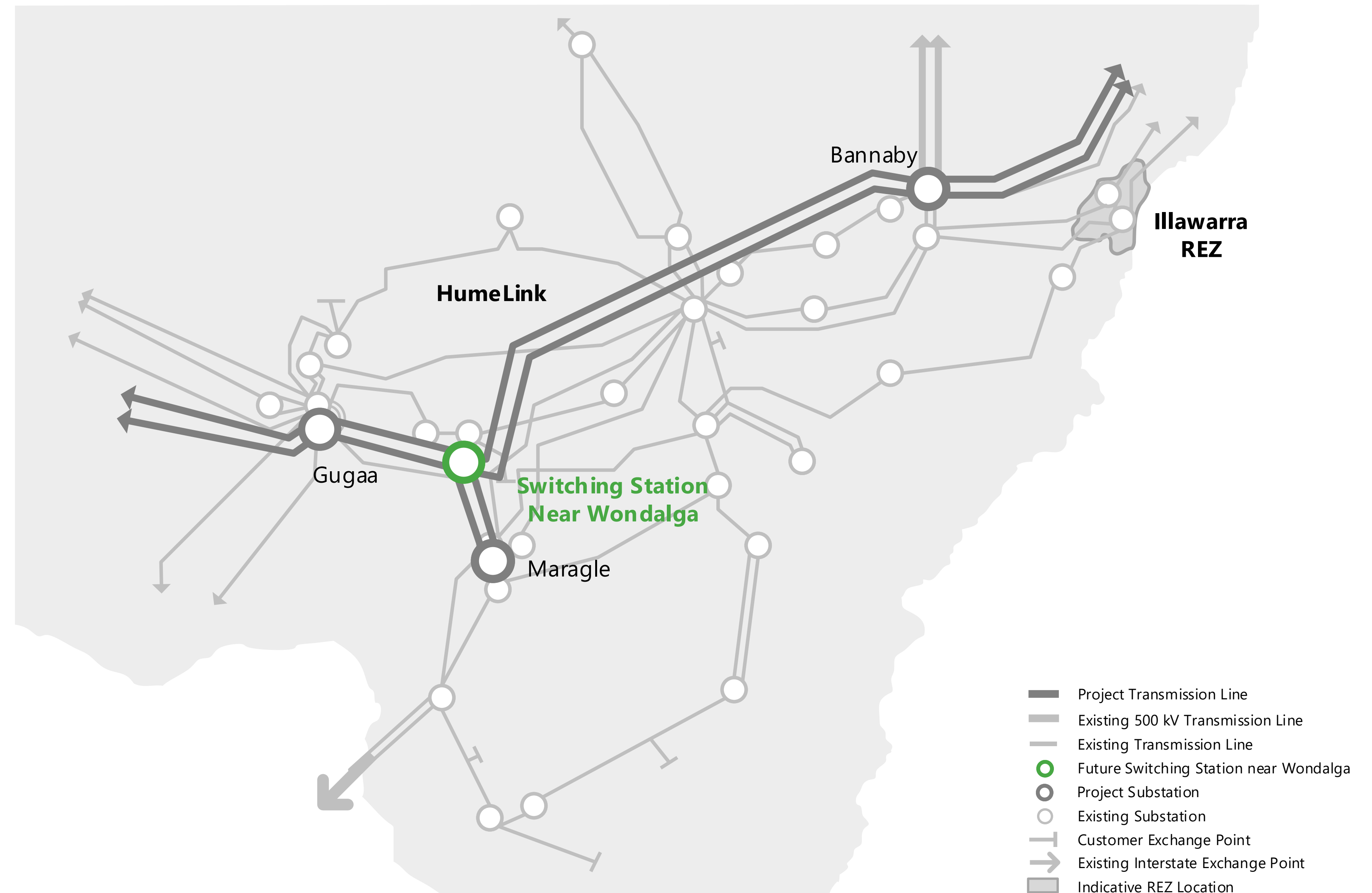
Switching Station Near Wondalga

- **Planner:** Transgrid
- **Network Operator:** Transgrid
- **Transgrid's role:** Planner/Integrated System Plan
- **ISP Status:** Actionable

The Switching Station Near Wondalga is a strategically important transmission investment for NSW and the wider NEM. Additional transfer capacity of 450 MW on the future 500 kV Southern Backbone is unlocked via a new 500 kV switching station. The new Switching Station would cut in at the Y point of the HumeLink 500 kV lines, connecting the three segments:

- 500 kV line from Gugaa to Bannaby
- 500 kV line from Gugaa to Maragle
- 500 kV line from Maragle to Bannaby

By improving how power flows are shared on the transmission lines delivered by HumeLink, the Switching Station Near Wondalga would increase the transfer capacity between Southern NSW and the major load centres of Sydney, Newcastle and Wollongong (SNW) as well as provide additional access to hydroelectric generation from the Snowy Mountains and lower-cost generation from Southern NSW, VIC and SA.





Victoria to NSW Interconnector West (VNI West)

(Including enabling South West REZ)

- **Planner (Stage 1):** EnergyCo
- **Planner (Stage 2):** Transgrid/VicGrid
- **Network Operator:** Transgrid (NSW Operations)
- **Transgrid’s role:** Planner/Integrated System Plan
- **ISP Status:** Actionable

The Victoria to New South Wales interconnector delivers benefits to consumers in both states including:

- **Facilitating renewable integration:** Enabling connection and transfer of generation from REZs in NSW and Victoria
- **Improving system resilience:** Increasing the capability to share supply across regions and respond to variability in generation and demand
- **Supporting reliability outcomes:** Providing access to firming capacity, including from Snowy 2.0, during periods of low renewable output
- **Enhancing network capability:** Supporting coordinated development of the transmission network alongside projects such as EnergyConnect and HumeLink

Transgrid is assessing a staged delivery approach for VNI West (NSW) to better align investment timing with expected market benefits to consumers in NSW and the ACT.

The RIT-T was completed in October 2023. VNI West progress updates can be found on the [project website](#).²⁷

Stage 1 – South West NSW REZ (Gugaa to Dinawan)

The South West REZ in NSW has been identified as a key development area to support the state’s transition to a low-emissions electricity system. Located in the south-west of the state, the REZ benefits from high-quality wind resources and proximity to existing transmission corridors, making it well-suited for large-scale renewable generation and storage integration. The REZ is intended to unlock significant new generation capacity by coordinating transmission augmentation with generation development, thereby reducing connection risk and improving network efficiency.

The SW REZ Access Scheme was formally declared by the Minister for Energy under section 24(1) of the Electricity Infrastructure Investment Act 2020 on 12 April 2024.²⁸ The declaration operationalises the terms and conditions of the Access Scheme, which sets out how generation and storage projects can be granted access rights to planned and new network infrastructure within the South West REZ.

In April 2025, the Minister for Energy and Climate Change announced²⁹ that four proponents progressing five wind, solar and battery projects (with a combined installed capacity of 3.56 GW) have been granted the right to connect to new power lines in the South West REZ. First generation is expected to come online by 2028.

With the current network configuration in South West NSW, the network’s ability to transfer energy is limited by a maximum generation hosting capacity of up to 550 MW. Transmission projects EnergyConnect, HumeLink, VNI West and other minor network upgrades are needed to achieve the intended network capacity of 2.5 GW.

The Transgrid scope for Stage 1 – South West REZ project includes:

- Upgrade Dinawan – Wagga – Gugaa double-circuit line from 330 kV to 500 kV operation and bypass at Wagga (lines built at 500 kV as part of the EnergyConnect and HumeLink projects).
- Expand Dinawan with a 500 kV switchyard with 3 x 500/330 kV 1,500 MVA transformers.
- Expand the Dinawan 330 kV switchyard to cater for SW REZ connections.
- Installing reactors at Dinawan and Gugga.
- Reinforcing 330 kV capacity between Wagga and Gugga by rebuilding the existing line as a double-circuit.
- Assessing the need for a Remedial Action Scheme to maintain transfer capacity during high-risk events to fulfil NER S5.1.8 Planning requirements.

²⁷ The capacity release and timing is conditional on availability of suitable market conditions and good test results.

²⁸ Government Gazette No. 126 of Friday 12 April 2024

²⁹ <https://www.energyco.nsw.gov.au/industry/access-schemes/south-west-REZ-access-scheme>

Figure 2.14: VNI West preferred option

**Stage 2 – Victoria to NSW Interconnection
(Dinawan – Kerang – Bulgana)**

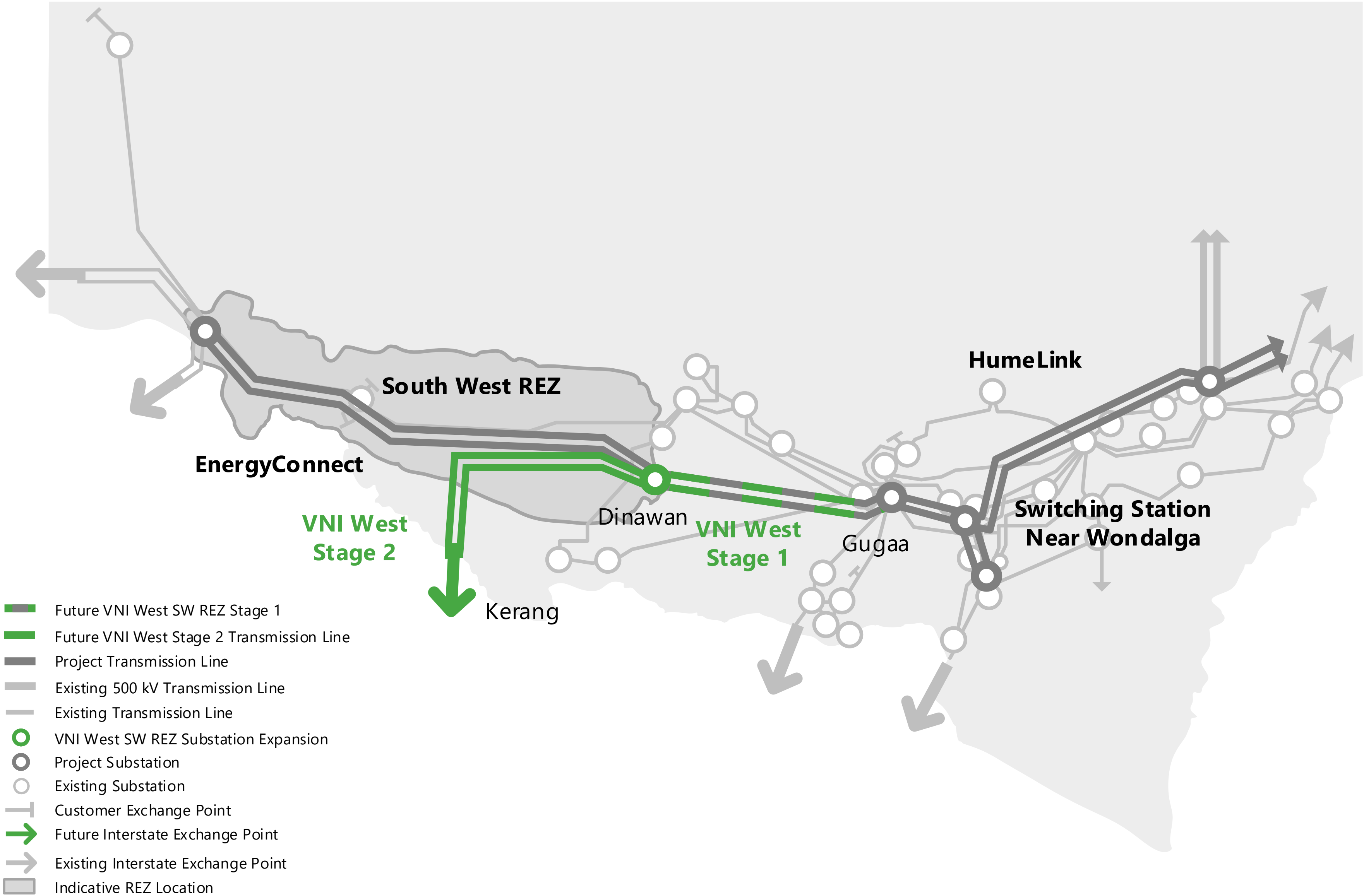
The Victoria to NSW Interconnector West (VNI West) is a proposed 500 kV double-circuit transmission line that would establish a new major interconnection between the high-voltage network in NSW and VIC. As shown in Figure 2.14, the project would enable increased transfer capability between regions, facilitating the integration and movement of renewable generation from south-west NSW, the far south of VIC, and western areas including SA. The project would operate in conjunction with other committed and proposed transmission developments, including EnergyConnect and HumeLink, to support an increasingly interconnected NEM.

Additional interconnection is expected to support reliability of supply in VIC as coal-fired generation retires. It will also reduce reliability risks and provide resilience to unplanned or earlier-than-expected generator retirements.

The proposed route will connect new renewable generation and increase transfer capacity to support development of the South-West REZ, including augmenting the Dinawan to Gugaa corridor to 500 kV.

Given the delay to the Victorian section of VNI West to allow for further planning and landholder engagement, Transgrid is reviewing the delivery schedule for the NSW component of the project.

- The Transgrid scope for Stage 2 - VNI West project includes:
- A new double-circuit 500 kV transmission line from Dinawan to the Victorian border.
 - Assessing the need for Remedial Action Scheme to maintain transfer capacity during high-risk events to fulfil NER S5.1.8 Planning requirements.



2.1.4 Future ISP developments

QNI Connect (QNIC)

- **Planner:** Transgrid/Powerlink
- **Network Operator:** Transgrid/Powerlink
- **Transgrid's role:** Planner/Integrated System Plan
- **ISP Status:** Future

The proposed second Queensland–NSW Interconnector is identified in the 2026 Integrated System Plan as a Future project requiring further analysis. The project comprises a new high-capacity 330 kV overhead transmission circuit to strengthen interconnection between the two regions, improving reliability and stability. Increased transfer capability between QLD and NSW will support greater integration of renewable generation, improve the efficiency of energy transfers across the NEM, and enhance network resilience during severe weather events.

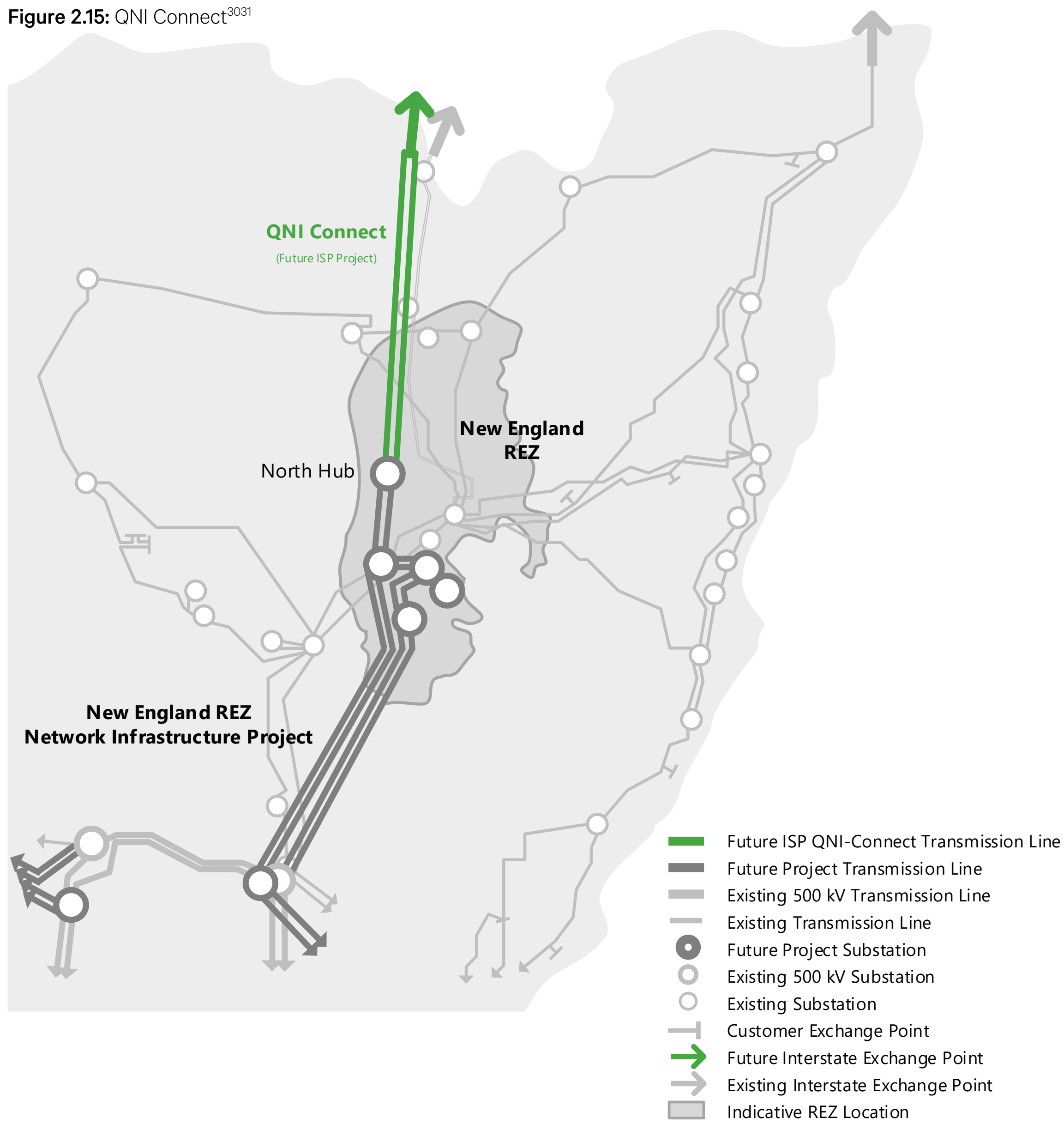
- The additional transmission capacity could also deliver net market benefits by:
- Efficiently maintaining supply reliability in NSW, following further coal-fired generation closures and the decline in ageing generator reliability
 - Facilitating efficient development and dispatch of generation in areas with high-quality renewable resources in northern NSW, through improved network capacity and access to demand centres
 - Enabling more efficient sharing of resources between NEM regions.

As part of evaluating network options, two corridors are being investigated. The 330 kV double-circuit western route from New England (North Hub) to Dumaresq to Bulli Creek to Braemar was selected as a credible option in the initial Integrated System Plan preparatory work. A new eastern route from New England (North Hub) to Tenterfield is also under consideration as an alternate potential viable line corridor. Both routes are being investigated, and these options will be updated based on current market conditions, generation and demand connection volume.

- The eastern route can offer additional benefits including:
- Reinforcing future security of supply to Lismore
 - Enabling future energy hubs in the north of the New England REZ to connect to this backbone as it runs through locations that are rich in wind resources.
- A 330 kV network option would involve:
- A new 330 kV single-circuit or double-circuit line from the QLD border to a new substation at New England North Hub
 - Reactive power compensation required for the transmission lines.

The North Hub will be constructed as part of the New England RNIP, which is now an Anticipated project under the 2026 Integrated System Plan.

Figure 2.15: QNI Connect³⁰³¹



³⁰ Includes transmission projects delivered contestably under the NSW EII Act framework, which will not be constructed, owned or operated by Transgrid
³¹ Connection of QNI Connect to North Hub is subject to Joint Planning with EnergyCo.

2.1.5 Future strategic developments

Sydney Ring Project - Hunter Transmission Project 2 (HTP2)

- **Planner:** To be determined
- **Network Operator:** To be appointed
- **Transgrid’s role:** Non-contestable works
- **ISP Status:** Option³²

In future, Sydney will increasingly rely on power from REZs, with higher volumes of power running through the Bayswater region transmission corridor towards Newcastle and Sydney. Future developments, including QNI Connect, will increase capacity through this part of the network.

The Hunter Transmission Project (HTP) is the first stage of strengthening this corridor, with a new 500 kV double-circuit transmission line between the proposed Bayswater South and Olney switching stations. Transgrid is supporting EnergyCo in delivery of non-contestable components of this project.

Following completion of HTP and associated developments, the Bayswater region is expected to accommodate up to six incoming 500 kV circuits, while transfer capacity towards Sydney will remain comparatively limited, with only two primary 500 kV circuits exporting power from the region. This evolving network configuration is expected to increase reliance on a constrained set of outbound pathways. The need for

further augmentation is being assessed through AEMO’s Integrated System Plan (ISP) and associated Integrated Investment Outcomes (IIO) frameworks.

A potential future (2030s) development option is HTP2, involving a new 500 kV double-circuit transmission line connecting Bayswater to Eraring, with a potential extension into the Sydney network, and a new 500/330 kV substation at Richmond Vale. The HTP2 development could repurpose existing 330 kV easements to accommodate higher-capacity infrastructure, reducing the need for new easements and limiting impacts on landholders and the surrounding environment.

Indicative scope of the HTP2 option may include:

- A new 500 kV double-circuit transmission line comprising:
 - Bayswater to Richmond Vale
 - Richmond Vale to Eraring
- Potential extension from Eraring into the Sydney network³³
- Potential utilisation of existing 330 kV transmission easements, including replacing a single-circuit 330 kV line with a 500 kV double-circuit line
- Reconfiguring adjacent 330 kV network infrastructure, including potential conversion of remaining single-circuit lines to double-circuit configuration to maintain 330 kV network capability.

Illawarra REZ

- **Planner:** EnergyCo
- **Network Operator:** To be appointed
- **Transgrid’s role:** Non-contestable works
- **ISP Status:** IIO considered project

The Illawarra region is supplied through Endeavour Energy’s 132 kV network, fed from Transgrid’s 330/132 kV Dapto substation. The Illawarra hosts large peaking generation, port infrastructure, transport infrastructure, industry and a skilled workforce.

The region has been earmarked by the NSW Government as the first urban REZ based around consumer energy resources, with an intended network capacity of 1 GW, which may increase significantly with the growth of emerging industries, such as green hydrogen and green steel manufacturing.³⁴ This significant industrial growth within Illawarra may necessitate 500 kV backbone expansion to the region via Marulan within the next 10 years.

Transgrid is working with EnergyCo and Endeavour Energy to develop solutions for this innovative project which aims to leverage integrated consumer energy sources like rooftop solar and batteries and existing infrastructure to minimise community and environmental impacts.

Dinawan – Darlington Point Transmission Project

- **Planner:** To be determined
- **Network Operator:** To be appointed
- **Transgrid’s role:** Non-contestable works
- **ISP Status:** IIO considered project

The Dinawan–Darlington Point transmission line is of strategic importance in increasing the export capability of the South West REZ by strengthening the Western Backbone in NSW. The augmentation will assist in alleviating network constraints that limit the dispatch of large-scale solar, wind, and storage resources in the South West region. By improving connectivity between Dinawan, a major REZ hub, and Darlington Point, the project will enable more efficient utilisation of high-quality renewable resources and support the secure and reliable transfer of energy towards major load centres.

The high-level scope of this option includes:

- Building a new 330 kV single circuit line between Darlington Point and Dinawan, (approximately 90 km); and
- Augmenting Dinawan and Darlington Point substations to accommodate new bays for the new line.

³² Not identified in the AEMO ISP Optimal Development Path
³³ Further studies are required to fully define the scope, and the line destination may be extended from Eraring to Sydney.
³⁴ Illawarra Renewable Energy Zone | EnergyCo

2.2 Forecast of constraints

Transgrid forecasts potential constraints on the network over the next 10 years. We take into account the network performance requirements in NER Schedule 5.1 or relevant NSW regulations over one, three and five years. We also consider forecast loads, future generation, market network services and changes in demand.

Our annual planning review also considers:

- Forecast loads submitted or modified by relevant registered participants in accordance with NER Clause 5.11.1
- Adequacy of existing connection points and relevant parts of the transmission system, and planning proposals for future connection points
- Most recent AEMO system planning updates, including the Integrated System Plan 2026, 2026 Electricity Statement of Opportunities, reports on system security planning covered by the Transition Plan for System Security 2025, information from joint planning, power system frequency, and other power system risk management planning.
- Potential for augmentations, or non-network alternatives to augmentations, that are likely to provide a net economic benefit
- Condition of network assets
- Potential to replace network assets, or use non-network options, that are likely to provide a net economic benefit

- Operation of, and any known or potential interactions between:
 - any emergency frequency control schemes, or emergency controls in place under NER clause S5.1.8
 - protection systems or control systems of plant connected to the network (including consideration of whether the settings of those systems are fit for purpose for the future operation of the network) where such operation or interactions would be likely to lead to cascading outages or major supply disruptions.

Additional connection point and transmission line data is available at Transgrid Connection Opportunities Portal: tapr.transgrid.com.au.



2.3 Regulated Revenue Proposal

How our revenue is set

Transgrid is responsible for the large steel electricity towers and high-voltage powerlines that move electricity across NSW and the ACT.

The prices we can charge for these services are regulated by the Australian Energy Regulator under the NER. This independent oversight helps ensure customers pay no more than necessary for a safe and reliable network.

Every five years, we submit a Revenue Proposal to the AER. This proposal sets out the funding we need to operate, maintain and invest in the network. The AER then reviews our proposal and determines the revenue we can recover from customers.

Our 2028–33 Revenue Proposal

We are currently developing our 2028–33 Revenue Proposal to reflect the significant changes shaping the energy system, as this report explains.

The transmission network is becoming increasingly complex to plan for, build and operate reliably. The system is moving from a small number of large, central generators that kept the grid stable to a widely dispersed and diverse mix of renewable generation and storage, including household solar and batteries – and an inherently dynamic and unstable grid that needs new forms of security services.

Our Proposal aims to ensure the network continues to deliver safe, reliable and efficient services for consumers, while supporting the energy system to transition as quickly as possible at the lowest sustainable cost. It focuses on the investment required to:

- Safely operate and maintain a large and increasingly complex transmission network
- Manage risks associated with ageing assets, extreme weather and cyber threats
- Maintain system security and reliability as the generation mix changes
- Support new connections, including renewable generation, storage and large loads
- Ensure electricity can continue to flow from where it is generated to where it is needed.

Major transmission projects, like Sydney Ring South, are progressing through separate planning and approval processes. This Revenue Proposal is for the investment required to maintain safety and reliability, meet demand growth and support the energy transition in line with the AEMO guidelines.

What is shaping our proposal

As major changes increase risk in the energy system, our proposal explains how we plan to:

- **Understand and balance the interests of NSW and the ACT electricity consumers**
Consumers fund the cost of the transition and so must be provided the opportunity to actively participate in its design and delivery. Consumers however do not experience our proposal in isolation – they see the combined effect of all investments across the system. We are therefore working to provide a clearer view of total bill forecasts, including our major projects delivered through other frameworks.
- **Maintain a safe, secure and reliable electricity network**
Much of the existing network was built decades ago, and the risk of asset failure is increasing as equipment ages. At the same time, extreme weather events and

cyber security risks are becoming more significant. In addressing these risks, we need to innovate, utilise our data and systems and maximise the potential of our existing assets.

- **Enable a system powered by more renewables**
As coal-fired generation retires, the grid needs new sources of system strength and stability from large synchronous condensers and grid-forming batteries.
- **Meet new and changing demand**
Population growth, electrification and large new loads such as data centres are driving the need for targeted network augmentation. We will test demand forecasts carefully, consider alternative solutions and use existing capacity wherever possible to reduce costs.
- **Deliver the best value for money**
To deliver the best value for money we will exercise cost discipline and manage delivery complexity. Where investment is necessary, we must deliver on budget, on time and at lowest cost to ensure consumers can realise the benefits of it. The scale and pace of the transition combined with global conflicts and supply chain shocks can make this particularly challenging, but we must robustly test our plans and processes to manage these risks.

How consumers are helping to shape our proposal

To build our proposal around consumers, we have expanded how we consult with customers and their representatives. Transgrid has always worked closely with consumer advocacy groups in developing our revenue proposals. But for this proposal, we also conducted consumer research and formed a new Consumer Working Group whose advice has shaped the proposal at

various stages of development. In our conversations with consumers and advocacy groups, we explained different ways the electricity system could evolve in the future – and what that would mean for electricity users. This information helped people understand what each option means and the trade-offs that come with alternative decisions or timings.

Next steps

We will continue to refine our plans through ongoing analysis and engagement with customers, stakeholders and regulators.

Key milestones are:

- **Draft Plan publication (September 2026):** setting out our proposed approach and expenditure for further consultation
- **Revenue Proposal submission (January 2027):** formal lodgement to the AER for assessment and determination

This staged process provides opportunities for stakeholders to influence our plans before they are finalised.

The projects and expenditure forecasts presented in this report reflect Transgrid’s current planning assumptions at the time of publication. As the Revenue Proposal continues to be developed, project need, scope, timing and cost estimates may be refined through further planning, consultation and regulatory review. In addition, the delivery, scope and cost recovery arrangements for certain augmentation projects may evolve as policy and regulatory frameworks continue to develop in response to the NSW Government’s Data Centre Guidelines and the Commonwealth Government’s proposed rule changes to the Australian Energy Market Commission (AEMC).



2.4 Subsystem developments

This section outlines our proposed capital works for subsystems to meet the network performance requirements of NER Schedule 5.1. It includes new projects to address emerging needs, as well as ongoing and recently completed work. We highlight what's driving each project and the estimated work, timing and costs, based on current planning information and requirements. These projects reflect forecast network needs and development pathways, some of which are expected to span multiple regulatory periods. As a result, reported costs should be considered in the context of the full project lifecycle. As the Revenue Proposal continues to be developed, project need, scope, timing and cost estimates may be refined through further planning, consultation and regulatory review.

More rooftop solar, home batteries, data centres, electric vehicle chargers and electrification mean energy demand is changing fast. Peak demand is growing and minimum demand will continue to fall, particularly in regional NSW. As this 'demand envelope' widens, we are upgrading subsystems where these changes are happening to keep the network reliable. These augmentation works do not cause any material inter-network impact, as they address localised or site-specific needs within each region. Specifically, they will neither impose power transfer constraints nor adversely impact the quality of supply in other TNSP networks.

For each subsystem project, we've looked at a range of credible options: network options, including improving, replacing or adding lines and substations; and non-network solutions, including virtual power plants, battery energy storage systems, or Direct Load Control schemes, that we usually contract from the market.

Our proposed subsystem developments align with the primary objectives of AEMO's Integrated System Plan and System Security Planning reports:

- Enhancing interconnection capacity between NSW and the other states
- Supporting the development and connection of large-scale renewable energy zones across the NEM
- Improving system strength and security in response to the decline of thermal generation sources and the increase in renewable energy sources, particularly in NSW and VIC.

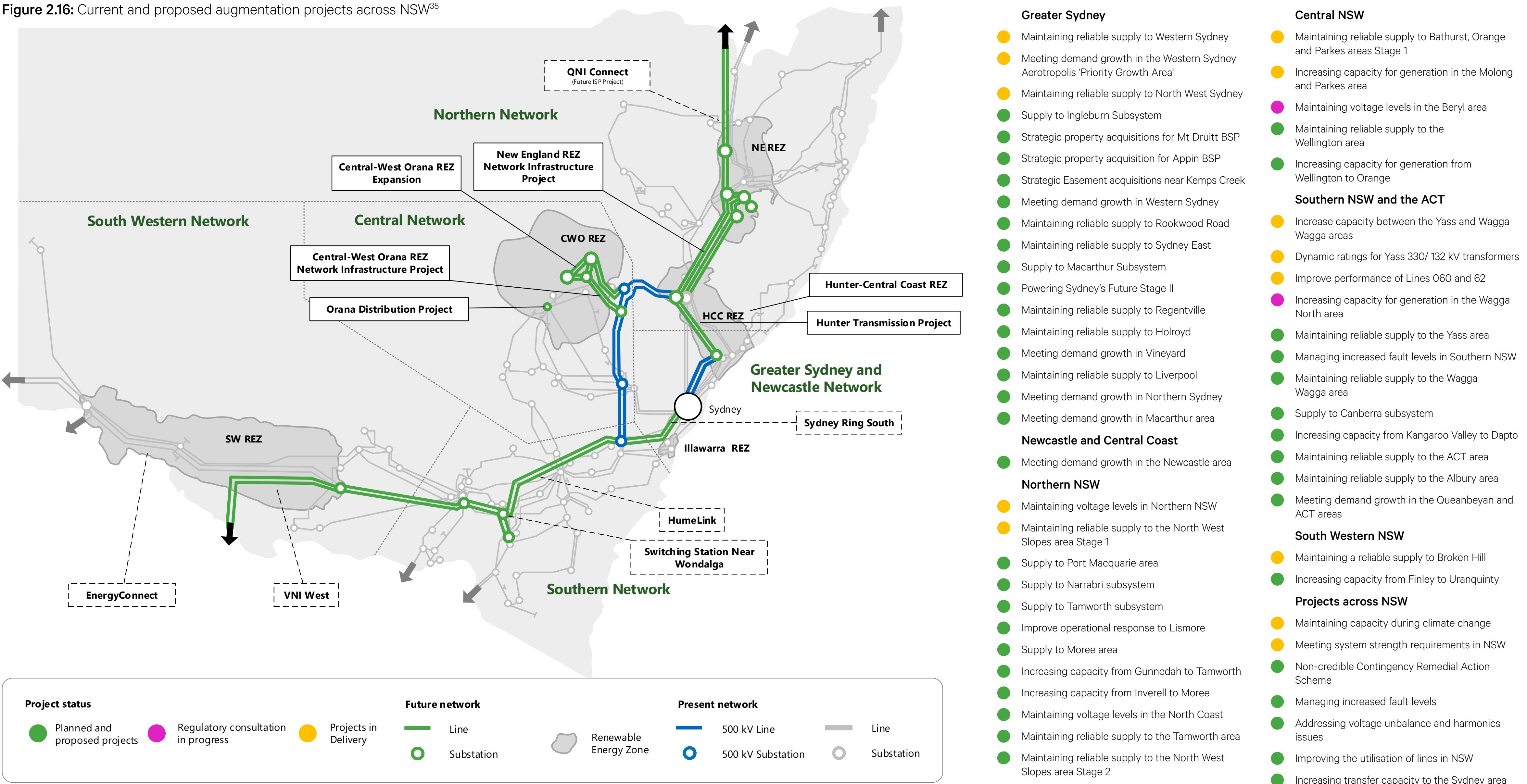
The information in this section is in response to the requirement of the NER Clause 5.12.2(c)(5) and (6).

Figure 2.16 shows all planned augmentation projects across NSW, including subsystem developments.



Nate Cull – Field Coordinator
Paul Sturt – Plant and Civil
Operator Grade 1

Figure 2.16: Current and proposed augmentation projects across NSW³⁵



35 Includes transmission projects delivered contestably under the NSW EII Act framework, which will not be constructed, owned or operated by Transgrid





2.4.1 Greater Sydney

The Greater Sydney network consists of a series of Transgrid-owned 330/132 kV and 330/66 kV BSPs that supply two distinct sub-transmission networks:

- Ausgrid’s Inner Sydney Metropolitan area, comprising a series of 132 kV sub-transmission lines and underground cables, owned and operated by Ausgrid, supplied from Beaconsfield, Haymarket, Rookwood Road, Sydney East, Sydney North and Sydney South 330/132 kV substations. The Inner Sydney area covers the load centres of the Sydney CBD, inner city, and the suburban area bounded by Hornsby and Dural in the North West, Homebush and Bankstown to the West, and Menai and Heathcote to the South West, and extending eastward to the coast.
- Endeavour Energy’s Greater Western Sydney area, comprising a series of 132 kV and 66 kV subtransmission lines and underground cables owned and operated by Endeavour Energy, supplied from Holroyd, Ingleburn, Liverpool, Macarthur, Regentville, Sydney West, and Vineyard 330/132 kV and 330/66 kV BSPs. This area covers the load centres of the Parramatta CBD, and the greater west extending from Hawkesbury in the North West, through to the Macarthur area in the South West, and extending westward to the Blue Mountains.

Over the next 15 years, the population of Greater Sydney will grow to 6.3 million people.³⁶ Population growth, the widespread electrification of homes, businesses and transport, and the rapid expansion of data centres to support a broader digital economy will together drive a major uplift in electricity demand. While a share of this growth is likely to be supplied locally within distribution

networks by local solar generation and increasingly sophisticated coordination of consumer energy resources (CER), this will not be sufficient by itself.

In the Greater Western Sydney area serviced by Endeavour Energy, demand growth is being driven primarily by new customer connections in government-supported greenfield development areas, like the Western Sydney Aerotropolis.³⁷ The region is experiencing strong population growth, ongoing residential development, and the expansion of commercial and industrial precincts. Growth is also driven by urban densification around key transport corridors and strategic centres. More recently, increasing numbers of proposed large-scale data centres and other high-capacity industrial loads have emerged as a significant driver of demand, contributing to higher demand forecasts than previously reported in Endeavour’s 2024 Distribution Annual Planning Report.

While historical maximum demand across the Sydney Metropolitan areas serviced by Ausgrid has remained relatively stable over the past five years, Ausgrid forecasts increasing summer and winter peak demand over the next decade. This growth is expected to be driven by population growth, ongoing urban development and densification, electrification, and the connection of large new loads like data centres. Ausgrid already supports 52 dedicated data centres across its network, and there is strong interest from developers seeking new large-scale connections across the network. Together, electricity demand from existing and new data centre connections in Ausgrid’s network is forecast to reach over 2 GW by 2040,³⁸ with more recent forecasts shared with Transgrid indicating potential for even higher growth.

36 <https://www.planning.nsw.gov.au/data-and-insights/population-projections/key-findings>
37 Endeavour Energy Distribution Annual Planning Report 2025
38 Ausgrid Distribution and 2025 Transmission Annual Planning Report

55 | Transgrid | 2026 Transmission Annual Planning Report | 2.4 Subsystem developments

In addition to demand growth in distribution networks, Transgrid has signed connection agreements with two direct connected data centres with a combined capacity of 1.5 GW, each connecting to the 330 kV transmission network that supplies the Greater Sydney region. Based on current assessments, this load can be accommodated within existing network capacity in the near term. However, Transgrid’s analysis of the impact of these new connections, alongside recent demand forecasts from distribution networks, reveals that the transmission network in Western Sydney is becoming increasingly constrained, with capacity largely exhausted beyond 2033.

While demand in Greater Sydney is expected to grow, so too is local generation from rooftop solar, which is increasingly being soaked up and time-shifted by sophisticated CERs like home batteries. Across NSW and the ACT, generation from rooftop solar is expected to increase by nearly 60 per cent over the next decade, from 8.6 TWh in FY25 to 14.9 TWh in FY35,³⁹ with much of this coming from urban centres. Supported by incentives like the Commonwealth Government’s Cheaper Home Batteries Program, homes and businesses are investing in behind-the-meter storage at unprecedented rates, which allows solar energy to be stored during the day and used in the evening. This not only helps lower bills for consumers but also reduces strain on the network at peak times.

While local CER will help support growing demand in Greater Sydney, we still see the need to invest in projects like Sydney Ring South and the Hunter Transmission Project to reliably and efficiently supply power to our critical urban centres with lower-cost renewable energy generated across NSW, firmed by large-scale batteries,

pumped hydro and gas-fired generation. In addition to foundational transmission projects, we also recognise that downstream network augmentations, such as new or upgraded Bulk Supply Points and upgraded distribution networks, may be required to cater for new demand, particularly under higher growth trajectories.

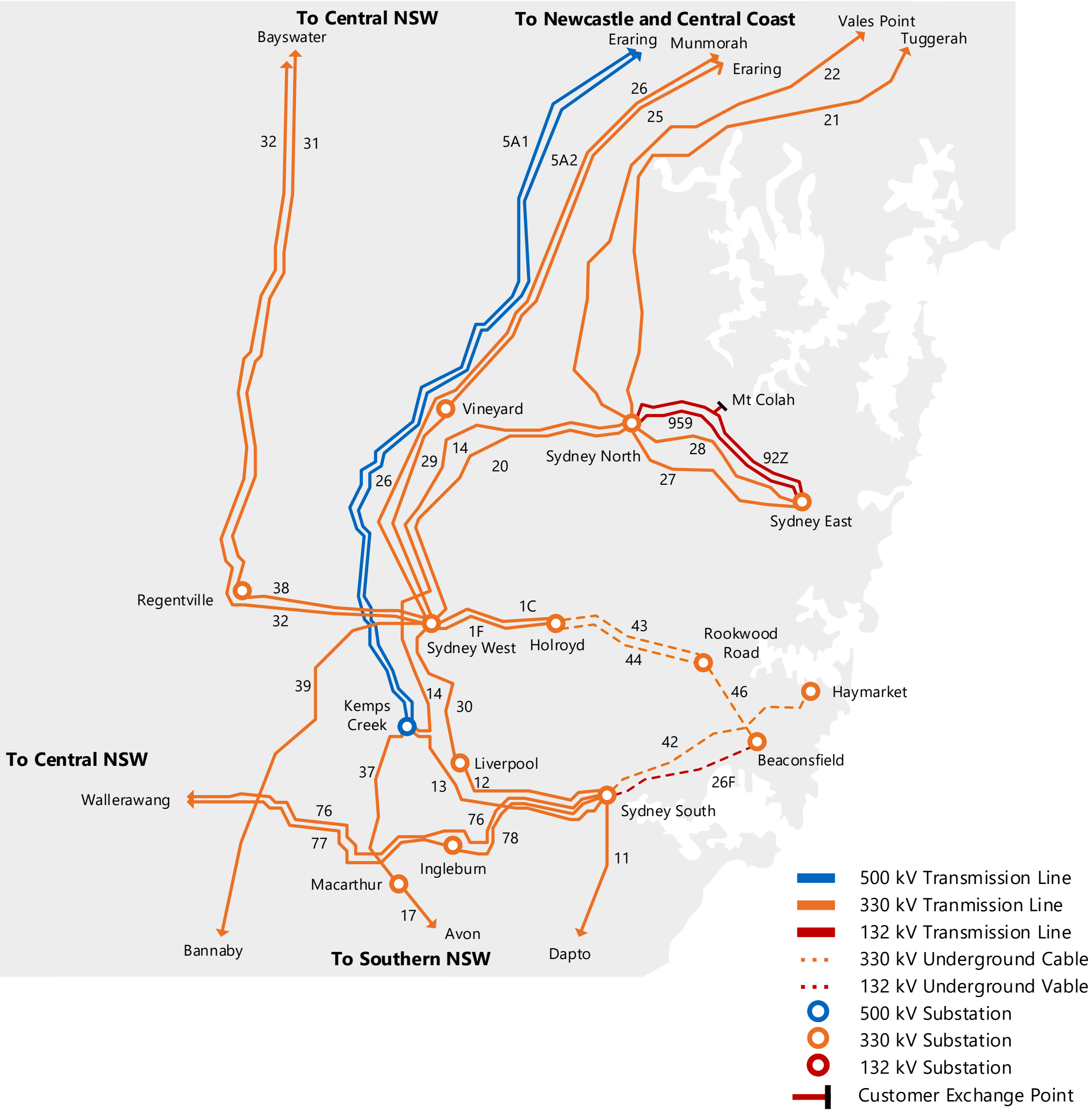
To support growth over the longer term, we are working on a broader Sydney Plan that encompasses a portfolio of potential projects in Greater Sydney that can be sequenced in response to the pace, scale and location of demand growth. The Sydney Plan ensures the network evolves systematically as and when required to power growth while supporting a reliable, secure electricity supply, and providing access to cleaner, more sustainable energy.

Planned and proposed projects

Through our established annual planning cycle, Transgrid is working with Ausgrid and Endeavour Energy to monitor and forecast demand growth in Greater Sydney and develop timely solutions in response to emerging network constraints. This process has already resulted in a number of augmentation projects progressing through to development and delivery, such as the new Bulk Supply Point at Kemps Creek, with more proposed for Transgrid’s 2028-33 regulatory period.

Table 2.1 lists our current and planned augmentation projects in the Greater Sydney area which cater for growing demand and maintain reliability at the subsystem level. Upstream augmentations that strengthen the backbone transmission network that supplies the region, such as the Hunter Transmission Project (Sydney Ring North) and Sydney Ring South, are discussed in Section 2.1.

Figure 2.17: Existing Greater Sydney network



39 Energeia Study on PV and small batteries, 2026

Table 2.1: Planned and proposed projects in Greater Sydney

Project description	Indicative operational date	Total estimated cost (\$2025/26 million)	Purpose and options	Project justification
Maintaining reliable supply to Western Sydney	Dec 2027	43	To address network constraints due to overloading of Sydney West 330/132 kV transformers under N-1 contingency. Installation of an additional transformer to increase the firm capacity at Sydney West.	Load driven
Meeting demand growth in the Western Sydney Aerotropolis ‘Priority Growth Area’	Nov 2028	175	To support load growth in the Western Sydney region, including new residential and commercial precincts. The preferred option under delivery includes a new bulk supply point adjacent to Transgrid’s Kemps Creek Substation and a new 330/132 kV transformer at Macarthur Substation.	Load driven
Maintaining reliable supply to North West Sydney	Sept 2029	50-60	To address voltage stability issues at Vineyard 330/132 kV substation due to the load growth in the North West Sydney region. The preferred option under delivery includes loop-in of line 26 into Vineyard substation.	Compliance
Supply to Ingleburn subsystem	2029	11	To provide two new 66 kV feeder bays at Ingleburn substation due to increasing demand in the distribution network.	Connection
Strategic property acquisition for Mt Druitt BSP	2030	TBD	To acquire land for establishing a new 330/132 kV BSP to meet demand growth in Western Sydney.	Strategic property
Strategic property acquisition for Appin BSP	2030	TBD	To acquire land for establishing a new 330/66 kV BSP in the Appin area to meet demand growth in the Macarthur region.	Strategic property
Strategic easement acquisition near Kemps Creek	2030	TBD	To reinforce supply to Western Sydney with additional 330 kV feeders.	Strategic property
Meeting demand growth in Western Sydney	2032	200 - 300	To maintain reliability of supply to Western Sydney with a new 330/132 kV BSP at Mt Druitt.	Demand
Maintaining reliable supply to Rookwood Road	2032	17 - 23	To address increasing load supplied from Sydney North.	Load driven
Maintaining reliable supply to Sydney East	2032	20 - 34	To address network constraints due to overloading of Sydney East 330/132 kV transformers under N-1 contingency.	Load driven
Supply to Macarthur subsystem	2033	7	To provide a new 132 kV feeder bay at Macarthur substation to supply Endeavour Energy's new Mt Gilead ZS	Connection
Powering Sydney’s Future Stage II	2033	300 - 750	To address network constraints due to the load growth and the reliability of ageing 132kV cables and reduced supply capacity for Inner Metro.	Demand
Maintaining reliable supply to Regentville	2033	100 - 135	To address network constraints due to growing demand in the Regentville area.	Load driven
Maintaining reliable supply to Holroyd	2033	80 - 110	To address network constraints due to overloading of Holroyd 330/132 kV transformers under N-1 contingency.	Load driven
Meeting demand growth in Vineyard	2034	38 - 50	To address network constraints due to overloading of Vineyard 330/132 kV transformers under N-1 contingency.	Load driven
Maintaining reliable supply to Liverpool	2035	TBD	To address network constraints due to growing demand in the Liverpool area.	Load driven
Meeting demand growth in Northern Sydney	2035	TBD	To maintain reliability of supply to Northwest Sydney with a new 330/132 kV BSP.	Load driven
Meeting demand growth in Macarthur area	2035	TBD	To maintain reliability of supply to Southwest Sydney with a new 330/132 kV BSP	Load driven

Projects under regulatory consultation

No prescribed augmentation projects have ongoing RIT-Ts in the Greater Sydney region.

Projects that have completed regulatory consultation (see [Transgrid link](#))

- Maintaining reliable supply to Western Sydney
- Meeting demand growth in the Western Sydney Aerotropolis Priority Growth Area
- Maintaining reliable supply to North West Sydney (Maintain voltage in the Vineyard area).

Completed projects

No prescribed augmentation projects were completed in the Greater Sydney region after the 2025 Transmission Annual Planning Report was published.

Renewable Energy Zones

To facilitate the Illawarra REZ, Transgrid may be required to deliver a range of enabling works. These may include both minor and major upgrades, such as enhancements to communications and protection systems, fault-level management, upgrades to existing transmission lines and BSPs and the potential development of new transmission lines and BSPs.

2.4.2 Newcastle and Central Coast

Newcastle and Central Coast areas are served by numerous 330 kV transmission lines and 330/132 kV BSPs. The NSW Government has identified the Hunter-Central Coast (HCC) REZ, requiring transmission projects to support growth in the region. See Section 2.1.1 for further details.

Table 2.2: Planned and proposed projects in Newcastle and Central Coast

Project description	Indicative operational date	Total estimated cost (\$2025/26 million)	Purpose and options	Project justification
Meeting demand growth in the Newcastle area	2035	TBD	To address network constraints due to growing demand in the Newcastle area	Load driven

Projects under regulatory consultation

No prescribed augmentation projects are planned in the Newcastle and Central Coast region.

Projects that have completed regulatory consultation

No prescribed augmentation projects completed regulatory consultation in the Newcastle and Central Coast region.

Completed projects

No prescribed augmentation projects were completed in the Newcastle and Central Coast region after 2025 Transmission Annual Planning Report was published.

Future potential distribution projects

HCC REZ Stage 2 – As part of the Hunter-Central Coast Renewable Energy Zone development, Transgrid is proposed to be responsible for delivering increased capacity. These works may include both minor and major upgrades such as enhancements to communications and protection systems, fault level management, upgrades to existing substations and a new transmission line.

Figure 2.18: Existing Newcastle and Central Coast network

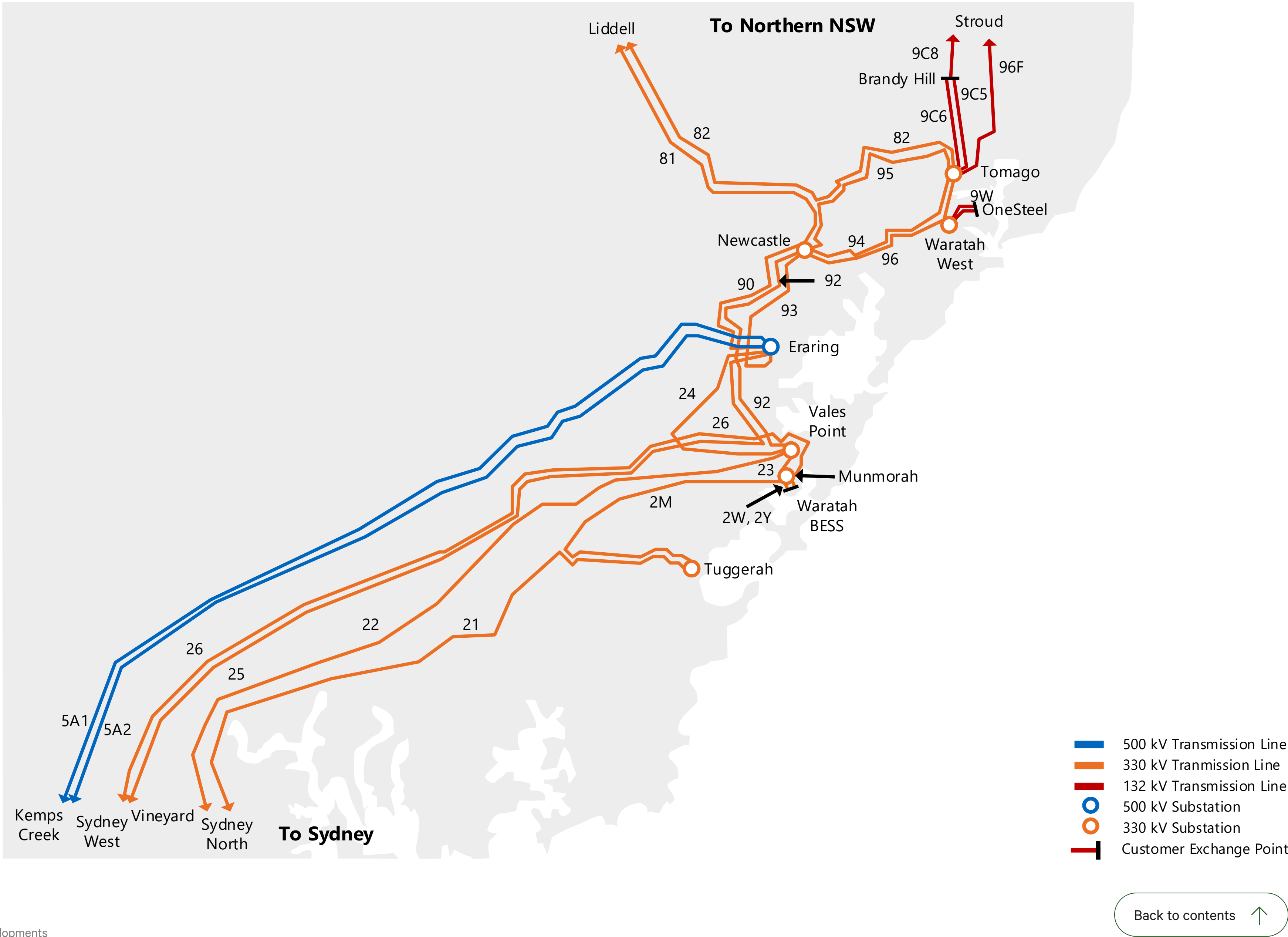


Figure 2.19: Existing Northern NSW network

2.4.3 Northern NSW

The Northern NSW area extends from Tomago in the Central Coast, up to Lismore in the far northeast, to Moree in the far northwest and back to Tamworth via a network of interconnected 330 kV and 132 kV lines. The network has two electrically and geographically distinct subsystems — northwest and the North Coast — and the main 330 kV corridor linking QLD to the Hunter region of NSW and to Sydney.

QNI Connect and New England REZ Network Infrastructure will be in this network (see Section 2.1).

Planned and proposed projects

Table 2.2 shows our planned projects to improve reliability of supply. Transgrid is also conducting Joint Planning with Essential Energy to support load growth projects in the region.

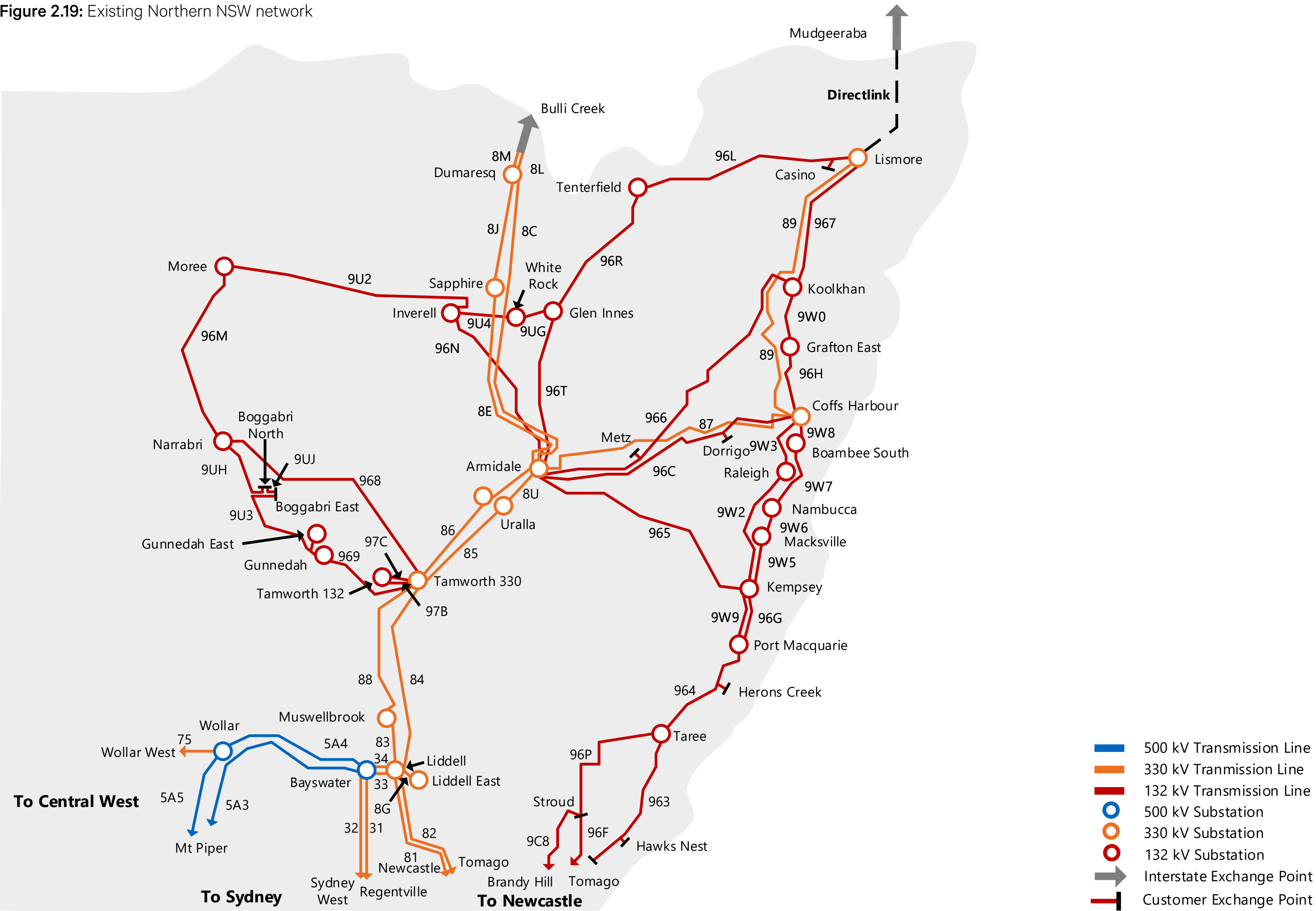


Table 2.3: Planned and proposed projects in Northern NSW

Project description	Indicative operational date	Total estimated cost (\$2025/26 million)	Purpose and options	Project justification
Maintaining voltage levels in Northern NSW	Nov-26	14	To address high-voltage issues during low demand in Essential Energy’s distribution network. A RIT-T has been completed with the preferred option of a 25 MVar reactor installation at Inverell Substation.	Compliance
Maintaining reliable supply to the North West Slopes area Stage 1	May-27	17 for network solution	To accommodate significant increases in demand in the Narrabri and Gunnedah areas over the next 10 years. The Stage 1 preferred option included a non-network BESS in the region and a third transformer at Narrabri Substation to maintain reliability.	Load driven
Supply to Port Macquarie area	2027	1.2	To provide two new 33 kV feeder bays at Port Macquarie to support the new Essential Energy zone substation.	Connection
Supply to Narrabri subsystem	2031	9	To provide a new feeder bay at Narrabri to support increasing load growth in the area.	Connection
Supply to Tamworth subsystem	2031	12	To support the significant increase in regional electricity demand driven by industrial precinct.	Connection
Improve operational response to Lismore	2032	7	To improve the operational response to Lismore by establishing a scheme to increase the reliability and supply capability of the area. To reduce the likelihood of pre-emptive load shedding and improve reliability in the Lismore area.	Proposed NCIPAP
Supply to Moree area	2031 2037	75 - 100 25 - 35	To address increasing load growth in the Moree area, which will see voltages breaching the NER power frequency voltage level requirements. Future scope is to address network constraints due to overloading of Moree 132/66 kV transformers under N-1 conditions.	Compliance
Increasing capacity from Gunnedah to Tamworth	2032	35 - 50	This proposed project is to reduce constraints on line 969 (Gunnedah to Tamworth).	Load driven
Increasing capacity from Inverell to Moree	2032	1.3	To remove rating constraints on Line 9U2 and improve network capacity between Moree and Inverell to support load growth in Northern NSW.	Proposed NCIPAP
Maintaining voltage levels in the North Coast	2032	28 - 40	To maintain voltages in the North Coast between Coffs Harbour and Taree during maximum and minimum demand.	Compliance
Maintaining reliable supply to the Tamworth area	2032	35 - 50	To address network constraints due to overloading of Tamworth 132/66 kV transformers under N-1 conditions.	Load driven
Maintaining reliable supply to the North West Slopes area Stage 2	TBD	TBD	To upgrade transmission lines to mitigate further network constraints as load increases further in the region. This is currently a contingent project, with progression subject to the trigger condition of a large-load customer entering into a connection agreement.	Load driven

Projects under regulatory consultation (see Section 2.8)

No prescribed augmentation projects have ongoing RIT-Ts in the Northern region.

Projects that have completed regulatory consultation (see [Transgrid link](#))

These prescribed augmentation projects have completed RIT-Ts in the Northern region.

- Maintaining voltage levels in Northern NSW
- Maintaining reliable supply to the North West Slopes area

Completed projects

No prescribed augmentation projects were completed in the Northern region after the 2025 Transmission Annual Planning Report was published.

Figure 2.20: Existing Central NSW network

2.4.4 Central NSW

The Central NSW network comprises an interconnected system of 500 kV, 330 kV and 132 kV transmission lines extending across the Central West region. The network includes key transmission corridors linking Sydney to Northern NSW and Southern NSW, as well as a series of BSPs that supply regional load centres including Orange, Wellington, Molong, Parkes and Cowra. The region also has significant generation and renewable energy interest but the 132 kV network faces existing voltage and thermal limitations.

Central-West Orana REZ and Orana Distribution Project are being developed in Central NSW – see Section 2.1.1.

Planned and proposed projects

Table 2.3 shows the planned projects in the Central NSW Region to improve supply reliability and transmission capacity.

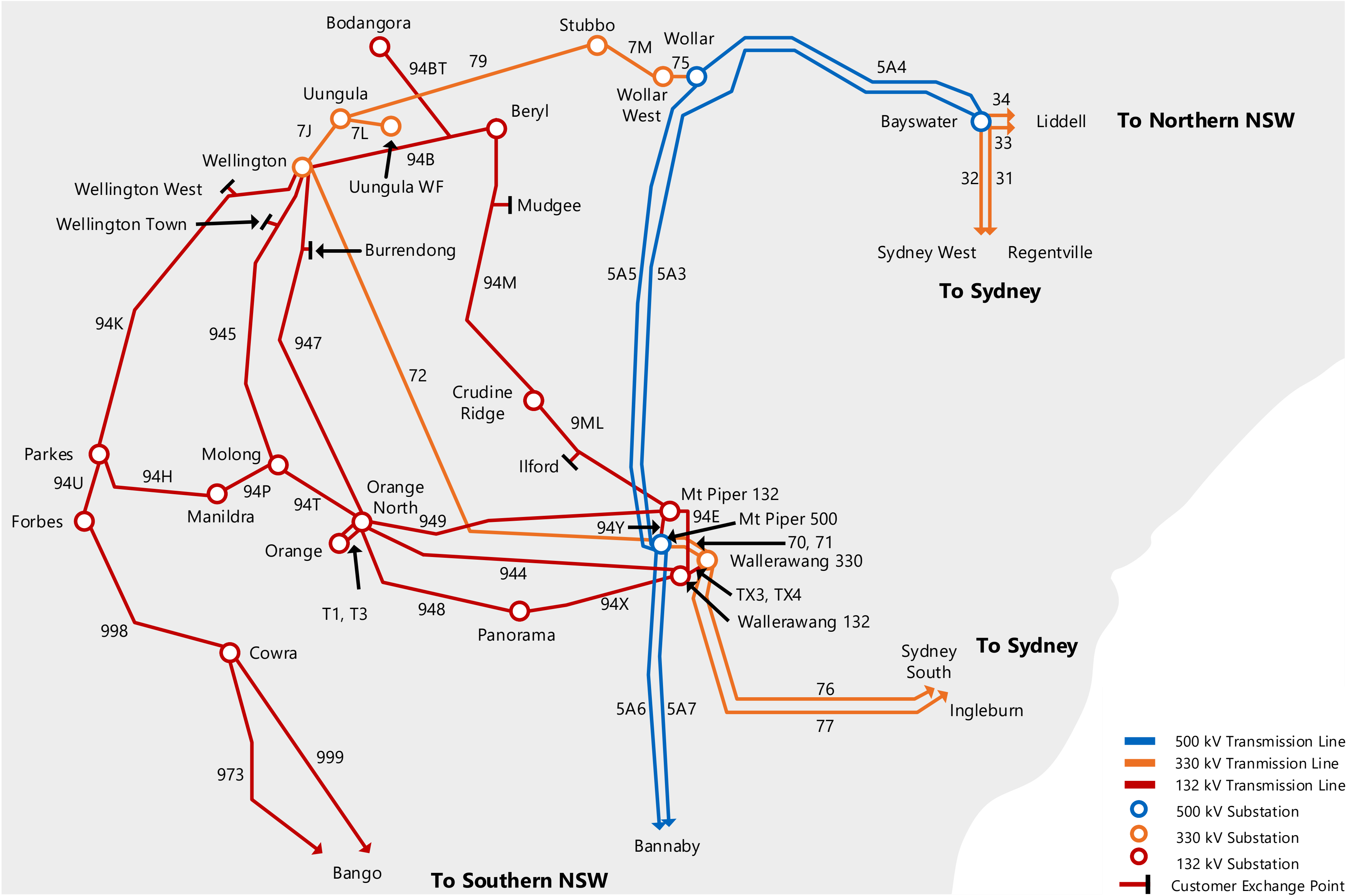


Table 2.4: Planned and proposed projects in Central NSW

Project description	Indicative operational date	Total estimated cost (\$2025/26 million)	Purpose and options	Project justification
Maintaining reliable supply to Bathurst, Orange and Parkes areas Stage 1	Nov-26	Non-network solution	To accommodate significant increases in demand in the Parkes areas over the next 10 years, mainly due to a rise in commercial demand, such as the NSW Government’s Parkes Special Activation Precinct and potential mine load growth. This growth is expected to cause voltage constraints in the area. The RIT-T preferred option for Stage 1 of the project is non-network service at Parkes.	Compliance
Increasing capacity for generation in the Molong and Parkes area	Dec-26	14.5	To increase capacity in the network west of Molong Substation, which has many renewable generators in service. The outputs of these generators are being curtailed by the relatively low thermal rating of line 94T. The RIT-T preferred option is to fit line 94T with a higher rating, low-sag conductor. The expected normal rating of the upgraded line is at least 190 MVA.	Economic benefits
Maintaining voltage levels in the Beryl area	2030	40 - 60	To address potential voltage constraints and reactive margin shortfall issues in the Beryl area. Transgrid has identified a range of credible network and non-network options to address these network constraints. The RIT-T PADR identified a SVC at Beryl as the preferred option at that stage.	Compliance
Maintaining reliable supply to the Wellington area	2033	TBD	This proposed project is to accommodate increasing number of connections on 330 kV busbar by upgrading the Wellington Substation to a breaker and a half arrangement.	Reliability
Increasing capacity for generation from Wellington to Orange	2033	TBD	This proposed project is to reduce thermal constraints on multiple lines in Central West around Wellington to Orange area.	Economic benefits

Projects under regulatory consultation (see Section 2.8)

The prescribed augmentation projects with ongoing RIT-Ts in the Central region.

- Maintaining voltage levels in the Beryl area

Projects that have completed regulatory consultation (see [Transgrid link](#))

These prescribed augmentation projects have completed RIT-Ts in the Central region.

- Maintaining reliable supply to Bathurst, Orange and Parkes areas Stage 1
- Increase capacity for generation from Molong to Parkes

Completed projects

The following prescribed augmentation projects in Central region have been completed since the 2025 Transmission Annual Planning Report was published:

- Increase capacity for generation from Molong to Orange North, which implemented dynamic ratings on line 94T thus reducing potential curtailment of low-cost renewable generation in the area.
- Meeting demand growth and reliability requirements in the Parkes area, to accommodate the loads proposed in the Parkes area.

Future potential distribution projects

Essential Energy and Transgrid are conducting Joint Planning to enable and enhance BSP hosting capacity. This will unlock generation and storage projects that will enable efficient supply of the local load while supporting NSW consumers required energy. As part of the Orana Distribution Project development, Transgrid is set to be responsible for delivering increased capacity at BSPs.



Caleb Arthur-Wornham -
2nd Year Transmission Line
Apprentice

Figure 2.21: Existing Southern NSW and the ACT network

2.4.5 Southern NSW and the ACT

The Southern network plays a crucial role in transmitting electricity both from renewable energy sources to major load centres, and between NSW and VIC. The network connects a mix of generation sources, including gas-fired power plants, wind farms, solar farms, BESS and hydroelectric power. Several projects have been planned in Southern NSW to reduce bottlenecks on the network to allow future renewable generation projects to connect.

Transgrid is working closely with local distribution network service providers, including Evoenergy and Essential Energy, to identify the most efficient way to meet forecast demand growth in the ACT and Queanbeyan areas. This work is being driven by strong projected load growth over the next decade, supported by the ACT Government’s Net Zero 2045 policy to electrify gas appliances and transport. New large-scale loads around Queanbeyan and South Jerrabomberra will add to these increased capacity requirements, reinforcing the need for coordinated solutions across the transmission and distribution networks.

HumeLink and Switching Station Near Wondalga are also being developed in this network. See Section 2.1.3 for more details.

Planned and proposed projects

A summary of the planned projects in the Southern NSW and the ACT region is provided in Table 2.5.

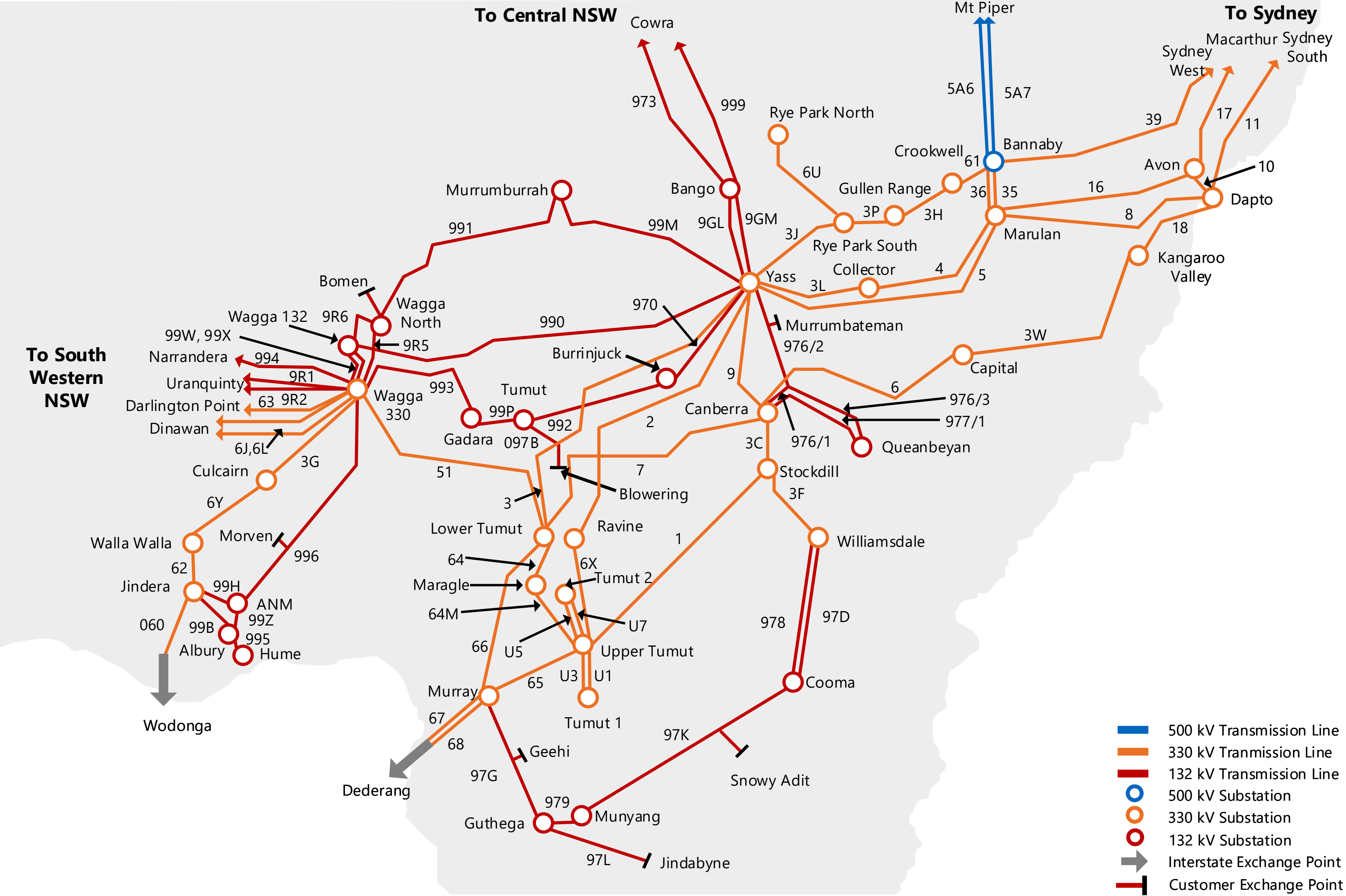


Table 2.5: Planned and proposed projects in Southern NSW and the ACT

Project description	Indicative operational date	Total estimated cost (\$2025/26 million)	Purpose and options	Project justification
Increase capacity between the Yass and Wagga Wagga areas	Sep-26	0.5	To improve the management of the post-contingent overloads of the 132 kV network in the subsystem between Yass and Wagga Wagga Feeders in the scheme include 970, 990, 991, 992, 993, 99M, 99P, 9R5, 9R6, 99X and 99W.	NCIPAP
Dynamic ratings for Yass 330/132 kV transformers	Dec-27	1.4	To implement a real-time monitoring system and the required upgrades to facilitate a dynamic rating system for the No.1 and No.2 330/132 kV transformers at Yass 330 kV substation.	NCIPAP
Improve performance of Lines 060 and 62	2027	0.5	To reduce constraints on lines 060 and 62.	Proposed NCIPAP
Increasing capacity for generation in the Wagga North area	Jun-28	20 - 25	To increase the transfer capacity for renewable generation in the Wagga North area. Options considered include upgrading the 132 kV lines 9R5 and 9R6 and to upgrade the busbar sections at Wagga 132 kV substation.	Economic benefits
Maintaining reliable supply to the Yass area	2028	10 - 15	To maintain a reliable supply to the Yass area and to meet the projected load growth from Essential Energy.	Connections
Managing increased fault levels in Southern NSW	May-29	50 - 100	The fault levels in the Southern transmission network will increase due to the Energy Connect, HumeLink, and VNI West projects. The switchgear at Lower Tumut, Upper Tumut, Wagga Wagga 330 kV and Murray 330 kV substations and the earth grid at Lower Tumut will all be upgraded to meet compliance requirements.	Compliance
Maintaining reliable supply to the Wagga Wagga area	2030	5	To meet overall network reliability requirements, including upgrading the busbar sections at Wagga Wagga 66 kV substation.	Compliance
Supply to Canberra subsystem	2030	TBD	To provide new feeder connections at Canberra to support increasing load growth in the ACT area.	Connections
Increasing capacity from Kangaroo Valley to Dapto	2032	2	To remove rating constraints on Line 18 and improve network capacity between Kangaroo Valley and Dapto.	Proposed NCIPAP
Maintaining reliable supply to the ACT area	2033	30 - 40	To meet network reliability requirements in the Canberra and the ACT area.	Compliance
Maintaining reliable supply to the Albury area	2033	25 - 30	To meet the projected load from Essential Energy.	Connections
Meeting demand growth in the Queanbeyan and ACT areas	2035	TBD	To address forecast demand growth in the ACT and surrounding regions. The project is driven by strong load growth associated with electrification, policy-driven decarbonisation, and emerging developments, and will deliver efficient transmission and distribution solutions to support increasing capacity requirements at key supply points.	Reliability

Projects under regulatory consultation (see Section 2.8)

This prescribed augmentation project has an ongoing RIT-T in the Southern NSW and the ACT region

- Increasing capacity for generation in the Wagga North area.

Projects that have completed regulatory consultation (see Transgrid link)

This prescribed augmentation project has completed a RIT-T in the Southern NSW and the ACT region.

- Managing increased fault levels in Southern NSW

Completed projects

No prescribed augmentation projects were completed in the Southern region after the 2025 Transmission Annual Planning Report was published.

Future potential distribution projects

Essential Energy and Transgrid are conducting Joint Planning to enable and enhance BSP hosting capacity. This will unlock generation and storage projects that will enable efficient supply of the local load while supporting NSW consumers required energy. As part of the proposed Marulan and Yass Distribution Project developments, Transgrid is proposed to be responsible for delivering increased capacity at BSPs.

Figure 2.22: Existing South Western NSW network

2.4.6 South Western NSW

The transmission network in South Western NSW operates across various voltage levels, with 220 kV lines reaching as far as Broken Hill. Transgrid is implementing expansion and enhancement projects to ensure network security during the energy transition. This includes the NSW section of EnergyConnect – a 330 kV interconnector linking SA to Buronga, which will enhance inter-regional transfer capability, support renewable integration and improve supply reliability.

Major projects, including EnergyConnect (energised), South West REZ and VNI West, are being developed in this network (see Section 2.1.3).

Planned and proposed projects

Table 2.5 shows the planned projects in the South Western NSW region.

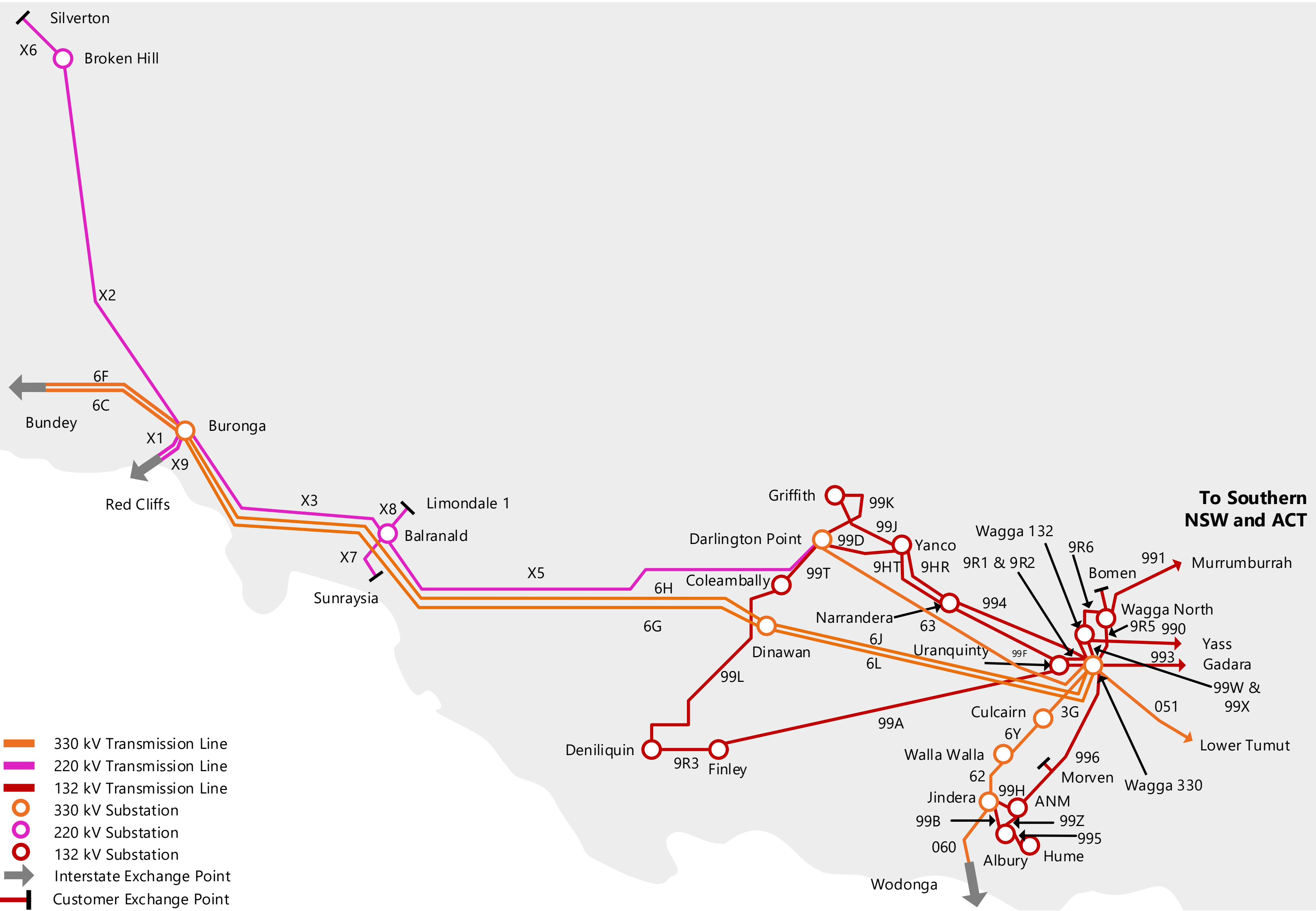


Table 2.6: Planned and proposed projects in South Western NSW

Project description	Indicative operational date	Total estimated cost (\$2025/26 million)	Purpose and options	Project justification
Maintaining a reliable supply to Broken Hill	2028	Non-network solution	To provide backup supply when line X2 is out of service, to meet the IPART reliability standard for Broken Hill	Reliability
Increasing capacity from Finley to Uranquinty	2032	0.8	To remove rating constraints on Line 99A and improve network capacity between Finley and Uranquinty	Proposed NCIPAP

Projects under regulatory consultation (see Section 2.8)

No prescribed augmentation projects have ongoing RIT-Ts in the South Western region.

Projects that have completed regulatory consultation (see [Transgrid link](#))

This prescribed augmentation project has completed a RIT-T in the South Western region.

- Maintaining a reliable supply to Broken Hill

Completed projects

The following prescribed augmentation projects were completed after 2025 Transmission Annual Planning Report was published:

- Maintaining reliable supply to Deniliquin Coleambally and Finley area. In October 2025, two 66 kV 11 MVAR reactors were installed at Deniliquin to address the high-voltage issues during low demand periods by installing.
- Maintain reliability to Broken Hill Area. This project, completed in June 2026, addressed the need to manage negative operational demand in the Broken Hill region when line X2 is out of service.
- Darlington Point 330/220/33 kV Tie Transformer cross tripping scheme. This project, completed in July 2026, is enabling high flows of renewable generation in Far West NSW towards Darlington Point. Previously, the dispatch from renewable generation in the Far West was constrained to prevent future overloading of 200 MVA 330/220/33 kV transformers during a trip of the other transformer. This project implemented



Relieving X5 voltage stability constraints Balranald 220 kV 20 MVAR capacitor bank

- a remedial action scheme to trip the remaining tie transformer, allowing the tie transformers to run at their maximum MVA rating.
- Relieving X5 voltage stability constraints. This project, completed in June 2026, addressed the very high power flows in the 220 kV network, which were leading to severe under voltages at Balranald and creating issues with voltage stability limit on Line X5, on a

contingent trip of a transmission line in North Western Victoria. This project installed a 220 kV 20 MVAR capacitor bank to provide additional reactive support to relieve the Line X5 stability limit.

2.4.7 Across NSW

Network Support and Control Ancillary Services needs

Network Support and Control Ancillary Services maintain power system security. Under the NER, AEMO identifies Network Support and Control Ancillary Services needs in NSW, and Transgrid is required to procure the services to address them.

In AEMO’s Transition Plan for System Security 2025, system strength and inertia deficits across NSW were identified from FY28 following the retirement of the Eraring Power Station. The subsequent extension of Eraring to April 2029 has deferred the timing of these shortfalls.

To manage current system strength requirements, Transgrid has procured non-network system strength services from Tumut 3 units operating in synchronous condenser mode. In parallel, Transgrid is accelerating the delivery of synchronous condensers at five sites across NSW (Phase 1), as directed by the NSW Government under the PNIP framework. The synchronous condensers being procured include flywheels to mitigate the forecast inertia deficits.

System strength and inertia requirements

As the NSW System Strength Service Provider, Transgrid is responsible for making sure the grid has enough system strength to stay secure and stable. This includes maintaining the minimum level system strength requirements and additional system strength to facilitate the stable connection and operation of new inverter-based resources as they are forecast to connect.

Section 5.1 discusses power system security in NSW and presents our proposed portfolio of solutions to address future needs. These solutions include synchronous condensers fitted with flywheels, contracts with synchronous machines to operate in the energy market beyond their typical market operation to provide system security services, modifications to synchronous generation units to enable operation in synchronous condenser mode and contracts with grid-forming batteries.

Planned and proposed projects

A summary of the planned projects across multiple subsystems in NSW is provided in Table 2.6.

Projects undergoing regulatory consultation (refer to Section 2.8)

No prescribed augmentation projects have ongoing RIT-Ts.

Projects that have completed regulatory consultation (see [Transgrid link](#))

This prescribed augmentation project has completed a RIT-T.

- Meeting system strength requirements in NSW (Phase 1)

Completed projects

The following project was completed after the 2025 Transmission Annual Planning Report was published:

- NSW oscillation monitoring – phasor measurement units were installed to provide the required data for wide area monitoring, enabling AEMO to detect and respond effectively to rapidly developing power system issues and more accurately model the power system.

Table 2.7: Planned and proposed projects across NSW

Project description	Indicative operational date	Total estimated cost (\$2025/26 million)	Purpose and options	Project justification
Maintaining capacity during climate change	Dec-2027	7.6	To implement Dynamic Line Ratings on multiple constrained lines, including lines 96N, 9R3, 99L, 999, 8C, 8E, 8J, 964/1, 964/2, 992, 993 and 99A.	Economic benefit
Meeting system strength requirements in NSW	Phase 1: 2029 Phase 2: 2033	2210	To implement five Phase 1 and three Phase 2 synchronous condensers (subject to resolving the commercial feasibility of Phase 2 synchronous condensers) to address system strength gaps. See Chapter 5 for further details.	System security
Non-credible Contingency Remedial Action Scheme	2029	TBD	Identified in the GPSRR, the project mitigates the risk of voltage collapse following a N-2 contingency on the 500 kV backbone.	Compliance
Managing increased fault levels	2030	TBD	Future network conditions and augmentation will increase fault levels at various locations in the network. This project will ensure equipment ratings are maintained though the transition.	Compliance
Addressing voltage unbalance and harmonics issues	Phase 1: 2030 Phase 2: TBD	TBD	To implement line transpositions and install harmonic filters to address the voltage unbalance and harmonics exceeding the allowed limits.	Compliance
Improving the utilisation of lines in NSW	2033	7	To implement Dynamic Line Ratings on multiple constrained lines, looking beyond 2028.	Proposed NCIPAP
Increasing transfer capacity to the Sydney area	2033	400 - 600	A proposed contingent project to address network capacity limits to the Greater Sydney area.	Load driven



2.5 Replacement projects

Replacement projects enable Transgrid to renew assets at the point where replacement, refurbishment and targeted life extension is more prudent than continued maintenance. It supports safe and reliable operation of the existing transmission system while managing whole-of-life costs and avoiding unnecessary investment.

These projects address assets that are deteriorating, obsolete or no longer economic to maintain — with investments targeted to renew and refurbish transmission lines, substations, secondary systems and network property assets so the current network can continue to operate reliably, safely and securely.

A significant proportion of our asset base is now approaching or operating beyond its expected economic life. As assets age, their condition deteriorates, failure risk increases, and maintenance becomes less effective and more costly. At the start of the 2028-33 regulatory period, 30-40 per cent of our substations and transmission line assets will have exceeded their expected life, and 50 per cent of our shorter-lived digital assets will be approaching obsolescence.

Replacement expenditure is therefore focused on managing end-of-life risk before assets fail in service. This includes replacing or refurbishing deteriorated structures, conductors, transformers, circuit breakers, protection and control systems, communication equipment, security systems and other assets where condition, obsolescence, safety obligations or reliability risk justify intervention.

The purpose of these works is to maintain the performance of the existing network, not to augment it. Each replacement investment is assessed against the risk and cost of continuing to operate the existing assets,

including the impacts on safety, reliability, bushfire, the environment, cyber and physical security outcomes. Reliability remains a clear priority for consumers, particularly in regional areas. These communities often have fewer alternatives or redundancies available during outages, meaning disruptions can have more immediate and longer-lasting consequences.

How we assess the investment needed to keep the grid safe and reliable

- As required by the National Electricity Objective,⁴⁰ we use our replacement capex (repex) to:
- Comply with applicable regulatory obligations
 - Maintain the quality, reliability and security of supply
 - Maintain the safety of the transmission system.

When assessing the required investment, we weigh replacement costs against the risks and rising maintenance costs of keeping existing assets.

Our assets are renewed or retired as they reach end of life. We look at the risk of asset failure and its potential impact in terms of reliability, safety, bushfire and environment. Where needed, the options considered include:

- Do nothing or increase maintenance interventions
- If viable non-network options are available, defer or avoid renewal
- Replace like for like
- Refurbish the existing asset
- Replace with an asset of different capacity based on forecast demand
- Reconfigure the network.

Our investment framework makes sure the option chosen delivers measurable customer benefits or meets a statutory obligation.

How we manage cost pressures

Maintaining a growing and fast-changing network requires more resources. New technologies like batteries, system security assets and digital systems introduce additional asset types that must be monitored, maintained and managed throughout their life cycle. The growing sophistication and frequency of cyber threats is also increasing the effort required to protect critical physical and digital infrastructure and maintain system security.

To help manage these pressures, Transgrid is standardising processes, optimising workforce deployment, improving asset management practices and making targeted investments in technology and digital systems. Together, these initiatives help contain costs while supporting the safe, reliable and secure operation of the network.

Our planned capital replacement works

This section describes Transgrid’s capital replacement works, some of which are expected to span multiple regulatory periods. As a result, reported costs should be considered in the context of the full project lifecycle, none of which cause any material inter-network impact. As the Revenue Proposal continues to be developed, project need, scope, timing and cost estimates may be refined through further planning, consultation and regulatory review. The information in this section is in response to the requirement of the NER Clause 5.12.2(c)(5) and (6).



⁴⁰ The National Electricity Objective: “...to promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity with respect to: A. price, quality, safety, reliability, and security of supply of electricity; and B. the reliability, safety and security of the national electricity system; and C. the achievement of targets set by a participating jurisdiction. i) for reducing Australia’s greenhouse gas emissions; or ii) that are likely to contribute to reducing Aus-tralia’s greenhouse gas emissions”

2.5.1 Transmission lines and cables

Steel tower/pole condition management

We are refurbishing steel structures on transmission lines in Newcastle, Central Coast, Sydney, Illawarra and New England. The program has included refurbishing/replacing rusted steel towers/poles and replacing conductors, earth wires, fittings and insulators at risk of failure. The following table lists our schedule for transmission line refurbishment or replacement.

Table 2.8: Planned steel tower transmission line asset renewal projects

Transmission line project	Indicative operational date	Total estimated cost (\$2025/26 million)
Line 12 Refurbishment	Sep-26	12
Line 8C/8J Refurbishment	Oct-26	11
Line X3 Restoration	Nov-26	19
Line 92/93 Refurbishment	Dec-26	6
Line 13 Kemps Creek Sydney South Refurbishment	Dec-26	4
Line 82/95 Refurbishment	Dec-26	13
Line 95 Refurbishment	Jan-27	4
Line 16 Marulan Avon Refurbishment	Jun-27	14
Line 8C/8E Refurbishment	Jun-27	16
Line 21 Conductor Replacement	Oct-27	16
Line 25/92 Refurbishment	Jan-28	5
Line 22 Conductor Replacement	May-28	16
Line 92Z & 959 Conductor Replacement	Jun-28	24
Line 11 - Sydney South - Dapto Tower Replacement	Jun-33	45
Line 5A1-5A2 Eraring - Kemps Creek Refurbishment	Jun-33	55 - 60
Line 8L/8M Refurbishment	Jun-33	5 - 10
Line 96X/96Xsp and 962/96Y Refurbishment	Jun-33	2 - 5
Conductor Replacement Program	Jun-36	130 - 140

Wood pole condition management

Transgrid is replacing wood pole structures in poor condition on 132 kV and 330 kV transmission lines with concrete or steel poles to address deterioration from wood rot, decay and termite attack. Some of these lines also need new conductor fittings and insulators. The following table lists our schedule for wood pole transmission line refurbishment.

Table 2.9: Wood pole replacement projects

Transmission line project	Indicative operational date	Total estimated cost (\$2025/26 million)
Line 94M Refurbishment	Apr-27	13
Line 963 Refurbishment	Jun-27	12
Line 947 Refurbishment	Jun-28	14
Line 992 Refurbishment	Jun-28	8
Line 94U Refurbishment	Jun-28	24
Line 86 Rebuild	Jun-28	14
Other Wood Pole Replacements	Jun-28	23
Line 991 Refurbishment	Jun-33	35 - 40
Line 944 Refurbishment	Jun-33	30
Line 99A Wood Pole Replacement	Jun-33	25 - 30
Line 973 Refurbishment	Jun-33	31
Line 969 Wood Pole Replacement	Jun-33	25 - 30
Line 9UH Refurbishment	Jun-33	5 - 10
Line 9U3 Wood Pole Replacement	Jun-33	20 - 25
Line 949 Refurbishment	Jun-33	2 - 5
Line 9R3 Refurbishment	Jun-33	5 - 10
Line 99M Refurbishment	Jun-33	5 - 10
Line 86 Refurbishment (Phase 2)	Jun-33	16
Line 96F Refurbishment	Jun-36	3
Line 995 Refurbishment	Jun-36	1



Remediation of low spans

The industry standard, AS7000, specifies minimum electrical clearances when transmission lines reach their maximum operating temperature (the line design temperature). Transmission lines with low spans at the normal foreseeable operating temperature pose a public safety risk.

To identify priority lines for remediation, we assessed low spans against multiple risk factors, including height and area temperature. We ranked the spans according to their risk to public safety to select remediation options that fulfil the requirements of AS5577 Electricity Network Safety Management Systems and reduce the public safety risk to As Low As Reasonably Practical (ALARP).

Table 2.10: Low Span Projects

Transmission line project	Indicative operational date	Total estimated cost (\$2025/26 million)
Low Spans - 132kV Lines	Jun-27	4
Low Spans - Main Grid 330kV Lines	Jun-27	9
Low Span Program Stage 2	Jun-33	10 - 15

Public safety

Through our Electricity Network Safety Management System, Transgrid takes all reasonably practicable steps to ensure public safety around our transmission lines, which run through public and private land. Asset inspections have identified ineffective climbing deterrents throughout the network and asbestos paint on certain towers that require modification or remediation.

Table 2.11: Public Safety Projects

Transmission line project	Indicative operational date	Total estimated cost (\$2025/26 million)
Public Safety Enhancements - Climbing Deterrent Stage 1	Jun-28	7
Transmission Line Tower Asbestos Paint	Jun-28	18
Public Safety Enhancements - Climbing Deterrent Stage 2	Jun-33	10 - 15

Underground cables

Transgrid’s underground cables include self-contained fluid-filled cables where the manufacturer is about to stop making parts. We are purchasing the required spares now to maintain cable reliability over the remainder of their designed service life.

Table 2.12: Planned underground cables asset renewal projects

Transmission line project	Indicative operational date	Total estimated cost (\$2025/26 million)
Underground Cables Capital Spares	Dec-26	2
Cable Monitoring System Renewal	Jun-31	5 - 10
XLPE Cable Capital Spares	Jun-32	2 - 5

Insulator programs

Transgrid’s network includes a large population of non-ceramic insulators (installed in the late 1990s and early 2000s) that are now approaching end of life. Condition assessments and testing indicate that deterioration mechanisms, such as reduced housing adhesion and moisture ingress, are increasing the risk of failure. Replacements are proposed to mitigate this risk and maintain a safe and reliable network.

Table 2.13: Planned insulator replacement programs

Transmission line project	Indicative operational date	Total estimated cost (\$2025/26 million)
Polymer Insulator Program	Jun-33	65 - 70

Network Resilience

Network Resilience projects are investments targeted to improve resilience against extreme weather events, including bushfire and wind, by reducing asset failure risk on high consequence lines.

Table 2.14: Planned network resilience projects

Transmission line project	Indicative operational date	Total estimated cost (\$2025/26 million)
Transmission Line Emergency Spares	Jun-31	2 - 5
Tower Strengthening	Jun-36	165 - 185

Completed projects

The following projects were completed since the 2025 Transmission Annual Planning Report was published:

- Line 23 - Vales Point Munmorah Refurbishment
- Line 12/76 Refurbishment
- Line 90/92 Refurbishment
- Line 977/1 Refurbishment
- Line 966 Refurbishment

2.5.2 Substation plant

In substations, to maintain network safety and reliability, we monitor and replace, retire or refurbish larger assets, such as transformers, reactors and capacitor banks, as needed. We also have asset renewal programs for smaller assets in poor condition, such as circuit breakers, instrument transformers, bushings, disconnectors, and gantry steelwork and foundations.

The following table lists our schedule of high-voltage asset renewal or replacement projects/programs.

Table 2.15: Planned substation primary (HV) asset renewal/replacement projects

Project/Program	Area	Indicative operational date	Total estimated cost (\$2025/26 million)
Broken Hill Gas Turbine Refurbishment	Western	Sep-26	67
Buronga Substation HV Asset Replacement	Southern	Nov-26	16
Condition Monitoring for Selected High Voltage Bushings	Across NSW	Nov-26	6
Substation Capital Spares Stage 1	Across NSW	Jan-27	2
Murray Transformer Renewal	Southern	Apr-27	46
Haymarket Transformer Cooling System	Sydney	May-27	2
Bayswater and Mt Piper Reactor Replacement	Northern (Bayswater) and Central (Mt Piper)	Jun-27	7
Beryl Capacitor Bank Renewal	Central	Jun-27	10
Molong No1 Transformer Renewal	Central	Jun-27	13
Gunnedah Non-SF6 Circuit Breaker Replacement	Northern	Jun-27	5
Sydney South No2 Reactor Replacement	Sydney	Jul-27	21
Foundation Renewal Program	Across NSW	Aug-27	6
Tamworth Transformer Renewal	Northern	Nov-27	34
Transformer Compound Wall Renewal	Across NSW	May-28	3
Narrabri Capacitor Bank Renewal	Northern	Jun-28	9
Air Core Reactor Switching Duty	Across NSW	Jun-28	3

Completed projects

The following projects were completed since the publication of the 2025 Transmission Annual Planning Report:

- Marulan No3 Transformer Replacement
- Kangaroo Valley RMU and Aux Transformer Replacement.

Project/Program	Area	Indicative operational date	Total estimated cost (\$2025/26 million)
Circuit Breaker Renewal Program Stage 1	Across NSW	Sep-29	66
Voltage Transformer Renewal Program Stage 1	Across NSW	Mar-30	11
Current Transformer Renewal Program Stage 1	Across NSW	May-30	15
Disconnecter Renewal Program Stage 1	Across NSW	May-30	11
SVCs - Capital Spares	Across NSW	Jun-30	5 - 10
Panorama Transformer Renewal	Central	Jun-31	1
Inverell Transformer Renewal	Northern	Jun-31	25
Steelwork Renewal Program	Across NSW	Jun-31	25 - 30
Broken Hill Transformer Renewal	Western	Jun-31	2 - 5
Circuit Breaker Renewal Program Stage 2	Across NSW	Jun-32	30 - 35
Disconnecter Renewal Program Stage 2	Across NSW	Jun-32	25 - 30
Substation Capital Spares Stage 2	Across NSW	Jun-32	5 - 10
Narrabri Transformer Renewal Program	Northern	Jun-32	35 - 40
Dumaresq Reactor Renewal Program	Northern	Jun-32	25 - 30
Buronga Reactor Renewal Program	Western	Jun-32	15 - 20
Darlington Reactor Renewal Program	Southern	Jun-32	20 - 25

Project/Program	Area	Indicative operational date	Total estimated cost (\$2025/26 million)
Taree Transformer Life Extension	Northern	Jun-32	2 - 5
Tumut Transformer Life Extension	Southern	Jun-32	2 - 5
Busbar Replacement for Disconnectors	Across NSW	Jun-32	37
Mount Piper Transformer Renewal	Central	Jun-32	30 - 35
Tenterfield Transformer Renewal	Northern	Jun-33	30 - 35
Sydney East Reactor No1 Renewal	Sydney	Jun-33	11
Replace Condemned Insulators in Substations	Across NSW	Jun-33	5
Replace HV Equipment in SVCs	Across NSW	Jun-33	45 - 50
Voltage Transformer Renewal Program Stage 2	Across NSW	Jun-33	15 - 20
Current Transformer Renewal Program Stage 2	Across NSW	Jun-33	15 - 20
Replace Capacitor Banks	Across NSW	Jun-36	50 - 55
Replace Air Core Reactors	Across NSW	Jun-36	2 - 5
Sydney South 132kV GIS	Sydney	Jun-36	135 - 145
Fit Online Condition Monitoring to Oil Filled TXs and REAs	Across NSW	Jun-36	2 - 5
Lismore Reactor Renewal Program	Northern	Jun-36	50 - 55
Broken Hill and Balranald Spare Transformer	Western	Jun-36	10 - 15
Haymarket GIS Renewal	Sydney	Jun-36	35 - 40
SF6 Online Condition Monitoring	Across NSW	Jun-36	2 - 5
Regentville Transformer Renewal	Sydney	Jun-36	2



2.5.3 Secondary

Secondary systems

Transgrid manages Digital Infrastructure assets, including protection, metering, control and communications technologies. Renewals improve asset visibility and capability and reduce risks from technological obsolescence where manufacturer support has been withdrawn for certain assets.

Project/Program	Area	Indicative operational date	Total estimated cost (\$2025/26 million)
Haymarket Secondary Systems Renewal	Sydney	Mar-27	21
Battery and Charger Renewal	Across NSW	Jun-27	1
Beryl Secondary Systems Renewal	Central	Jun-27	3
Regentville Secondary Systems Renewal	Sydney	Jun-27	16
Metering Comms Implementation	Across NSW	Jun-27	4
Secondary Asset Capital Spares	Across NSW	Jul-27	2
Sydney East Secondary Systems Renewal	Sydney	Dec-27	41
Substation Security Zone Replacement	Across NSW	Jun-28	1
Lower Tumut Secondary Systems Renewal	Southern	Jun-28	49
Microwave Renewal Program	Across NSW	Jun-28	11
Wallerawang Secondary Systems Renewal	Central	Jun-28	12
Comms Alarm System Renewals	Across NSW	Jun-28	7
Operational Telephone Network Renewal	Across NSW	Nov-28	11
Secure Remote Access Protocol (SRAP) Renewal	Across NSW	Jun-30	2 - 5

Project/Program	Area	Indicative operational date	Total estimated cost (\$2025/26 million)
Supervisory Control and Data Acquisition (SCADA) Renewal	Across NSW	Jun-31	50 - 55
Automation Asset Renewal Program	Across NSW	Jun-31	5 - 10
Haymarket Transformer PLC Renewal	Across NSW	Jun-31	5 - 10
Jindera Secondary Systems Renewal	Southern	Jun-32	10 - 15
Coffs Harbour Digital Assets Renewal	Northern	Jun-32	25 - 30
Armidale Digital Assets Renewal	Northern	Jun-32	30 - 35
Eraring Digital Assets Renewal	Central	Jun-32	20 - 25
Canberra Digital Assets Renewal	Southern	Jun-32	20 - 25
Moree Digital Assets Renewal	Northern	Jun-32	20 - 25
Bayswater North Digital Assets Renewal	Northern	Jun-32	20 - 25
Queanbeyan Digital Assets Renewal	Southern	Jun-32	20 - 25
Optical Ground Wire - Tenterfield to Lismore	Northern	Jun-33	9
Multiplexer B Renewal program	Across NSW	Jun-33	15
Cowra substation Secondary Systems Renewal	Central	Jun-33	10

The following table lists our planned replacement projects, including secondary system and communications renewals.
Table 2.16: Planned substation secondary asset renewal and replacement projects⁴¹

Project/Program	Area	Indicative operational date	Total estimated cost (\$2025/26 million)
Panorama Secondary Systems Renewal	Central	Jun-33	22
Secondary Asset Replacement Programs	Across NSW	Jun-33	49
Broken Hill SVC Server Upgrade	Western	Jun-33	1
Tomago Secondary Systems Renewal	Western	Jun-33	6
Liddell Automation Renewal	Northern	Jun-33	10 - 15
Protection Asset Renewal Program	Across NSW	Jun-36	130 - 140
DC Systems Renewal	Across NSW	Jun-36	5 - 10
Metering Renewal	Across NSW	Jun-36	5 - 10
DI Capital Spares	Across NSW	Jun-36	5 - 10
LVAC Renewal Program	Across NSW	Jun-36	50 - 55
Williamsdale Digital Assets Renewal	Southern	Jun-36	6
Comms Bearer Renewal	Across NSW	Jun-36	110 - 120
Telco Tower Renewal	Across NSW	Jun-36	10 - 15
Network Analysis Renewal Program	Across NSW	Jun-36	10 - 15

Project/Program	Area	Indicative operational date	Total estimated cost (\$2025/26 million)
Asset Monitoring Renewal Program	Across NSW	Jun-36	25 - 30
Gunnedah Digital Assets Renewal	Northern	Jun-36	5 - 10
Dapto Digital Assets Renewal	Southern	Jun-36	20 - 25
Beaconsfield North Digital Assets Renewal	Sydney	Jun-36	15 - 20
Griffith Digital Assets Renewal	Southern	Jun-36	15 - 20
Manildra Digital Assets Renewal	Central	Jun-36	2 - 5
Sydney West Digital Assets Renewal	Sydney	Jun-36	30 - 35
Macarthur Digital Assets Renewal	Sydney	Jun-36	10 - 15
Rookwood Road Digital Assets Renewal	Sydney	Jun-36	10 - 15
Orange North Digital Assets Renewal	Central	Jun-36	5 - 10
Wallerawang Digital Assets Renewal	Central	Jun-36	20 - 25
Wagga North Digital Assets Renewal	Southern	Jun-36	5 - 10
Multiplexer Renewal Program	Across NSW	Jun-36	20 - 25

41 Some Secondary System Renewals are being delivered as packaged primary and secondary works. The estimated cost would include the primary scope.



Cyber and physical security

Transgrid’s legislative, regulatory and safety obligations include the NSW Electricity Supply (Safety and Network Management) Regulation 2014, the Work Health and Safety (WHS) Regulation 2011, Security of Critical Infrastructure Act 2018 and the recently ascended Security Legislation Amendment (Critical Infrastructure Protection) Act 2022 (SLACIP Act 2022). These instruments provide minimum requirements for critical infrastructure cyber and physical security and associated risk management programs.

Under the SLACIP Act 2022, Transgrid is subject to enhanced cyber security obligations and a requirement to increase the standing level of cyber maturity. From a physical security perspective, our existing electronic systems across multiple sites have or are expected to reach the end of their serviceable life. Transgrid therefore needs to address increasing asset obsolescence risks and, by extension, security risks to its critical assets as follows.

Table 2.17: Planned cyber and physical security projects and programs

Project/Program	Area	Indicative operational date	Total estimated cost (\$2025/26 million)
Operation WAN Asset, Change, and Configuration Management (OpsWAN ACM) and Ticketing Upgrade	Across NSW	Nov-27	5
Cyber Security Upgrade (Operational Technology environments)	Across NSW	Jun-28	4
Physical Security Upgrade	Across NSW	Jun-33	41
Operation WAN (OpsWAN) Renewal	Across NSW	Jun-33	15 - 20
Physical Security Network Enhancements	Across NSW	Jun-36	5 - 10

Network property

We monitor the condition of substation property assets to ensure their safe operation and enable us to meet our responsibilities under the WHS Act 2011 and Australian Standards. We have scheduled the following renewals to address safety and operational risks on our network property assets.

Table 2.18: Planned network property programs

Project/Program	Area	Indicative operational date	Total estimated cost (\$2025/26 million)
Fire Systems Renewals Stage 1	Across NSW	Jun-28	2
Surveillance & Access Control	Across NSW	Jun-36	65 - 70
Network Property Renewal	Across NSW	Jun-36	25 - 30
Fire Systems Renewals Stage 2	Across NSW	Jun-36	10 - 15
Fencing Renewal	Across NSW	Jun-36	15 - 20

Completed projects

The following projects were completed since the publication of the 2025 Transmission Annual Planning Report:

- Murrumburrah Secondary Systems Renewal
- Ingleburn Secondary System Renewal
- Broken Hill Secondary Systems Renewal
- Alarm Management Philosophy Implementation
- Palisade Gate Renewals



Beau Smith - 2nd Year Substation Technician Apprentice
James Wilkinson - Substations Technician Grade 3
Brad Wales - Substations Technician Grade 3

2.6 Network Capability Incentive Parameter Action Plan (NCIPAP)

The NCIPAP is a regulatory plan that each TNSP prepares to identify network limits and propose low-cost operational or minor capital projects that improve transmission network capability, under the Service Target Performance Incentive Scheme administered by the AER. The scheme encourages low-cost, high-impact improvements to the transmission system.

Changes to the Scheme

From the 2028-2033 regulatory control period, a welcome change will be introduced in the process for Transgrid to propose NCIPAP projects.

Under the current Scheme, NCIPAP projects are proposed as part of the revenue reset process with additional projects able to be added during the regulatory control period via an annual compliance review. All NCIPAP projects must be completed by the end of the regulatory control period to avoid financial penalties.

Under the new Scheme, NCIPAP projects will instead be proposed annually via the Transmission Annual Planning Report. Project completion dates will be set individually, providing greater flexibility in delivery timeframes.

The role of the Transmission Annual Planning Report

While the Transmission Annual Planning Report has historically focused on reporting planned projects, it will increasingly play a broader role in identifying emerging network need and signalling future investments. It will also provide greater transparency on how network planning decisions benefit consumers. This chapter provides an overview of existing NCIPAP projects and identifies new and emerging initiatives informed by forecast demand growth, system needs and connection activity.

2.7 Asset retirements and deratings

In the 2025 Transmission Annual Planning Report, Transgrid advised that the contingency ratings used for market dispatch on certain existing 330 kV transmission lines would be reduced to align with current rating methodologies and technical standards. The affected lines are:

- Line 3L (Yass to Collector)
- Line 4 (Collector to Marulan)
- Line 5 (Yass to Marulan)

Following further assessment, Transgrid has deferred the application of the revised contingency ratings.

The existing ratings will remain in place while Transgrid continues to assess the impacts of the proposed change, monitor asset performance and network loading conditions, and engage with market participants and other stakeholders. Consistent with the approach outlined in the 2025 Transmission Annual Planning Report, any future changes to the applicable ratings will be subject to further assessment and stakeholder engagement prior to implementation.

Over the next 10 years, there are no planned new asset retirements or deratings that would result in network constraints beyond those already identified in previous Transmission Annual Planning Reports. Transgrid will continue to assess asset performance and network requirements.

The information reported in this section is in response to the requirement of NER Clause 5.12.2(c) (1A) and (1B).



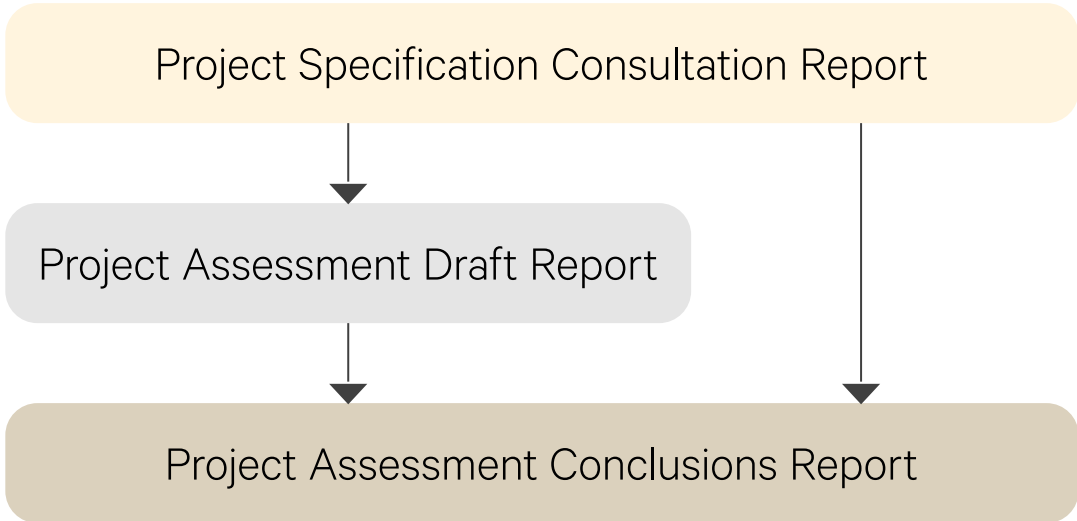
Xavier Robens - 2nd Year Transmission Line Apprentice



2.8 Regulatory Investment Test for Transmission (RIT-T)

TNSPs use a public consultation process called the Regulatory Investment Test for Transmission (RIT-T) for network investments likely to cost more than \$8 million.

The RIT-T normally involves the three reports shown in the diagram below, which come at key milestones in the consultation process. After the Project Specification Consultation Report and Project Assessment Draft Report, Transgrid considers stakeholder submissions received in response to these documents before we prepare the Project Assessment Conclusions Report.



In this Report, Transgrid is required to disclose certain information about RIT-Ts in progress, including a brief project description, commissioning date, other reasonable options considered and estimated costs.

2.8.1 RIT-T schedule

The table below shows the calendar year quarter start date for our various RIT-Ts. This includes new RIT-Ts planned for 2026-27 and RIT-Ts that are underway, with final RIT-T documents planned for publication later in the year.

A list of our ongoing RIT-T consultations can be found on our [website](#).

Table 2.19: Active and planned RIT-T assessments

Project description	RIT-T kick off quarter	Type of project ⁴²	Region
Managing asset risks at Sydney South substation	2018Q3*	Substation	Greater Sydney
Increasing capacity for generation in the Wagga North area	2024Q3*	Market Benefits	Southern NSW and the ACT
Maintaining voltage levels in the Beryl area	2024Q4*	Reliability	Central West NSW
Sydney Ring South	2026Q2 [†]	Major Development	Greater Sydney
Maintaining voltage control in Inner Sydney Metropolitan area	2026Q3*	Substation	Greater Sydney
Maintaining compliance with performance standards applicable to Transgrid’s communication network	2026Q4	Transmission Line	Northern NSW
Managing risks on Line 947 (Wellington-Orange North)	2026Q3	Transmission Line	Central West NSW
Maintaining reliable supply to the ACT area	2026Q4	Reliability	Southern NSW and the ACT
Maintaining reliable supply to Sydney East	2027Q1	Reliability	Greater Sydney
Meeting demand growth in Western Sydney (Mount Druitt area)	2027Q2	Reliability	Greater Sydney
Address voltage unbalance and harmonic issues	2027Q2	Compliance	Across NSW
Powering Sydney’s Future Stage II	2027Q2	Reliability	Greater Sydney

⁴²Active RIT-T, Transgrid anticipates publication of the PADR/PACR during 2026-27.
[†]Active RIT-T, Transgrid anticipates the proposed preferred option is shared publicly around mid-2027.

⁴² RIT-Ts for replacement projects are categorised by the asset (eg, Substation). RIT-Ts for augmentation projects may involve multiple types of assets and for this reason are categorised as either ‘Major Development’ (typically ISP projects); or by the identified need (ie Market Benefits or Reliability).

The table below provides a list of RIT-Ts we completed during 2025-26.

Table 2.20: Completed RIT-T assessments

Project description	RIT-T completed date	Type of project	Region
Maintaining safe and reliable operation of Sydney East, Wagga 132 kV, and Dapto substations	September 2025	Substation	Greater Sydney; Southern NSW and the ACT
Maintaining compliance with performance standards applicable to Panorama substation secondary systems	September 2025	Secondary Systems	Central West NSW
Maintaining compliance with performance standards applicable to Cowra substation secondary systems	September 2025	Secondary Systems	Central West NSW
Meeting demand growth in the Western Sydney Aerotropolis ‘Priority Growth Area’	September 2025	Reliability	Greater Sydney
Maintaining reliable supply to Vineyard in North West Sydney	October 2025	Reliability	Greater Sydney
System Security Roadmap Operational Technology Upgrades	November 2025	Communications & IT	Greater Sydney; Newcastle & Central Coast
Managing risks on Line 11 (Sydney South–Dapto)	November 2025	Transmission Line	Greater Sydney; Southern NW and the ACT
Managing risk on Line 94M (Beryl – Crudine Ridge)	December 2025	Transmission Line	Central West NSW



2.8.2 Material Change in Circumstance (MCC)

Even once a RIT-T is complete, circumstances may change before the project is delivered. These changes may include updated costs, revised assumptions, or new system needs that may affect the original RIT-T assessment. The NER requires TNSPs to monitor for changes to key assumptions underpinning the Project Assessment Conclusions Report analysis. This helps ensure investment decisions are based on the latest information and continue to deliver the best outcomes for consumers.

Where a material change is identified, Transgrid must reassess the project and publish an MCC assessment. This assessment determines whether the preferred option identified in the PACR remains preferred, or whether a different option now provides greater net benefits. In most cases, the RIT-T outcome remains the same. However, if the preferred option has changed, we treat that change as an MCC event.

Our MCC Assessments are available at the same location as our RIT-T consultations on our [website](#).

Table 2.21: Completed MCC Assessments

Project description	MCC Assessment date	Type of project	Region	MCC Event (Y/N)
Maintaining compliance with performance standards applicable to Sydney East substation secondary systems	September 2025	Secondary Systems	Greater Sydney	N
Maintaining voltage levels in Northern NSW	October 2025	Substation	Northern NSW	N
Increasing capacity for generation in the Molong and Parkes area	November 2025	Market Benefits	Central West NSW	N
Maintaining safe and reliable operation of Tamworth 220 kV substation	January 2026	Substation	Northern NSW	N
Maintaining reliable supply to Western Sydney	February 2026	Reliability	Greater Sydney	N
Managing risk on Lines 21, 22, 959 & 92Z (conductor condition)	April 2026	Transmission Line	Greater Sydney; Newcastle & Central Coast	N
Managing risk on Line 94M (Beryl-Crudine Ridge)	July 2026	Transmission Line	Central West NSW	N
Meeting demand growth in the Western Sydney Aerotropolis ‘Priority Growth Area’	July 2026	Market Benefits	Greater Sydney	N
Meeting system strength requirements in NSW	August 2026	Reliability	NSW	Y
Managing the risk of capacitor bank failure	August 2026	Substation	Northern NSW	N

In cases where we consider a Material Change in Circumstances Event has occurred, we undertake the following as required in the NER:⁴³

- Notify the AER and publish a statement outlining the change and its implications;
- Assess whether the preferred option remains optimal, or if an alternative option should be pursued
- Propose an appropriate course of action, which may range from updated analysis through to, in rare cases, reapplying the RIT-T process in its entirety.

[1] As per clause 5.16.4(z4)of the NER.

43 Outlined in clause 5.16.4(z3)(4-6)

2.9 2025 Changes from the Transmission Annual Planning Report

The following projects, described in the 2025 Transmission Annual Planning Report, have been removed from the 2026 report:

- Improving voltage control in Southern NSW: This project was raised to address voltage issues under low-demand conditions at Kangaroo Valley and Balranald. However, the project need is no longer required for compliance, with more renewables becoming committed and providing voltage support at or in the vicinity of those locations.
- Increase capacity for generation from Parkes to Wellington: This project was raised to address the existing binding constraint on Line 94K under system normal conditions during daytime periods of high solar generation in the Parkes to Wellington area. However, none of the assessed options are justifiable. The economic evaluation indicates that no option can deliver any net economic benefit to the NEM relative to the base case.
- Maintaining reliable supply to Beaconsfield in the Inner Sydney Area: This project was raised to address network constraints due to the retirements of 132 kV cables and contingency of Beaconsfield Transformer. The scope of work for this project is included as part of PSF Stage 2.
- Increase Capacity from Port Macquarie to Taree: This project was raised to address the existing binding constraint on Line 964 (Port Macquarie to Taree) during a 330 kV line contingency. However, none of the assessed options are justifiable. The economic evaluation indicates that no option can deliver any net economic benefit to the NEM relative to the base case.

- Maintain voltage levels in the Cowra to Forbes area: This project was raised to address overvoltages from Cowra to Forbes. Latest studies show that this is no longer required for compliance.
- Increase reliability in Northern NSW: This project was to maintain reliability of supply to the Lismore area under certain network conditions. The economic evaluation indicates that no option can deliver any net economic benefit to the NEM relative to the base case.

Updates in this chapter and referenced Appendices since the 2025 Transmission Annual Planning Report include:

- Following the Project Assessment Draft Report for managing asset risks at Sydney South substation RIT-T in 2020, further assessment and consideration of the scope was required. As Transgrid has not yet been able to determine a conclusion, it is not practicable to publish a Project Assessment Conclusions Report. Consequently, the RIT-T is still active. Transgrid expects to finalise the process in FY27.
- Following the February 2024 Project Specification Consultation Report for improving voltage control in southern NSW, subsequent developments changed the identified need. This enabled us to withdraw the need and project scope set out in the Project Assessment Conclusions Report. Consequently, the RIT-T was cancelled in February 2026. We notified the sole submitter to the RIT-T process directly of the outcome. The cancellation notice is available on our website.

- Following publication of the AEMO 2026 ISP, further assessment of QNI Connect system needs and development timing changed the project outlook. Consequently, QNI Connect is no longer considered an actionable project and has been moved to a future planning pathway, with further development and consideration to occur through subsequent planning processes.
- Multiple project name updates.
- Multiple replacement project changes and updates.



Scott Wilson - Field Manager

Network innovation and connections

In the deep transition, we're using new technologies and innovative solutions to improve how we connect customers, ease constraints and make the most of the existing network.



Mitchell Tallar - Site Manager



Xavier Robens - 2nd Year
Transmission Line Apprentice
Caleb Arthur-Wornham - 2nd Year
Transmission Line Apprentice

With the NSW electricity system in the deep transition, Transgrid is using non-network solutions, operational innovation and connection process improvements to unlock capacity, manage increasing operational complexity, reduce constraints and deliver lower-cost outcomes for consumers.

Network constraints can weaken reliability and affect electricity prices. The NSW electricity system is being constrained by multiple factors, including an increasing gap between minimum and maximum demand and the need to keep the power system secure and reliable as higher volumes of lower-cost renewable energy are connected. Our forecasts continue to suggest that new thermal and voltage constraints will appear and grow in additional regions.

Part of the way we ease constraints is to build additional transmission lines and substations – conventional ‘poles and wires’ infrastructure. But, where possible, we look for innovative alternatives – new technologies and non-network solutions – that can often meet identified needs faster and cheaper by using existing assets. Progressing non-network solutions where they are prudent and

efficient helps keep electricity affordable. Their faster deployment can also reduce delays and accelerate benefits, for example by reducing constraints on renewable energy generation.

Non-network solutions, which include services from battery energy storage systems (BESS), third-party reactive support, embedded generation or contracted demand response, can defer the need for network capital investment, enabling flexibility in investment timing. This can be particularly valuable where system needs are time-critical, uncertain or evolving.

- In this chapter:
- **Section 3.1** shows our current use of emerging and innovative technologies and non-network solutions to defer or avoid significant network capital costs.
 - **Section 3.2** outlines new opportunities where our planning studies show it may be feasible and cost effective to implement non-network solutions instead of, or alongside, transmission upgrades.
 - **Section 3.3** explores opportunities to further enhance the regulatory framework for non-network solutions.
 - **Section 3.4** highlights the work we are doing to support our generation and load customers and connecting more renewable generation and energy storage as quickly and efficiently as possible.
 - **Section 3.5** highlights the major changes from Chapter 3 in the 2025 Transmission Annual Planning Report.

Table 3.0: Transgrid’s innovation projects and their benefits for consumers

Innovation category	Examples	Consumer benefit
Non-network solutions	Network support agreements, demand management innovation	Defers capital expenditure, reduces impact of constraints
System security technologies	Wallgrove BESS, synthetic inertia, System Integrity Protection Scheme (SIPS)	Maintains system security as coal retires, unlocks capacity
Operational technology (OT)	Alarm management, OT upgrade, real-time tools	Reduce outage and incident risk, improves network utilisation
Delivery productivity	Live line work, mobile switching, robotics, Smart Aerial Imagery Processing (SAIP)	Reduces outage duration and constraint impacts

3.1 Innovation projects benefiting consumers

Not every energy challenge requires new poles and wires. Transgrid is exploring a range of new technologies and non-network solutions that can help deliver reliable and affordable electricity. This section presents some recent examples of Transgrid’s innovation projects and explains how they benefit consumers.

Broken Hill and Far West NSW

Transgrid is working with local communities, governments and regulators to provide a safe, reliable and affordable energy supply to Broken Hill and the surrounding region in Far West NSW.

Historically, when the single 220 kV transmission line supplying the Far West region was out of service, backup power for Broken Hill has been provided by two gas turbines. Transgrid acquired these turbines from Essential Energy in 2022 and is planning for their replacement as they approach end of life.

On 29 January 2026, the NSW Minister for Energy and Environment issued a Ministerial Direction classifying the Far West Project as a Priority Network Infrastructure Project. The Direction enables new back-up generation and storage to be fast-tracked and supports a revised agreement with Hydrostor to provide outage reserve power from its proposed Silver City Energy Storage Centre.

Under the Ministerial Direction, Transgrid will identify, develop and implement a back-up solution to address energy reliability for the Far West region. Transgrid is working closely with the NSW Department of Climate Change, Energy, the Environment and Water to deliver the Priority Network Infrastructure Project.

We will also work with Hydrostor to amend the existing network support agreement to reflect the terms of the Direction.

Bathurst, Orange and Parkes

In late 2025, Transgrid finalised procurement for dynamic reactive support services from a hybrid solar and BESS in the Parkes area, aiming to begin service provision in 2026. This facility will cater for increasing energy demand in the region, providing voltage support and deferring the need for a new transmission line between Wellington and Parkes. The RIT-T for Maintaining Reliable Supply to the Bathurst, Orange and Parkes areas and an amended Project Assessment Conclusions Report (published in January 2023), confirmed BESS facilities at Parkes and Panorama as the preferred option. Based on recent forecasts, only the Parkes solution is required in the near term.

North West Slopes

Transgrid is procuring non-network services in the North West Slopes region to meet increased industrial electricity demand in the area while deferring new transmission investment. The RIT-T for Maintaining Reliable Supply to the North West Slopes Area (Stage 1) and an amended Project Assessment Conclusions Report (published in January 2023), confirmed the preferred solution in the short term as a reactive and active power support service from a BESS facility together with a new transformer at the Narrabri substation, eventually supported by transmission line augmentations over the longer term.

Transgrid is continuing to monitor the demand forecasts from Essential Energy. A network support agreement to align with the updated timing of demand will be confirmed through joint planning with Essential Energy.

South West NSW

Transgrid continues to procure services from existing operating BESS facilities in South West NSW to increase transfer capacity of the network between Darlington Point and Wagga Wagga. The 2022 RIT-T for Improving Stability in South Western NSW concluded that contracting with a committed BESS for network support services would unlock substantial market benefits and provide flexibility for future network augmentations in the region, including VNI West and the South West REZ. Accordingly, Transgrid’s network support agreements with the BESS facilities are already increasing power flow limits on the transmission system, reducing generation constraints in the region.

Sydney, Newcastle and Wollongong

Transgrid’s System Integrity Protection Scheme uses up to 350 MW of capacity (700 MW once fully commissioned) from a BESS on the Central Coast to increase transmission capacity between regional NSW and key load centres in the Sydney, Newcastle, Wollongong region. The scheme allows higher line ratings across 36 lines by automating the response to contingency events like lightning strikes and bushfires. The higher line ratings give electricity consumers in Sydney, Newcastle and Wollongong access to more

energy through existing transmission lines. Innovative solutions like this, while highly beneficial, increase the challenges associated with system operability, as discussed in Chapter 5.

Demand Management Innovation Allowance

Transgrid's Demand Management Innovation Allowance program funds research and development for demand management projects with the potential to reduce long-term network costs.

A project trialling an AI-driven digital twin platform was funded in 2025 in collaboration with AgenticGrid. ai, Monash University and RACE for 2030. The digital twin platform will enable stakeholders to explore cost-effective, resilient and sustainable demand management solutions by simulating various scenarios, such as weather events and consumer energy resource adoption.

In 2026, the allowance will fund a project led by Flipped Energy to research and trial the capability of data centres for flexible compute loads. The project was selected following an expression of interest process that attracted a wide range of innovative demand management topics.



Upgrading our operational technology

As the NSW and the ACT transmission system becomes more dynamic, maintaining system security is becoming more challenging. Our control room is managing a growing number of network elements, alarms and notifications. Alarm monitoring points alone have increased from 18,000 in 2015 to 55,000 today, reflecting the rapid growth in connection points and system variability. As we connect more generators to the network, the number of notifications our control room operators receive per shift will nearly double from 2025 to 2030.

This increasing operational complexity makes it harder to safely release network outages, coordinate switching, respond to incidents and maintain transfer capability. It can also increase the risk that constraints are applied for longer than necessary, or that network access becomes a limiting factor for maintenance, augmentation and new connections. As a result, some customers may experience power interruptions or outages when the network is under pressure.

In early 2025, Transgrid implemented the first phase of its alarm management project, improving situational awareness in response to the rapid growth in alarm points. Since then, the operating environment has continued to evolve, with the control room managing a growing volume of planned outages to support network augmentation, generator connections and essential maintenance. This has required operators to coordinate more complex switching programs and balance competing priorities between maintaining system security, enabling new connections and minimising customer impacts, increasing overall operating risk.

To address these challenges, in May 2026 Transgrid lodged a Contingent Project Application with the AER for the System Security Roadmap – Operational Technology Upgrade. Subject to approval, this investment will give our operators the enhanced tools and real-time information they need to manage an increasingly dynamic power system. Stronger operating capabilities will allow more renewable generation to connect faster, reducing costs. They will also support a more reliable electricity supply for consumers through lower outage risk, faster incident responses and more efficient network utilisation (see Section 5.2).

Reducing outage-related constraints and improving network access

Transgrid is also evolving our approach to network access. We need planned outages to deliver our program of maintenance and capital works. But as maintenance, augmentation and connection activity increases, these planned outages can temporarily prevent generators and consumers from using the network.

To shorten outages or avoid equipment having to be taken out of service, where safe and practicable, we are making greater use of mobile switching and improved outage coordination. We are also planning for live line work to further improve our ability to reduce outage impacts, leading to greater consumer and customer benefits. These initiatives are not a substitute for major network investment, but they can help reduce the operational constraints of the energy transition.

We are also exploring targeted applications of artificial intelligence (AI) to improve outage planning and access

coordination, while maintaining appropriate human oversight and operational accountability.

Drones and Smart Aerial Imagery Processing (SAIP) technology

Transgrid uses SAIP helicopters with conductor-tracking cameras to capture high-resolution imagery of our conductor and hardware assets. AI helps us analyse this data to detect signs of deterioration or damage, so we can identify assets that need to be replaced before faults occur. By finding issues early, we can reduce outages and extend asset life. This enables us to reduce total network costs, improve reliability and minimise customer disruption.

In addition, we use drones to inspect steel and concrete structures across the transmission network. Our trials found drones can improve inspection efficiency by about 50 per cent compared to traditional climbing inspections, delivering cost reductions while also improving safety and being less disruptive to landowners and the environment.

Using robotics to replace conductors

Transgrid deploys cutting-edge robotic pullers, known as ‘Gorilla robots’, to reduce risk when replacing conductors in our transmission lines. These robots can operate in locations where power lines cross roads or rail tracks, conducting work that would otherwise need large cranes, traffic management and extended outages. By simplifying replacement works, Gorilla robots help reduce disruption, improve safety and support the reliable operation of the electricity network.



Lilly Flick - 1st Year
Transmission Line Apprentice

3.2 Emerging opportunities for non-network solutions

Our planning studies show that non-network solutions can help maintain voltage stability, support system security and ensure power flows on transmission lines and equipment stay within their ratings.

Before we use them, non-network options are typically selected through a RIT-T process, which identifies non-network options with the potential to benefit consumers.

Table 3.1: Emerging constraints that can be solved by non-network solutions

Project	Network need or constraint	Constraint date	RIT-T status	Possible non-network solution/s ⁴⁴	Forecast network expenditure (\$2025/26) ⁴⁵
Maintaining voltage levels in the Beryl area	Voltage constraint	2025	Project Assessment Draft Report published 2026	Dynamic reactive support up to 50 MVAR (e.g. grid-scale BESS)	Total Augex ⁴⁶ ~\$44m Annual deferral value ~\$1.2 m
Increasing capacity for generation in the Wagga North area	Thermal constraint	2025	Project Assessment Draft Report published 2025	Energy storage as a service	Total Augex \$20 - 25m
Increasing capacity for generation from Parkes to Wellington	Thermal constraint	2025	No RIT-T is planned as none of the assessed options are viable	Energy storage as a service to reduce loading on line from Parkes to Wellington	0
Meeting system strength requirements in NSW	System strength (Fault current and/or voltage waveform stability)	From 2026	Project Assessment Conclusions Report published in July 2025 ⁴⁷ . Material Change in Circumstance to the RIT-T published August 2026 ⁴⁸ .	Synchronous generation; and/or Synchronous condensers; and/or Re-purposing, modification or conversion of existing generation; and/or BESS with grid-forming inverters (refer to Chapter 5)	Refer to Project Assessment Conclusions Report, Material Change in Circumstance report, and Chapter 5
Increasing capacity from Port Macquarie to Taree	Thermal constraint	2026	No RIT-T is planned as none of the assessed options are viable	Energy storage as a service	0

44 Indicative only, other non-network solutions and technologies may also be suitable.

45 Anticipated network investment in the absence of any non-network solutions

46 This value is indicative for a SVC as per the RIT-T PADR.

47 [Meeting system strength requirements in NSW PACR, July 2025](#)

48 [Material Change in Circumstance Report, Meeting system strength requirements RIT-T, August 2026](#)

Table 3.1 presents the emerging constraints and requirements where non-network solutions may be able to support the network over the next 10 years. For each project, Transgrid has sought (or will seek) expressions of interest from the market as part of, or alongside, the Project Specification Consultation Report for the specific RIT-T.

Both NER Clause 5.12.2(c)(4) and the Transmission Annual Planning Report Guidelines require Transgrid to report the subset of forecast constraints, identified in Chapter 2, where an estimated reduction in future load would defer a forecast constraint for 12 months. This information is included in Table 3.1.

Project	Network need or constraint	Constraint date	RIT-T status	Possible non-network solution/s ⁴⁴	Forecast network expenditure (\$2025/26) ⁴⁵
Increasing capacity for generation from Wellington to Orange	Thermal constraint Voltage constraint	2028	No RIT-T is planned as none of the assessed options are viable	Energy storage as a service to reduce loading on multiple lines in Central West	0
Maintaining reliable supply to Holroyd	Transformer thermal constraint	2029	TBD	Demand management	\$80 - 110m
Meeting demand growth in Vineyard	Transformer thermal constraint	2031	TBD	Demand management, energy storage as a service	\$38 - 50m
Maintaining reliable supply to the ACT area	Transformer thermal constraint	2031	TBD	Demand management, energy storage as a service	\$30 - 40m
Supply to Moree area	Voltage constraint Transformer thermal constraint	2031 2037	TBD	Dynamic reactive support Demand management	\$75 - 100m \$25 - 35m
Maintaining reliable supply to Sydney East	Transformer thermal constraint	2032	TBD	Demand management	\$20 - 34m
Maintaining voltage levels in the North Coast	Voltage constraint	2032	TBD	Dynamic reactive support	\$28 - 40m
Maintaining reliable supply to the Tamworth area	Transformer thermal constraint	2032	TBD	Demand management, energy storage as a service	\$35 - 50m



3.3 Getting more from non-network solutions

Non-network solutions that make the most of technological advances are essential to make the most of the existing network in the deep transition. They help to both defer traditional network solutions and alleviate underlying pressure for network augmentation — as well as playing an increasing role in reducing network costs.

Transgrid welcomes and actively seeks out non-network solutions. However, practical experience shows that, as the role and volume of non-network solutions increase, so too does the complexity to assess, design and implement them. These additional complexities increase the implementation costs and risks for networks.

Important recent reforms have gone some way to addressing this issue, including the AEMC’s 2025 Improving the cost recovery arrangements for transmission non-network options rule⁴⁹ and the AER’s 2026 Network alternative support payment guideline.⁵⁰ However, for non-network solutions to be deployed at scale and pace, Transgrid requires clear and predictable pathways to recover the efficient costs incurred in identifying, assessing, procuring and developing these solutions. While cost-recovery arrangements have improved, uncertainty remains about when and how costs will be recovered, particularly where costs are incurred upfront and recovery is not determined until later. We need incentive frameworks that are outcome-focused to support timely and efficient decision-making and ensure the best outcomes for electricity consumers in NSW and the ACT.

Opportunities to ensure the regulatory framework encourages non-network solutions that benefit consumers include:

- **Addressing the lack of transparency of consumer costs:** Contrary to previous industry practice, the current RIT-T Application Guidelines⁵¹ prompt TNSPs to consider the whole-of-market benefits and costs of non-network solutions rather than the anticipated service contract price. As a result, the full costs that consumers ultimately fund may not always be visible in the assessment. In particular, where payments to providers are treated as wealth transfers, rather than counted as a project cost, these payments may receive less emphasis when comparing options.
- **Appropriately recognising TNSP activities and risks in delivering non-network solutions:** Significant TNSP resources are required to plan, develop, negotiate, implement and operate non-network solutions. These activities can involve complex commercial negotiations and operational obligations. The regulatory framework should appropriately recognise the efficient costs, risks and resources required to deliver non-network solutions.
- **Allowing networks to recover costs incurred before the ‘preceding year’:** Current cost-recovery arrangements prevent networks from recovering prudent and efficient development costs that occur before the preceding year of when a non-network solution first begins providing services. As complexities, and therefore lead times, increase, this provision risks weakening incentives to use non-network solutions.

- **Funding alternative options if suitable non-network solutions cannot be implemented:** Non-network solutions can depend on third-party projects being delivered on time and in the right location. If these projects are delayed or do not proceed, there may not be enough time or regulatory funding to deliver an alternative network solution. This can increase delivery risk and may prevent consumers from receiving the benefits identified in the RIT-T process. For example, Transgrid has no regulatory allowance for network investments as a fallback for current non-network solutions scheduled for implementation during the 2023–28 revenue period.
- **Evolving the definition of non-network:** Given the significant shifts in the energy market since the current regulatory framework was introduced, the definition of what is classified as a non-network option should be reviewed to ensure it remains fit for purpose.

These issues can all be addressed through targeted, incremental reforms that preserve the benefits of competitive procurement while improving delivery speed and certainty.

Transgrid is working with TNSPs and other stakeholders to explore how these issues should be addressed. In particular, the AEMC’s Electricity Network Regulation Review (ENRR) is expected to consider both the framework for delivering non-network solutions, and network incentives more broadly. The ENRR will be completed across 2026 and 2027, with the final report expected in December 2027.

Deliverability risks for emerging non-network solutions

Non-network solutions can provide efficient and flexible alternatives to a traditional network investment. However, where a preferred option depends on a small number of proposed third-party projects, implementation can be affected by factors outside the TNSP’s direct control. These may include project development delays, changes in connection timing, financing or planning approvals, changes in load forecasts, or new potential providers emerging after the original RIT-T or tender process.

These risks are particularly relevant where the required service is geographically specific and there are limited alternative providers. If a preferred non-network option cannot be implemented when required, TNSPs may not have sufficient time or regulatory funding to develop a fallback network option. Greater flexibility in regulatory approval and cost-recovery arrangements would help manage these risks and support outcomes that remain in consumers’ long-term interests.

49 [Improving the cost recovery arrangements for Transmission non-network options | AEMC](#)
50 <https://www.aer.gov.au/industry/registers/resources/reviews/network-alternative-support-payment-guideline>
51 [Regulatory Investment Test for Transmission application guidelines | AER](#)



3.4 Network connections

3.4.1 How we support our generation and load customers

Large energy projects, like solar farms, wind farms and BESS, as well as large-load customers like data centres, may connect directly to the transmission network depending on their scale, location and operational needs. These transmission connections can provide high levels of reliability, redundancy and system strength. Transgrid assesses all connections in accordance with the National Electricity Rules (NER) to ensure they integrate safely and efficiently with the transmission system and maintain overall network performance. We encourage generators and large-load customers to engage with Transgrid early so we can plan the network to deliver the best outcomes for the community.

Our customer team is on hand to help you connect to our network. Contact us now on connections@transgrid.com.au.

For further information, please visit our Network Connections page [Network Connections - Delivering The Future Grid | Transgrid](#)

Collaboration and support every step of the way

Transgrid helps connect new generation and energy storage projects to the transmission network. Our goal is to make the connection process as fast and efficient as possible, working closely with customers to achieve the timeframe goals in AEMO's Connections Scorecard.

Our contestable business, Lumea, is Australia's most experienced connections provider, with a portfolio of more than 55 projects totalling 14 GW. Lumea supports the energy transition by connecting renewable generators and large energy users to the transmission grid. This includes building, owning, operating and maintaining critical energy and telecommunications infrastructure to keep customers connected and generating power reliably.

As connection volumes increase and the power system becomes more complex, Transgrid is improving the connections process to make it faster, more transparent and more predictable for customers while maintaining system security. This program focuses on reducing rework, standardising assessments, improving upfront project readiness, and leveraging new tools and automation to streamline approvals. Over time, this will enable faster connection timeframes and increased customer certainty to support the energy transition.

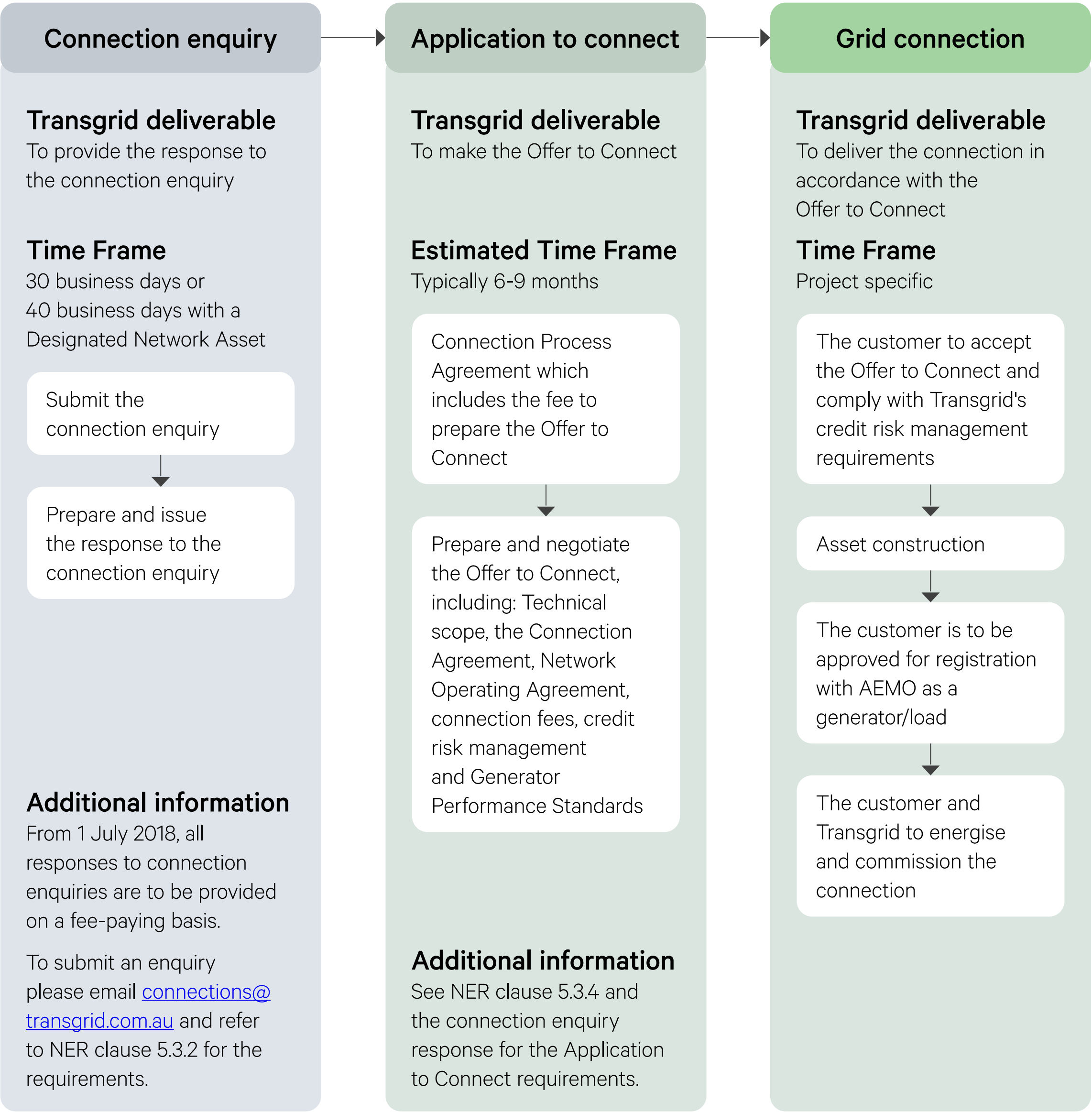
We are also contributing to other initiatives for improving the connections process, including:

- The Connections Reform Initiative
- The Streamlined Connections Process
- NSW Priority Battery Energy Storage System (BESS) Project Program
- Batch processing for connections in REZs
- Transmission expansion options
- Unlocking hosting capacity.

Connection process

Our connection process, which adheres to the NER, consists of three stages (see Figure 3.1). We review each enquiry on its own merits, taking into account the technical specifications of the proposed connection.

Figure 3.1: Formal connection process

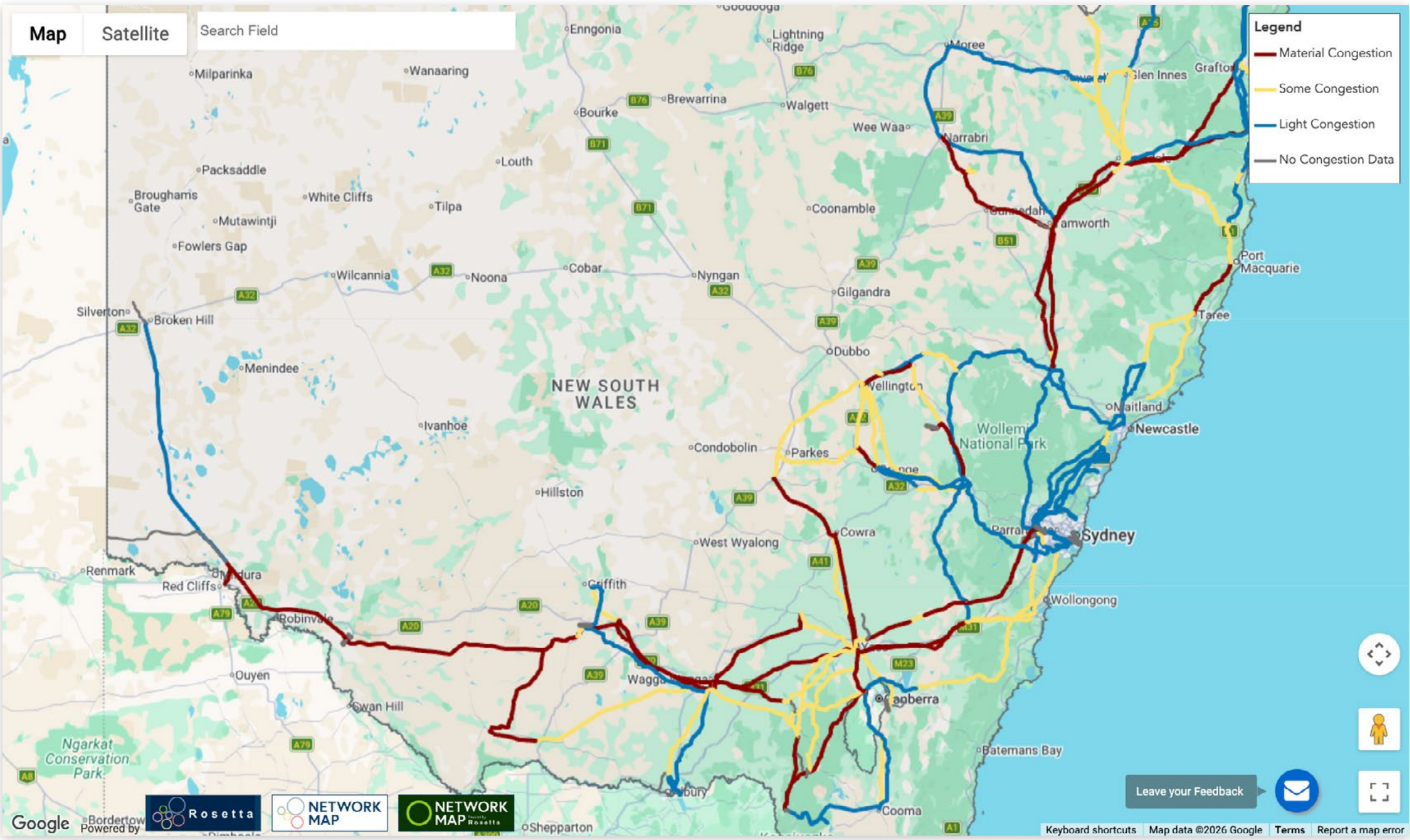


Rich data from the Transgrid Connection Opportunities Portal

Transgrid provides generation and storage proponents with the data they need to make informed investment decisions. Choosing where to connect to the network depends on many factors, including project size, technology type, timing and the strength and capacity of the local transmission system. To help proponents make their own initial risk and investment determinations, we’ve developed the Transgrid Connection Opportunities Portal, powered by Rosetta. This interactive data visualisation and mapping tool gives proponents direct access to spatial and temporal insights about the NSW transmission network to support early-stage planning.

With this rich data set, proponents can assess risk, compare location options and better justify their investment decisions before beginning the formal connection process and receiving project-specific information.

Figure 3.2: Existing line congestion visualisation example from the Transgrid Connection Opportunities Portal



3.4.2 Renewable connections summary

Renewable energy interest in connecting to Transgrid’s transmission network has increased since the 2025 Transmission Annual Planning Report. A high level of connection enquiries and connections are in various stages of development.

Importantly, BESS and hybrid (renewable energy combined with BESS) installations are increasing in size and frequency, opening previously congested areas, enabling more generators to connect to the transmission network.

Since 2025 Transmission Annual Planning Report, more renewable generation proponents have signed connection agreements. We have incorporated these agreements in our planning review as committed generation, which now includes:

- 320 MW of solar
- 2,300 MW of BESS
- 1,631 MW of hybrid
- 275 MW of wind

How the Portal can help you plan

- **Map overlays** – visualise transmission lines and substations (Section 2), including Bulk Supply Points (Appendix 2)
- **Transmission line and Bulk Supply Point load profiles** – download detailed historical data
- **Line congestion insights** – identify network constraints early to avoid delays and optimise connection strategies
- **Transmission line utilisation** – identify physical or operational limits on key network corridors to avoid bottlenecks and plan more efficient connection pathways. (Appendix 4)

- **Network Capacity** – view available network capacity information for both generation and load
- **Renewable insights** – explore renewable energy integration across the network (Section 3.4.2)
- **System strength** – understand the robustness of different grid locations (Section 5)
- **Outage data** – view historical data to understand network availability
- **Project information** – view upcoming developments to align with future system needs

Technical advice

New connections to Transgrid’s transmission line infrastructure are made via a purpose built “loop-in loop-out” switching station located as close as possible and not further than 1 km away from the proposed point of “cut-in” on the transmission line infrastructure. If the proposed point of “cut-in” on the transmission line is within 10 km of an existing substation, we recommend a direct substation connection. This approach can provide significant advantages over a proposed transmission line “cut-in”, such as reduced connection cost, along with enhanced connectivity and capacity offered by existing substations with multiple line connections, as opposed to a line cut-in that limits access to a single line.

- Since the 2025 Transmission Annual Planning Report, we have had:
- 52 connection enquiries totalling 27.3 GW
 - 36 connection process agreements totalling 10.4 GW
 - 17 connection commitments totalling 4.5 GW
 - 5 connection registrations totalling 1.4 GW
 - **9 connections commissioned totalling 3.1 GW.**

We expect more solar, wind, battery energy storage and hybrid generation proponents to sign connection agreements over the next 12 months, as projects advance through the connection process.

Figure 3.3: Developmental stages of current generation connection projects

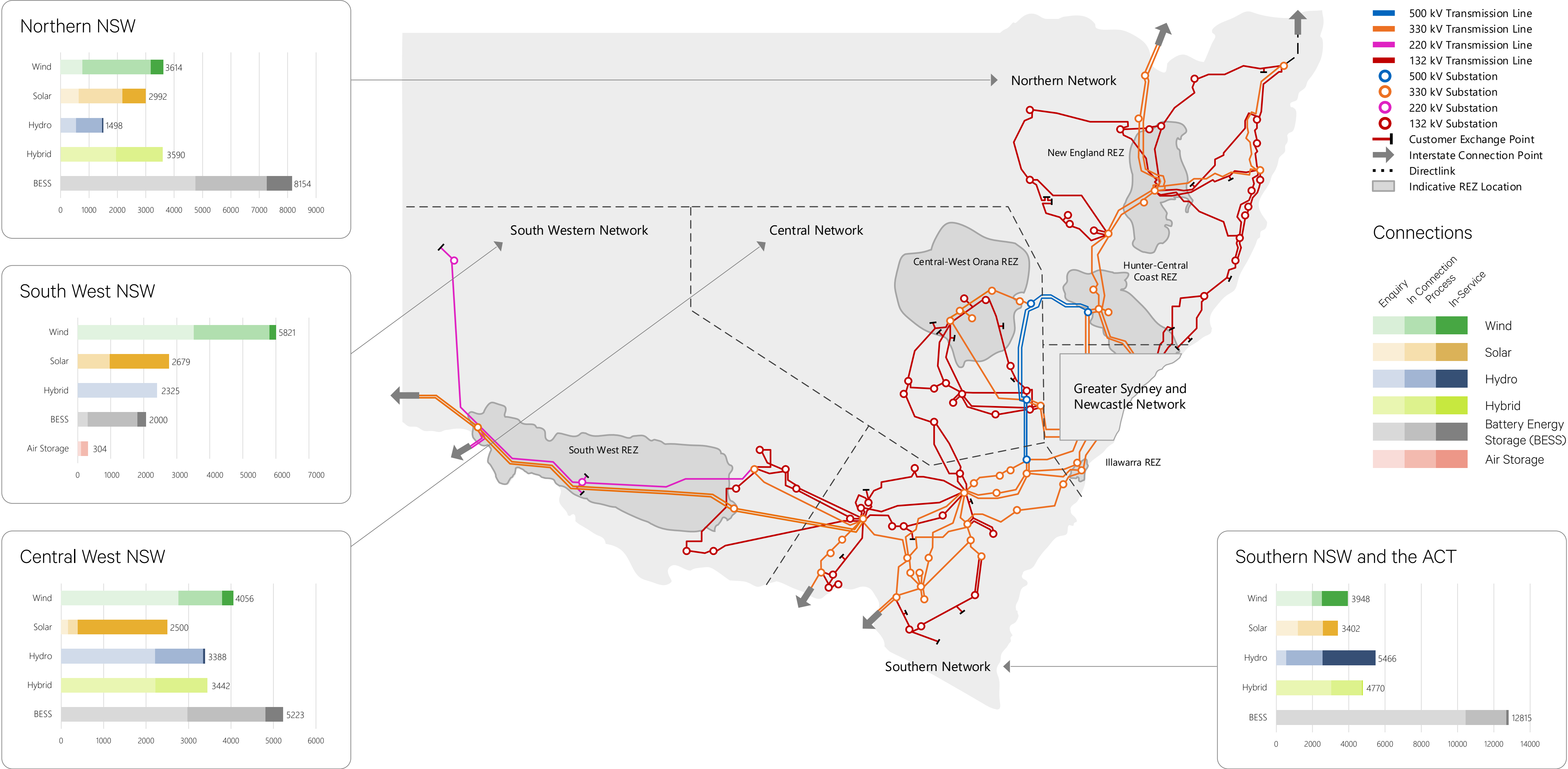


Figure 3.4: Developmental stages of current Transgrid load connection projects

3.4.3 Load connections summary

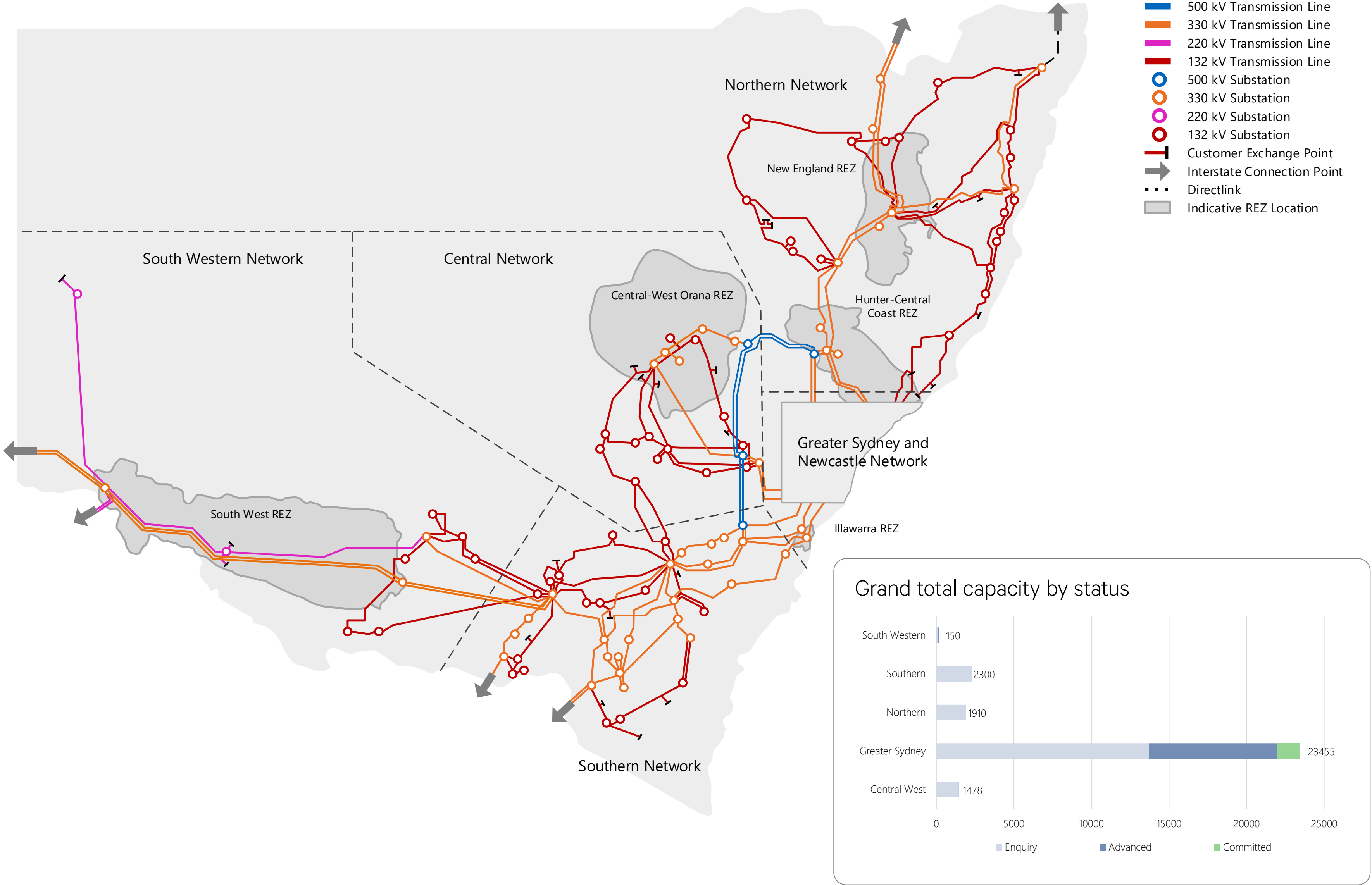
Large-load interest in connecting to Transgrid’s transmission network is increasing, driven largely by the rapid expansion of data centres supporting cloud computing, digital services and the growing adoption of AI. Data centre peak demand, which is currently 0.5 GW, is forecast to grow to around 3.5 GW by 2035 under Baringa's most-likely scenario (see Section 1.3.3).

Since Transgrid’s first data centre enquiry in 2022, over 40 connection enquiries have come in — more than 24 since the 2025 Transmission Annual Planning Report. Of these, 10 (with a total connection capacity of 8.25 GW) have advanced to the connection application stage and are all proposed to connect in the Greater Sydney region. To put that into perspective, the average daily demand for electricity in NSW typically ranges between 7.5 GW and 10 GW.

Existing capacity within the Sydney region is now largely committed. This does not affect Transgrid’s continued planning for forecast growth and reliability needs of existing households and businesses. Meaningful additional capacity will not become available until major transmission projects are completed. The limited remaining capacity is due to growing demand, driven by population growth and electrification of households and businesses, and other commercial and industrial loads, including data centres.

Transgrid is working with proponents, distribution network service providers, AEMO and government to improve visibility on network capability, connection timing and augmentation requirements, while highlighting opportunities in other parts of NSW where capacity may be available.

While data centres comprise the majority of the projected load growth shown on this map, other industrial loads have also been considered.



3.5 Changes from the 2025 Transmission Annual Planning Report

Updates in this chapter and referenced Appendices since the 2025 Transmission Annual Planning Report include:

- Network support opportunities have been updated (see Table 3.1)
- The Improving voltage control in southern NSW RIT-T has been cancelled, with notice issued in February 2026
- In January 2026, the Far West Project was classified as a Priority Network Infrastructure Project, enabling fast-tracking of new back-up distribution generation and/or storage and a revised agreement with Hydrostor to provide outage reserve power from its proposed Silver City Energy Storage Centre
- Transgrid initiated its first DMIA project in collaboration with AgenticGrid.ai, Monash University and RACE for 2030, and will fund a second project led by Flipped Energy following an expression of interest process
- In May 2026, Transgrid lodged the System Security Roadmap – Operational Technology Upgrade Contingent Project Application with the AER.



Taylor Madden - Substations
Technician Grade 1

Forecast assumptions

What’s happening inside our rapidly changing energy system during the deep transition.



Jamie Brown - Construction Manager
Amy Longmuir - 4th Year Substation Technician Apprentice



Ben Chew - Substations
Technician Grade 2

Our forecasts in this report paint a picture of structural shifts in load supply and demand. They map what happens as NSW changes how, where and when energy is used and generated, with peak demand growing higher and minimum demand changing in a different way than previously projected. Our forecasts also highlight the increasing pressure these factors put on the grid. Greater variability and more complexity continue to point to the need for coordinated investment, including in non-network solutions, to maintain reliability as we move further into the deep transition.

This chapter outlines the key inputs and assumptions underpinning our analysis, as well as updates since the 2025 report. It presents minimum and maximum demand forecasts and energy consumption projections, based on inputs developed in collaboration with our specialist advisors.

We now project data centre loads to be approximately four times higher in 10 years than forecast in the 2025 report. New data centres in NSW are expected to be concentrated in Western Sydney and within parts of the Ausgrid network. As of early 2026, NSW network service providers were collectively assessing a pipeline of over 42 GW of proposed data centre projects at varying stages of development and maturity. While we expect only a moderate proportion of this capacity to proceed, even a modest realisation of the pipeline would represent a substantial increase in network load.

Other major emerging loads, including renewable hydrogen production, are expected to remain relatively modest until the mid 2030s. Our assumptions for hydrogen production align with AEMO's Integrated System Plan (ISP) draft 2026 inputs.

Population growth and continued electrification are projected to increase NSW Region summer maximum demand and annual energy consumption by 2.7 per cent and 3.9 per cent per year, respectively. These increases are driven by steady economic growth and further supported by new data centre connections, hydrogen production, and rising electric vehicle charging demand.

Consumer energy resources, including rooftop solar, small scale batteries, and electric vehicles, continue to expand rapidly. Growth in rooftop solar, battery uptake, and EV charging is expected to increase demand variability. If well coordinated, these resources may also contribute to smoothing demand profiles.

The increasing prevalence of rooftop solar means weather conditions will have a greater influence on operational demand. On clear, mild days, households will draw very little energy from the grid, whereas daytime demand will rise on cloudy or rainy days, or during periods of extreme temperatures.

Due to the rapid growth in data centre load, we now expect the long-term decline in minimum demand to reverse by around 2029, although not before minimum demand falls below 2,000 MW. Minimum demand is most likely to occur in late spring or during the summer months.

4.1 Key highlights

4.1.1 Summary of energy and demand projections

Table 4.1 summarises projected growth in NSW Region energy and demand and compares it to equivalent 2025 Transmission Annual Planning Report projections.

Table 4.1: NSW Region medium-scenario energy and demand (compound average annual growth rates)

	Historical growth*	Projected growth†	2025 TAPR equivalent
Annual energy	-0.6%	3.9%	1.9%
Summer maximum demand (50% POE)	-0.8%	2.7%	1.4%
Winter maximum demand (50% POE)	0.4%	2.3%	1.5%
Minimum Demand (50% POE)	-7.1%	Net 4.5% (negative initially, then positive growth)	Negative growth

*Historical period 2016 to 2025 (2016/17 to 2025/26 for annual energy and summer maximum/minimum demand)
†Projection period 2026 to 2035 (2026/27 to 2035/36 for annual energy, summer maximum/minimum demand)

The significant changes between the current projections and those in the 2025 Transmission Annual Planning Report are highlighted in Table 4.2.

Table 4.2: Major changes since the 2025 Transmission Annual Planning Report

	Difference	Effect
Data centres will make a large contribution to energy and demand growth	24,661 GWh more by FY36 (compared with 6,723 GWh due to new data centres included in major loads in 2025 TAPR)	Growth in data centre electricity demand is projected to outpace the expansion of small-scale PV generation. Given that data centres typically operate with a near constant load profile, this increase will elevate both the maximum and minimum demand levels across the network.
Hydrogen electrolyser capacity expected to be connected in significant amounts in the 2030s	3,651 GWh by FY36 (compared to over 817 GWh in 2025 TAPR)	Renewable hydrogen production is assumed to draw electricity from the grid, increasing annual energy consumption. Because electrolyzers must operate at high utilisation rates to remain cost-effective, they are expected to help reduce minimum midday demand. However, they are unlikely to fully shut down during peak periods, meaning they may also contribute to both summer and winter maximum demand levels.
The impact of growing consumer energy resources (rooftop solar generation, small-scale battery operation and EV charging) is similar	Increased PV generation of 8,299 GWh, EV charging of 4,270 GWh of net small battery charging of 44 GWh, a net reduction in grid demand of 3,984 GWh (compared with a reduction of 4,302 GWh forecast in 2025 TAPR)	The net impact is expected to reduce grid energy consumption, lower peak demand, and accelerate the near-term decline in minimum operational demand. Our forecasts assume battery charging during morning periods and discharging during evening peak intervals. EV charging is also projected to shift increasingly toward periods of high solar generation or off-peak, low-tariff windows. Realising these outcomes, however, will depend on the implementation of appropriate incentives and supportive policy frameworks.
With the expectation of dramatic increases in new data centre loads, minimum demand is now forecast to fall initially and then begin rising again over the next 10 years.	Minimum demand continues to fall as midday network demand is offset by rising behind-the-meter PV generation. However, annual minimum demand is most likely to reach its inflection point in spring 2028, after which it is projected to begin rising as new data centres create additional daytime demand.	Declining minimum demand and increasing maximum demand present significant challenges for effective grid management. Extremely low – or near zero – demand conditions make it more difficult to maintain system stability. Key operational issues include voltage control, system strength, and the management of surplus generation. For reporting years beginning in late April and ending in March, annual minimum demand is now occurring in either spring (September to November) or summer (December through March). This shift reflects the growing variability in summer demand patterns and highlights the evolving operational dynamics of the power system.

4.2 NSW Region projected energy and demand

4.2.1 Inputs and assumptions

Like AEMO’s Electricity Statement of Opportunities and ISP, our forecasts assume that Australia will put measures in place to achieve its 2030 and 2050 net zero commitments. Measures to achieve the Federal Government’s Small-scale Renewable Energy Target and the Large-scale Renewable Energy Target include multiple state government environmental and energy programs and policies. We expect these policies will result in steady increases in renewable generation, grid-scale batteries and less coal-fired power generation.

This year, our specialist input forecasters are:

- **Baringa** – providing structured analysis of data centre project pipeline information and forecasts of likely future energy use by transmission and distribution connected data centres in NSW
- **Oxford Economics Australia** – providing population and economic forecasts
- **Endgame Economics** – providing retail electricity price forecasts
- **Energeia** – providing forecasts of the rise of consumer energy resources, including rooftop solar, small, behind the meter batteries and electric vehicle (EV) adoption, and daily use profiles.

Demand Forecasting Methodology and Scenario Alignment

Transgrid’s top-down demand forecasts were developed in house, using technical modelling and a simulation framework provided by GHD to integrate specialised inputs.

To ensure consistency, forecasting assumptions have been closely aligned with AEMO’s draft 2026 ISP, mapping our projections against three scenarios:

1. **Central (Most Likely):** Aligned with AEMO’s Step Change scenario, this represents Transgrid’s current baseline and most probable future outlook.
2. **Accelerated Change:** Aligned with AEMO’s Accelerated Transition scenario, this assumes rapid economic and population growth, alongside accelerated adoption of EVs and small batteries. Notably, almost all net growth in annual energy under this scenario is driven by the connection of new data centres. These compounding growth drivers are partially offset by higher projected electricity prices and increased rooftop solar adoption.
3. **Slow Change:** Aligned with AEMO’s Slower Growth scenario, this accounts for lower population and economic growth, reduced adoption of EVs and small batteries, and minimal new data centre connections. These trends are partially mitigated by lower electricity prices and slower rooftop PV adoption. Overall, maximum demand under this scenario closely tracks the projections outlined in the 2025 Transmission Annual Planning Report Medium scenario.

Population and economic growth

Oxford Economics advises that economic growth is expected to slow in the near term, with GDP easing to around 1.6 per cent by June 2027 due to geopolitical tensions, persistent inflation and higher interest rates, which are weighing on confidence and spending.

Nationally, as inflation moderates, interest rate cuts anticipated from late 2027 are expected to drive a recovery. This includes a strong rebound in dwelling construction, supported by housing undersupply and pent-up demand, alongside gradual improvements in consumer spending and investment. Population growth is projected to slow to around 1.2 per cent, reducing its contribution to economic growth and lowering long-term potential growth.

In NSW and the ACT, economic activity is expected to weaken in FY27 before rebounding in FY28–29, supported by lower interest rates and rising household incomes, though slower government spending, particularly in the ACT, will weigh on growth.

Dwelling completions are projected to rise sharply through FY28–30 before moderating, with total housing stock increasing by 28 per cent to approximately 4.65 million by FY46.

Overall, the outlook reflects short-term weakness followed by a cyclical recovery, with longer-term growth constrained by slower population and labour force expansion.

Rooftop solar and batteries

Rooftop solar and EV adoption are growing slightly faster than projected in the 2025 Transmission Annual Planning Report. Battery capacity is expected to be significantly higher. The net impact of rooftop solar and battery and vehicle charging will be to reduce network energy consumption and slightly lower summer maximum demand, which increasingly occurs in the early evening. In winter, the battery discharging offset to maximum demand will be offset by EV charging through the evening peak, even as the proportion of managed charging increases. More solar generation during the middle of the day will continue to push minimum demand lower.

Large industrial and mining loads

In line with projections in the 2025 Transmission Annual Planning Report, existing, committed and advanced large industrial and mining loads (i.e., excluding data centres and renewable hydrogen production) are expected to increase slightly over the next 10 years.

Renewable hydrogen

We have revised our expectations for renewable hydrogen growth, which are now based on AEMO’s ISP draft 2026 inputs.

Data centres

Our data centre projections are informed by independent analysis of the project pipeline, alongside a report commissioned from Baringa⁵² and supported by NSW network service providers. This analysis considers a range of factors, including the likelihood of projects proceeding, ramp-up rates to full capacity, data centre and developer types, load realisation assumptions and expected power demand. It is further supported by empirical evidence of data centre daily load profiles. Small existing and committed data centres identified by Baringa have been excluded from our forecast.

Growth in NSW data centre developments is expected to be primarily driven by rising demand for digital services, including AI, cloud computing and data storage. Key sectors underpinning this demand include finance, telecommunications, government, healthcare and retail, all of which require substantial computing infrastructure and correspondingly high electricity consumption. Sydney CBD and Western Sydney exhibit favourable conditions for developers and are emerging as key development hubs, supported by high population density, strong fibre connectivity and access to a skilled workforce.

Under the Central Scenario, Baringa’s analysis indicates that the rated capacity of NSW data centres is projected to increase significantly, from approximately 720 MW in 2026 to 6,700 MW by 2040.

By project status, the rated capacity of existing facilities is expected to grow from 690 MW in 2026 to 1,180 MW by 2040, driven by expansions of current operations. New projects — including both committed developments and anticipated future projects — are projected to increase from 35 MW in 2026 to 5,500 MW by 2040 under the Central Scenario.

Collectively, the rated capacity of existing and new data centre projects is forecast to reach approximately 6,700 MW by 2040, highlighting the substantial scale of growth expected across the NSW data centre sector.

4.2.1.1 Summary of load forecasting inputs and assumptions

Table 4.3 shows per cent changes in model inputs compared to the 2025 Transmission Annual Planning Report.

Table 4.3: Inputs and assumptions summary (Central scenario)

Model inputs	2026 TAPR	2025 TAPR
	Average annual % change	
Economic and demographic	2026/27 to 2035/36	2025/26 to 2034/35
Population	0.9	0.8
State Final Demand	2.1	2.3
Real retail electricity price	2.4	1.9
Real retail gas price	2.4	0.1
Consumer price index	2.6	2.7
Consumer Energy Resources	Increase 2026/27 to 2035/36	Increase 2025/26 to 2034/35
Small solar installed MW	6,065	7,341
Small batteries installed MWh	6,874	4,054
EV annual charging GWh	4,270	5,153
Specific loads	Increase 2026/27 to 2035/36	Increase 2025/26 to 2034/35
Large industrial and mining loads GWh	333	322
Hydrogen production loads GWh	3,651	817
Large data centre loads GWh	24,661	6,723

52 Baringa Partners LLP (May 2026) NSW Data Centre Forecasting: Methodology Overview and Results, 13 May 2026 Final Results for NSP review.

4.2.2 Annual energy projections

Figure 4.1 and Table 4.4 show recent and projected annual NSW Region energy sent out.

Projected energy growth is dominated by our assumed growth in data centre connections. Minor changes to historical annual energy reflect AEMO’s revised native energy sent out series for recent years.

Figure 4.1: Actual and projected NSW Region annual energy sent out

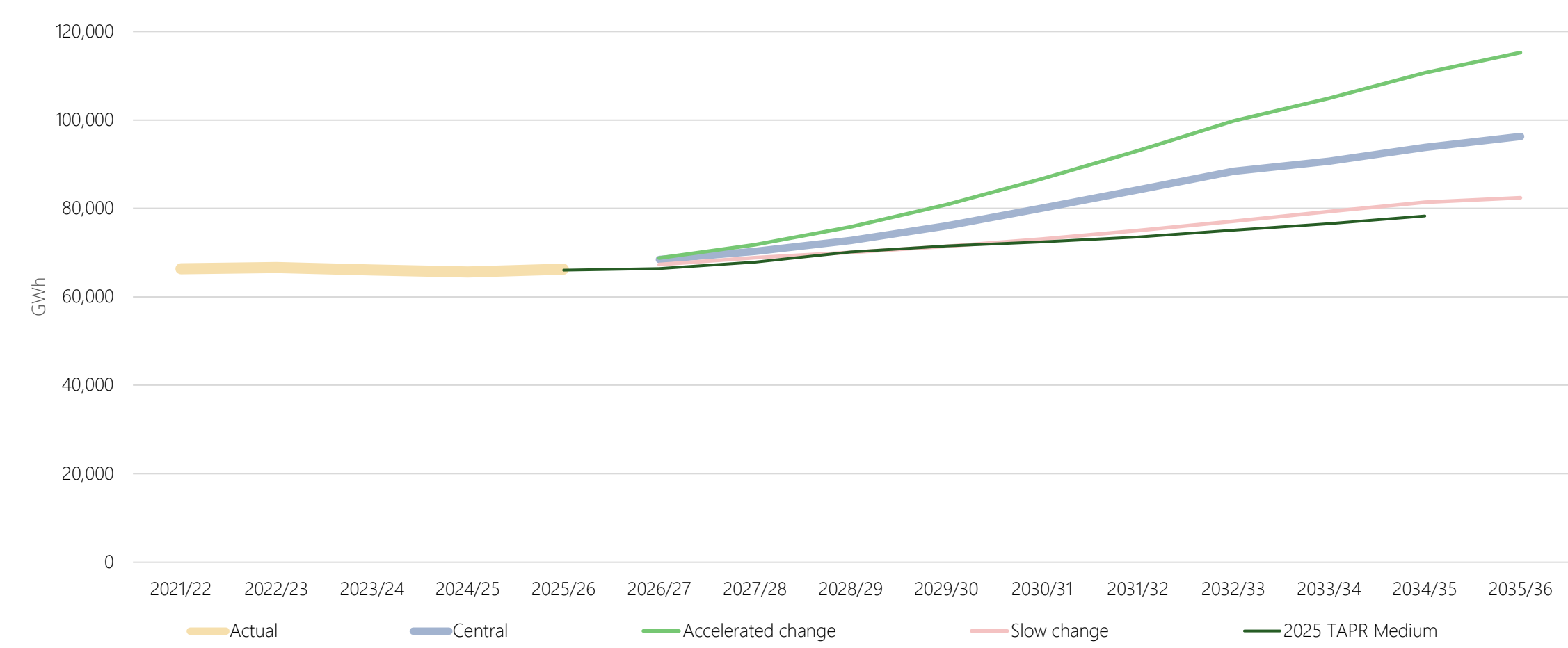


Table 4.4: NSW Region annual energy sent out (GWh)

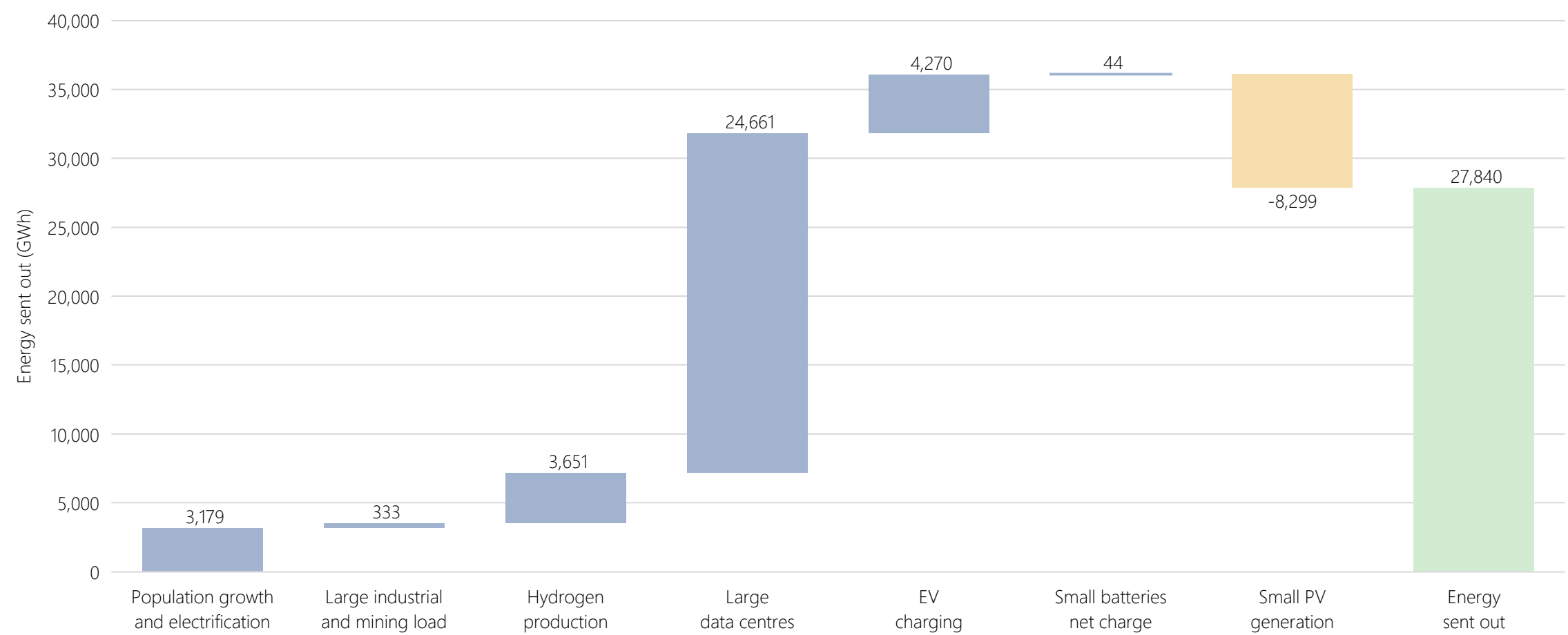
	Actual	Central	Accelerated change	Slow change
2021/22	66,299			
2022/23	66,651			
2023/24	66,055			
2024/25	65,594			
2025/26 est.	66,250			
2026/27		68,470	68,770	67,340
2027/28		70,310	71,830	68,900
2028/29		72,730	75,810	70,070
2029/30		76,040	80,860	71,400
2030/31		80,100	86,660	73,050
2031/32		84,190	93,010	74,990
2032/33		88,390	99,760	77,110
2033/34		90,650	104,940	79,320
2034/35		93,820	110,680	81,370
2035/36		96,310	115,230	82,390
CAGR: 2026/27 to 2035/36		3.9%	5.9%	2.3%

The main drivers of change are:

- Increased demand from new data centres, potentially exceeding the anticipated growth in rooftop solar generation
- Rapid expansion of small-scale rooftop solar, reducing household reliance on network-supplied electricity
- Underlying structural growth driven by population increases and rising income levels
- Accelerating electrification across sectors, partially offset by higher real electricity prices and improvements in energy efficiency
- Growing demand from EV charging, reflecting increased adoption of plug-in battery electric vehicles
- Delayed development of Australia’s renewable hydrogen industry
- Rising uptake of small battery storage systems

These changes are illustrated in Figure 4.2.

Figure 4.2: Contribution to change in energy sent out FY27 to FY36

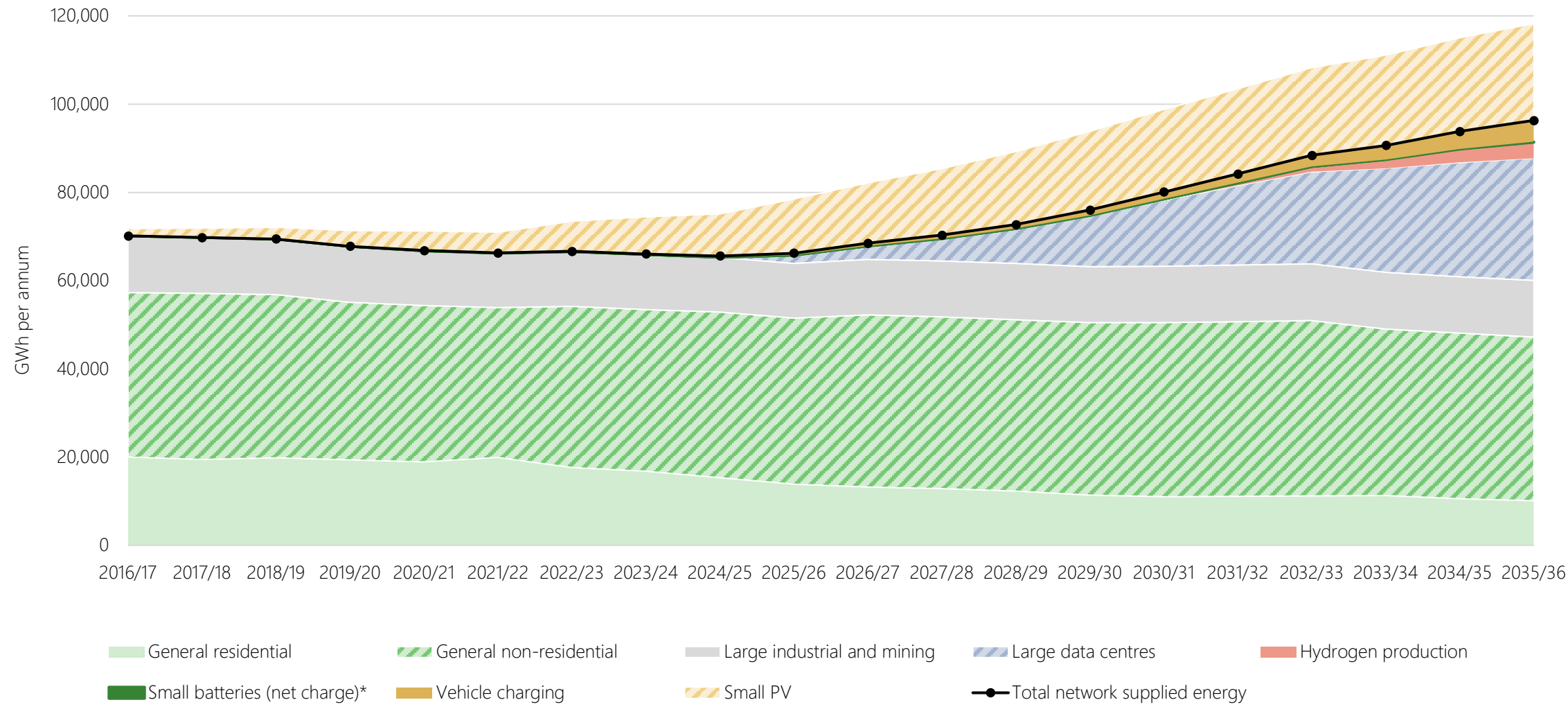


Composition of future network energy

Figure 4.3 illustrates a continued decline in residential electricity consumption, while overall non-residential demand remains broadly stable. This trend reflects relatively modest underlying consumption, increasingly offset by consumer-generated supply from rooftop solar systems.

Looking ahead, the primary drivers of demand growth are expected to be the expansion of data centres, increased EV charging, and by the mid-2030s the emergence of hydrogen production. Without additional uptake in small-scale rooftop solar, energy sent out in the NSW Region could be approximately 8,299 GWh higher by 2036.

Figure 4.3: Composition of NSW Region annual network energy consumption (GWh)



*Small batteries (net charge) is barely visible as the quantum is very small.



4.2.3 Summer maximum demand projections

Figure 4.4 and Table 4.5 show recent and projected NSW Region summer as generated maximum demand. Projected demand grows at a higher than 2025 Transmission Annual Planning Report projections.

Figure 4.4: Actual and projected NSW Region 50% probability of exceedance (POE) summer as generated maximum demand

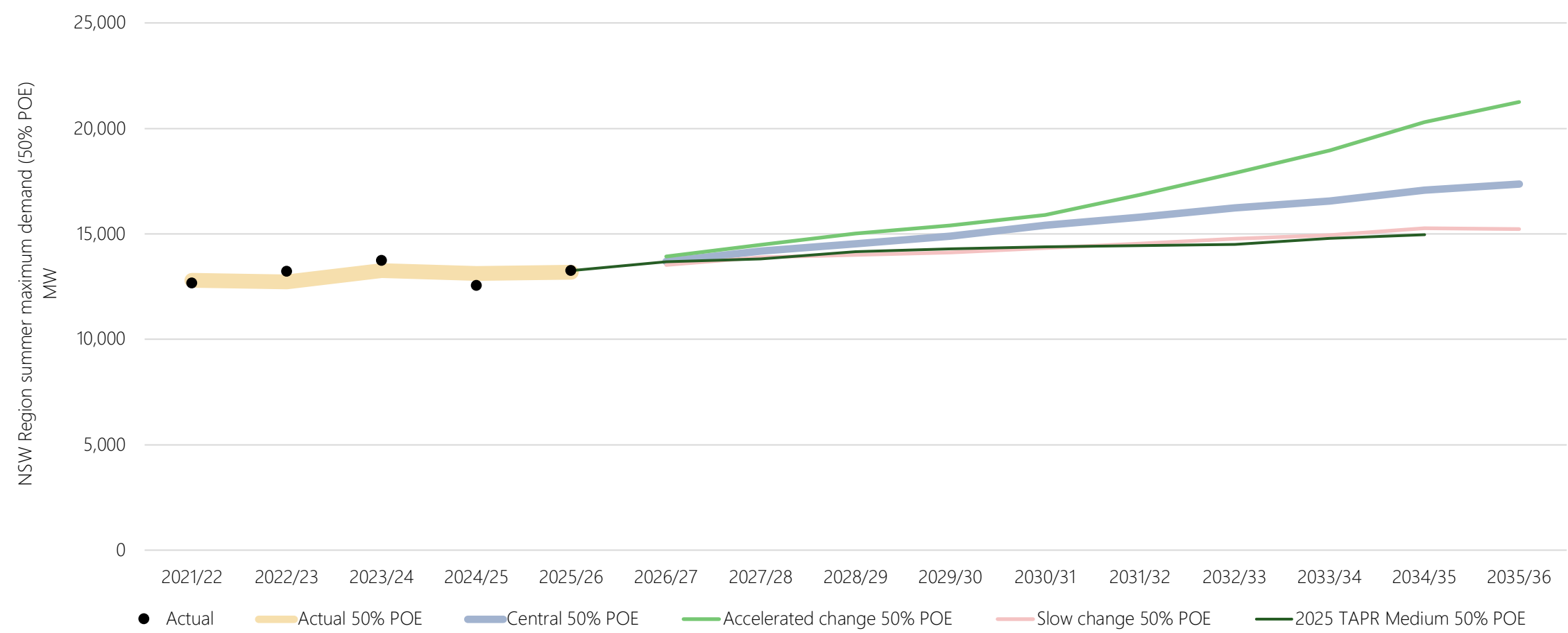


Table 4.5: NSW Region as generated summer maximum demand (MW)

	Actual	Central			Accelerated change			Slow change		
		10% POE	50% POE	90% POE	10% POE	50% POE	90% POE	10% POE	50% POE	90% POE
2021/22	12,656	13,442	12,805	12,169						
2022/23	13,216	13,349	12,727	12,082						
2023/24	13,723	13,890	13,260	12,716						
2024/25	12,546	13,812	13,122	12,613						
2025/26	13,240	13,784	13,176	12,615						
2026/27		14,350	13,690	13,060	14,590	13,930	13,300	14,200	13,530	12,900
2027/28		14,920	14,190	13,510	15,220	14,490	13,810	14,620	13,880	13,180
2028/29		15,280	14,520	13,900	15,780	15,020	14,400	14,790	14,010	13,360
2029/30		15,660	14,900	14,180	16,160	15,400	14,680	14,950	14,120	13,350
2030/31		16,220	15,400	14,650	16,720	15,900	15,410	15,230	14,330	13,550
2031/32		16,640	15,800	15,150	17,300	16,850	16,280	15,460	14,530	13,800
2032/33		17,060	16,240	15,480	18,390	17,880	17,270	15,660	14,760	13,920
2033/34		17,510	16,560	15,910	19,580	18,960	18,160	16,000	14,940	14,150
2034/35		17,910	17,080	16,380	21,010	20,300	19,290	16,210	15,270	14,390
2035/36		18,160	17,370	16,690	22,020	21,250	19,950	16,180	15,230	14,430
CAGR: 2026/27 to 2035/36		2.7%			4.7%			1.3%		

Significant drivers of change are:

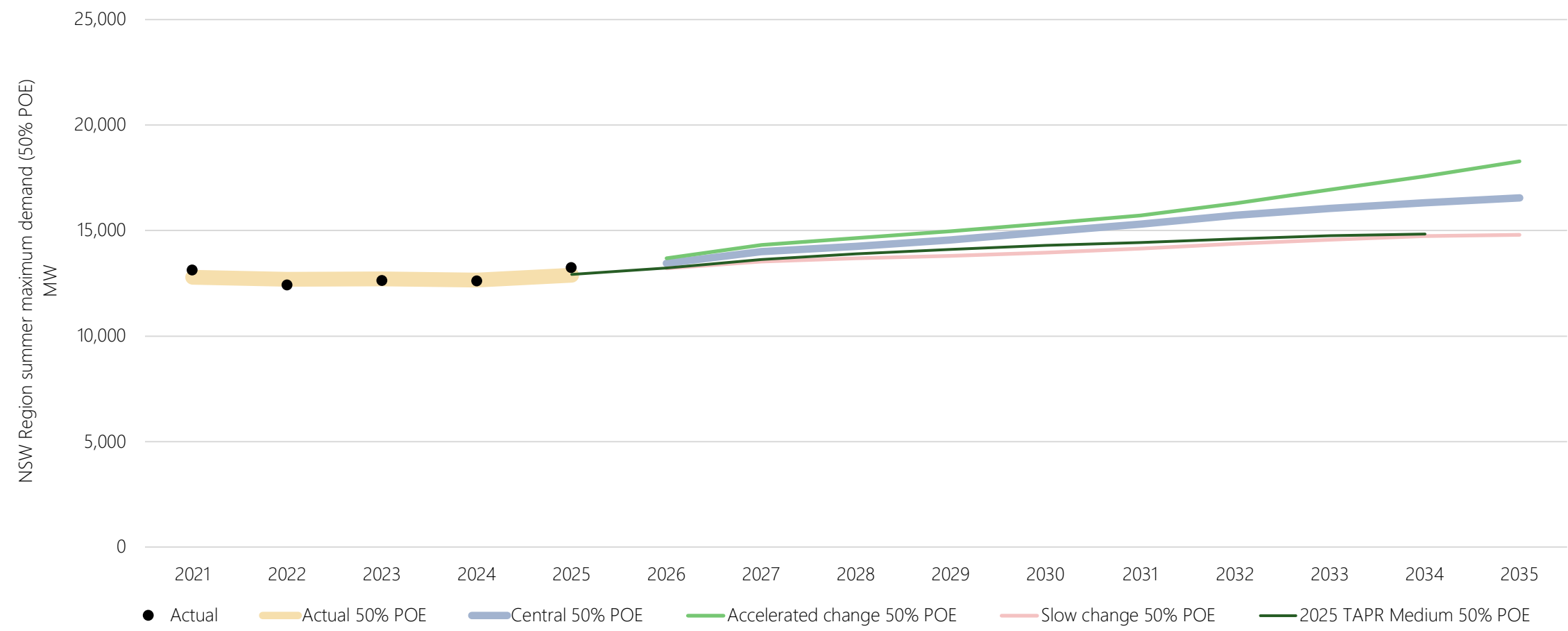
- Increasing baseline demand driven by the same factors outlined above for energy
- New data centre loads – and, later in the forecast period, renewable hydrogen loads – both of which are expected to operate at high load factors
- High levels of rooftop solar generation in the early afternoon, which are shifting maximum demand to the early evening when solar output is significantly lower and can only partially offset network demand
- The uptake of small batteries and incentives encouraging the shift of EV charging to off-peak periods which are reshaping evening peak demand

4.2.4 Winter maximum demand projections

Figure 4.5 and Table 4.6 show recent and projected NSW Region winter as generated maximum demand.

Projected demand and its rate of growth are higher than forecast in the 2025 Transmission Annual Planning Report.

Figure 4.5: Actual and projected NSW Region 50% POE winter as generated maximum demand



The largest drivers of change are:

- Increasing baseline demand driven by the same factors influencing overall energy consumption as outlined above
- The rising likelihood of milder temperatures due to the impacts of climate change
- New data centres and renewable hydrogen facilities operating at consistently high load factors
- The winter evening peak occurring after sunset, outside solar generation hours
- Changing evening peak demand patterns shaped by the uptake of small batteries and off-peak EV charging

Table 4.6: NSW Region as generated winter maximum demand (MW)

	Actual	Central			Accelerated change			Slow change		
		10% POE	50% POE	90% POE	10% POE	50% POE	90% POE	10% POE	50% POE	90% POE
2021	13,117	13,254	12,785	12,359						
2022	12,418	13,109	12,683	12,235						
2023	12,623	13,173	12,712	12,267						
2024	12,612	13,103	12,653	12,246						
2025	13,246	13,389	12,893	12,427						
2026		13,940	13,450	12,990	14,180	13,690	13,230	13,690	13,210	12,750
2027		14,480	14,010	13,550	14,780	14,310	13,850	14,000	13,530	13,070
2028		14,720	14,250	13,810	15,120	14,650	14,210	14,150	13,680	13,240
2029		15,040	14,560	14,080	15,440	14,960	14,480	14,290	13,810	13,350
2030		15,430	14,930	14,460	15,830	15,330	14,860	14,430	13,950	13,490
2031		15,820	15,310	14,850	16,220	15,710	15,250	14,640	14,150	13,710
2032		16,230	15,730	15,220	16,770	16,280	15,780	14,850	14,380	13,880
2033		16,530	16,040	15,520	17,430	16,940	16,420	15,040	14,570	14,050
2034		16,840	16,320	15,850	18,090	17,570	17,110	15,230	14,730	14,270
2035		17,050	16,550	16,070	18,880	18,280	17,780	15,280	14,790	14,320
CAGR: 2026 to 2035		2.3%			3.3%			1.3%		

4.2.5 Yearly minimum demand projections

Demand in 2025 Transmission Annual Planning Report was projected to become negative sometime in the early 2030s. Due to the projected increase in data centre loads, we now expect that the decline in minimum demand will be reversed. Demand reaches its minimum in 2029 (below 2,000 MW) and grows after that.

Figure 4.6 and Table 4.7 show recent and projected NSW Region as generated minimum demand for years ended March⁵³.

Figure 4.6: Actual and projected yearly NSW Region 50% POE as generated minimum demand

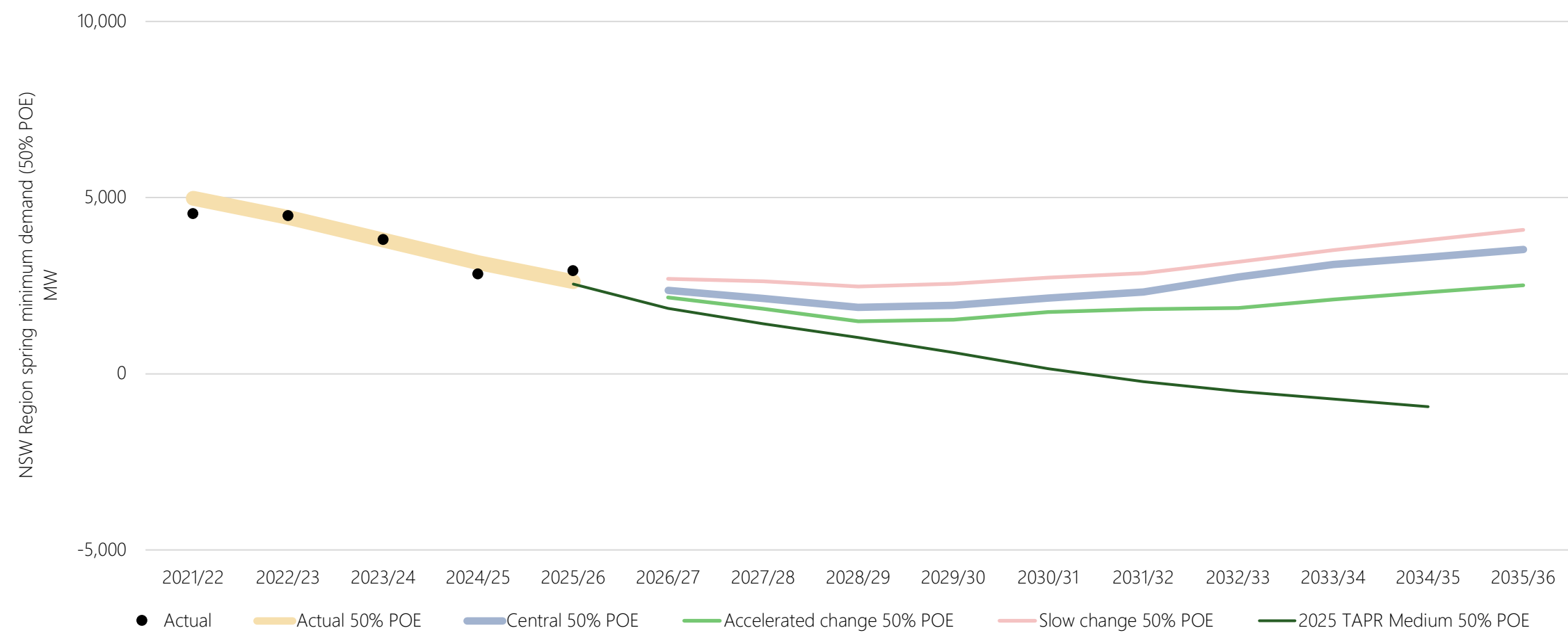


Table 4.7: NSW Region as generated yearly minimum demand (MW)

	Actual	Central			Accelerated change			Slow change		
		10% POE	50% POE	90% POE	10% POE	50% POE	90% POE	10% POE	50% POE	90% POE
2021/22	4,537	4,569	4,984	5,323						
2022/23	4,483	3,907	4,433	4,756						
2023/24	3,799	3,343	3,796	4,182						
2024/25	2,824	2,779	3,152	3,526						
2025/26	2,915	2,230	2,614	3,011						
2026/27		1,900	2,370	2,860	1,700	2,170	2,660	2,270	2,690	3,160
2027/28		1,700	2,140	2,660	1,400	1,840	2,360	2,200	2,620	3,110
2028/29		1,410	1,890	2,460	1,010	1,490	2,060	2,040	2,480	2,980
2029/30		1,390	1,940	2,510	990	1,540	2,110	2,090	2,560	3,060
2030/31		1,540	2,150	2,780	1,140	1,750	2,380	2,230	2,730	3,290
2031/32		1,730	2,320	2,990	1,190	1,830	2,430	2,390	2,860	3,410
2032/33		2,120	2,750	3,360	1,160	1,870	2,590	2,690	3,170	3,680
2033/34		2,430	3,100	3,690	1,340	2,110	2,780	3,040	3,510	4,090
2034/35		2,680	3,310	3,910	1,510	2,310	3,000	3,310	3,800	4,380
2035/36		2,930	3,530	4,130	1,690	2,510	3,220	3,570	4,080	4,660
CAGR: 2026 to 2035		4.5%			1.4%			4.7%		

The largest drivers of change are:

- The rapid adoption of rooftop solar generation significantly reducing households’ reliance on the network during daytime hours
- Increasing data centre demand helping to offset declining network load during the day
- Limited uptake of EV and small battery charging during these periods resulting in excess solar generation being exported to the grid
- Emerging loads, including small-scale mining operations and – later in the forecast horizon – renewable hydrogen production, which are expected to partially offset minimum demand levels

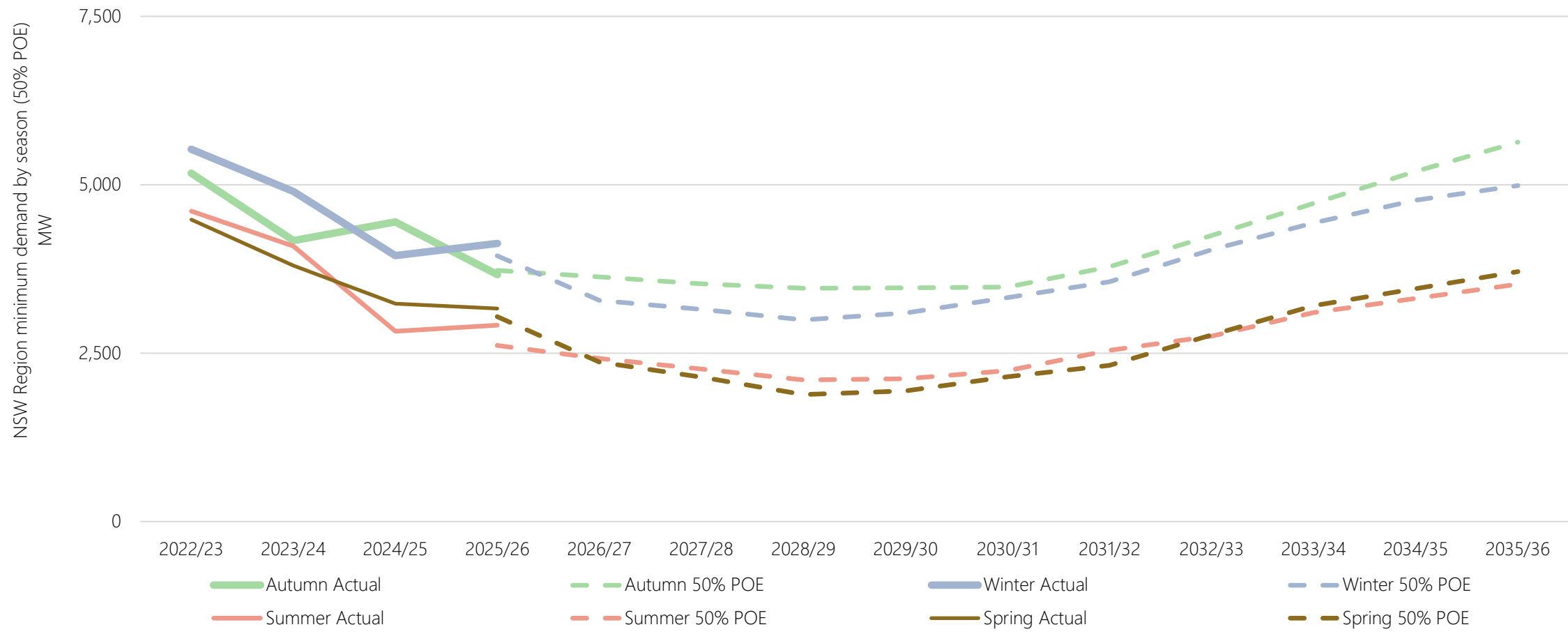
53 Including autumn, winter, spring and summer seasons, with projected yearly minimum demands generally occurring in spring or summer.



Minimum demand may occur in spring or summer

In each reporting year, from late March to the end of the end of summer next year, the lowest demand can happen either in spring or in summer. The projections presented in Table 4.7 and illustrated in Figure 4.7 are derived from an analysis including minimum demand across all seasons. Further examination at a seasonal level indicates that minimum demand in spring and summer remain closely aligned throughout the forecast horizon, as demonstrated in Figure 4.7.

Figure 4.7: Actual and projected NSW Region 50% POE minimum demand by season



Minimum demands occur under mild temperatures (neither too hot nor too cold) and high solar generation conditions. Table 4.8 shows that, while spring and autumn generally have similar average temperatures, autumn has less sunlight and more rain. Spring has more solar exposure than autumn, and almost as much as summer, but without summer’s higher average cooling requirement. As a result, mild but sunny summer days can produce similar demand conditions to those seen in spring, when minimum demand is most likely to occur.

Table 4.8: Daily weather summary by load forecasting season (Sydney Airport)

	Summer	Autumn	Winter	Spring
	Average daily temperature Celsius (1990-2025)			
Average	22.9	18.6	13.8	18.3
Maximum	34.6	31.2	23.4	30.3
Minimum	12.2	9.8	8.9	9.3
	Global solar exposure MJ/m² (1990-2025)			
Average	21.7	12.8	10.6	19.1
Maximum	35.0	24.9	18.7	32.0
Minimum	0.3	0.2	0.2	0.2
	Rainfall mm (1990-2025)			
Average	3.2	3.5	2.9	2.0
Maximum	216.2	143.4	151.2	115.4
Minimum	0.0	0.0	0.0	0.0

4.2.6 Load forecasting definitions and conventions

Our forecasts include the following aspects of transmission network demand:

- Annual energy in GWh
- Summer and winter maximum demand in MW
- Minimum demand in MW.

Network or “native” demand is the total output of all NEM-connected generators, except scheduled loads like pumped hydro and BESS charging.

Generation output measured at generator terminals is termed "as generated". It includes any power used for generator auxiliary load. Generation measured at the point of connection with the network is termed, "sent out". In this Report, energy (GWh) is measured as sent-out generation, with minimum and maximum demand measured as generated.

Maximum and minimum demands are half-hourly averages that are highly weather dependent. High temperatures during summer afternoons/evenings and low temperatures during winter evenings typically produce demand peaks.

To account for the imprecise nature of long-range weather forecasting, forecasts are prepared on a probabilistic framework. The probability of exceedance (POE) for maximum demand is the probability that a given maximum demand will be exceeded in a particular year, so 10 per cent POE represents a maximum demand level that has a 10 per cent chance that maximum demand will be above this level in any given year. This can be described as a 1 in 10-year event. Similarly, 50 per cent POE equates to a 1 in 2-year event and 90 per cent POE as a 9 in 10-year event.

For load forecasting purposes, seasons are defined as follows.

- **Summer** – 16 November (previous year) to 15 March (next year)
- **Autumn** – 16 March to 31 May
- **Winter** – 1 June to 31 August
- **Spring** – 1 September to 15 November

About 22 per cent of Transgrid’s load currently comes from large industrial, mining and data centre customers. These large users are connected at high-voltages and tend to have stable demand, unaffected by economic conditions, population growth or weather. Because of this, they are excluded from our forecast modelling and added back in separately based on annual reviews and inputs from existing large industrial load customers.

Network demand forecasts are built from top-down models of underlying demand. Consumer energy resources, like rooftop solar, batteries and EVs, are removed first, then added back to estimate total network demand.

Our modelling also takes into account the likely impact of emissions reduction targets, population changes, economic and energy price growth and technology adoption. Assumptions about appliance efficiency are based on existing energy efficiency programs and generally assumed to continue at historical rates.

See Appendix 1 for further information on how the projections were prepared and a review of the previous model and input accuracy.



Rod Pomfrett - Site Manager

4.3 Bulk supply point forecasts

In early 2026, we received bulk supply point (BSP) forecast from Distribution Network Service Providers (DNSPs), incorporating the local knowledge of DNSPs and directly connected customers.⁵⁴ Generally, BSPs have gradual load changes. However, our forecasts also include spot loads⁵⁵ unlikely to be captured by allowing for general economic growth. This year, these spot loads come from rapid planned development in South West Sydney, data centre growth, regional Special Activation Precincts and mining projects.

Figure 4.8: BSP forecast growth rates (Summer)

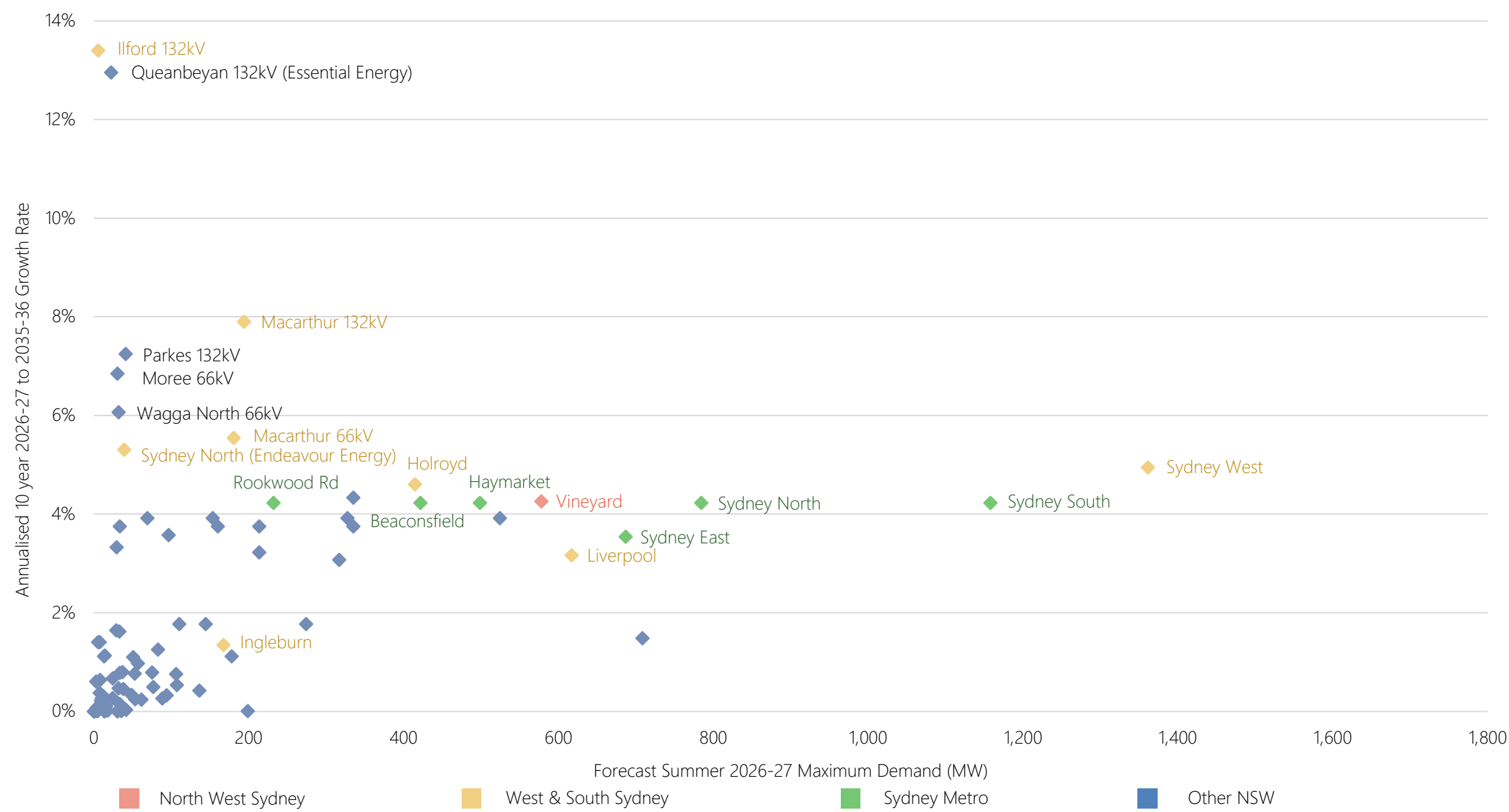


Figure 4.9 shows the summer forecast growth rates for BSPs serving the respective DNSPs. See Appendix 2 for detailed year-on-year forecasts of summer and winter maximum demands at the individual BSP level.

The BSPs with the highest growth rates serve the following areas:

4.3.1 West and South West Sydney

This area is predominantly within the South West Sector Land Release and Broader Western Sydney Employment Area where a large number of residential lot releases are planned. Load increases are also expected due to the opening of new Western Sydney Airport at Badgerys Creek later this year. The Aerotropolis development is planned as a smart city and will include associated commercial, residential and light industrial/ancillary services growth. Significant load increases will also occur from data centre expansion and construction.

4.3.2 North West Sydney

The development and operation of North West Rail infrastructure and associated activity in medium/high density residential, commercial and industrial areas will drive load growth in this area.

4.3.3 Sydney Inner Metropolitan area

This area continues to grow at a moderate rate, with real income and population growth forecast to result in higher load growth. The NSW Government is planning a range of projects that will increase electricity loads, including transport infrastructure and several precincts or urban developments.

This year, Ausgrid’s forecasts also incorporate substantial load increases as a result of new and existing data centre growth/expansions in and around Macquarie Park and Lane Cove and in areas closer to population centres.

In future, Beaconsfield and Haymarket will be key BSPs to watch as these are two of our largest exit points supplying the Sydney Inner Metropolitan area.

4.3.4 Other NSW

Other NSW consists of areas in:

Central West – Spot loads in this area primarily relate to two Special Activation Precincts in Parkes and Moree. Load increases will also be required to support rising demand in existing mines at Parkes and Orange.

Northern NSW – Spot loads in this area relate to the expected development of a major gas project.

Southern NSW – Spot load growth, including in the Evoenergy network, will come from mining/industrial developments, new data centres and increased load from electrifying appliances and transport. The Wagga Wagga Special Activation Precinct will also contribute. Located on the Inland Rail, the precinct houses the Riverina Intermodal Freight and Logistics hub, with overnight access to international ports and 75 per cent of Australia’s population.

54 Macroeconomic data is generally not available at a BSP level, so it is generally not possible to develop macroeconomic models for individual BSPs and to produce forecasts for different economic scenarios. In practice, the BSP forecasts are produced in a variety of ways (see respective DNSP annual planning reports), reflecting the amount of data available and the nature of the loads.

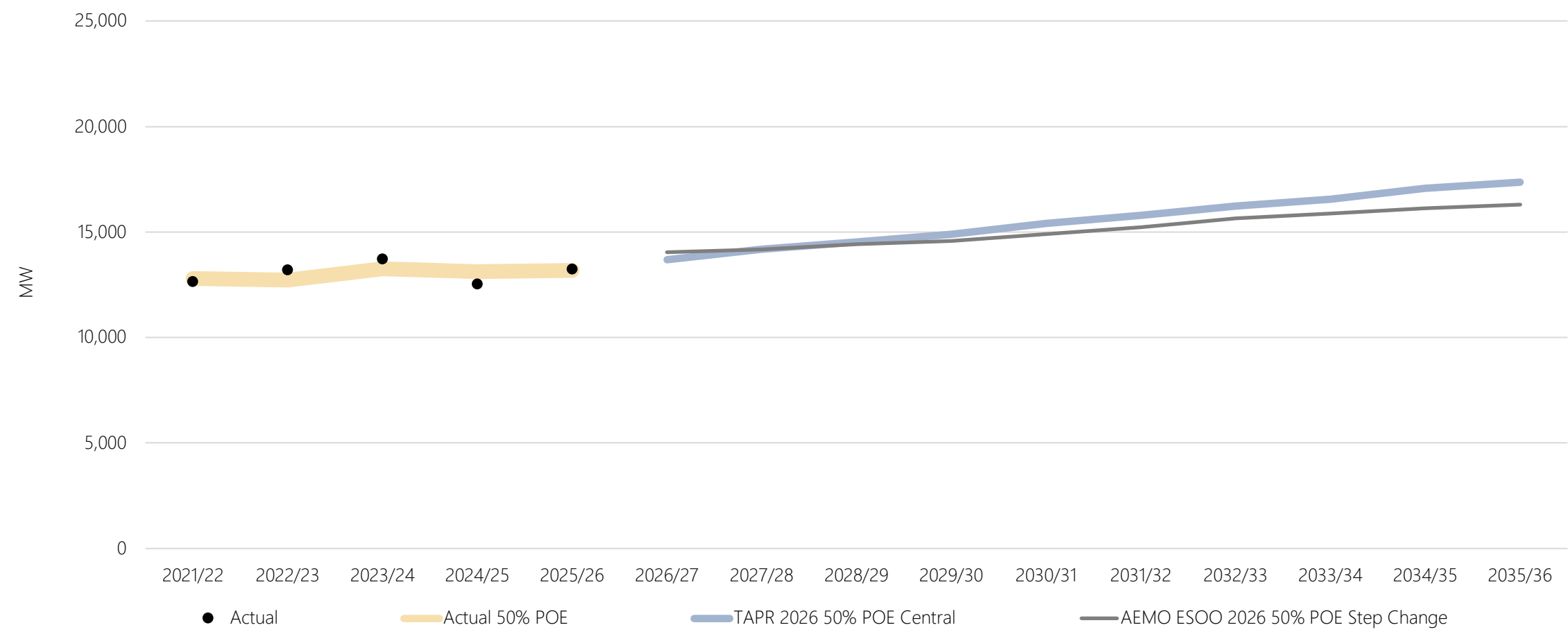
55 Spot loads are step (one off) increases in load for a BSP due to new commercial/housing developments or large industrial customer connections. There could be spot load decreases in cases where there are withdrawals of large-load customers from the grid.



4.4 Higher future load growth than previously predicted

Transgrid's forecasts in the 2026 Transmission Annual Planning Report show substantial future load growth compared to our 2025 forecasts. The Transgrid forecasts shown in Figure 4.9 are considerably higher than AEMO's Electricity Statement of Opportunities 2026 and comparable to the aggregate DNSP BSP forecast.

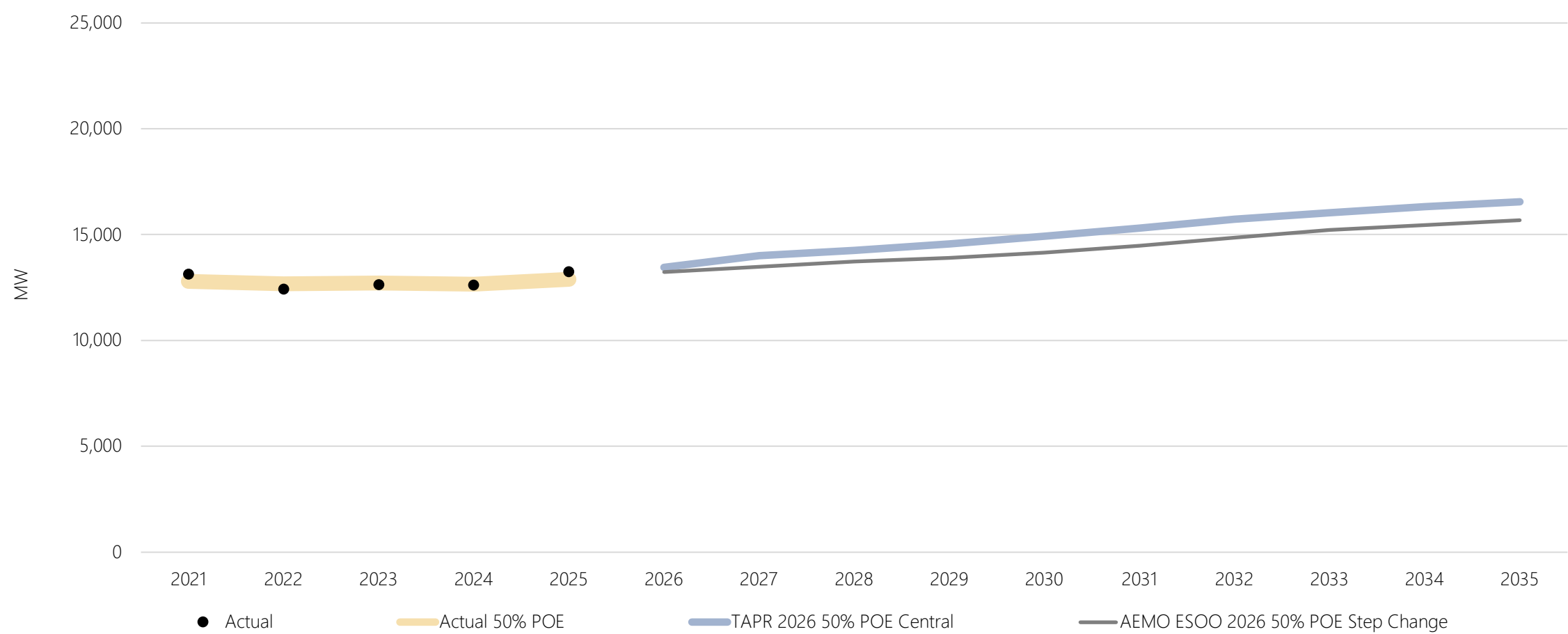
Figure 4.9: Transgrid's 2026 vs AEMO's ESOO 2026 summer maximum demand forecast for NSW Region



4.4.1 Transgrid's 2026 NSW Region forecast vs AEMO's Electricity Statement of Opportunities 2026

The most recent update of AEMO's top-down forecasts for the NSW Region was conducted in August 2026 as part of ESOO 2026.⁵⁶ This section compares Transgrid's 2026 top-down summer and winter maximum demand forecasts with those of AEMO (Figure 4.10 and Figure 4.11). Both demand forecasts are presented on a “native as generated” basis.

Figure 4.10: Transgrid's 2026 vs. AEMO's ESOO 2026 winter demand forecast for NSW Region



⁵⁶ <https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-reliability/nem-electricity-statement-of-opportunities-esoo>

4.4.2 Transgrid 2026 NSW Region forecast vs aggregate DNSP BSP forecast

Historical comparisons show that, on average, aggregate BSP forecasts from DNSPs are higher than NSW Region forecasts. This is because DNSP forecasts are not generally based on econometric modelling⁵⁷ and include localised spot loads. Also, most DNSP forecasts have little or no adjustments for energy efficiency and rooftop solar, unlike NSW Region forecasts.

Also unlike Transgrid’s NSW Region forecast, none of the BSP loads include transmission network losses or power station auxiliary load. Despite this difference, the individual BSP forecasts for each season can be aggregated to provide a useful comparison with the overall NSW Region demand forecast. To achieve this, we consider:

- Diversity of load or timing of maximum demand
- Transmission network losses
- Power station auxiliary load.

We account for the limitations of this process by:

- Using 50 per cent POE forecasts where they are available, and where they are not, by assuming individual BSP projections are based on enough historical data to converge towards an approximate 50 per cent POE forecast
- Diversifying individual BSP forecasts to allow time differences between historical local seasonal maximum demand and NSW maximum demand
- Adding forecast aggregate directly connected industrial loads not included in the BSP forecasts

- Incorporating transmission network losses and power station auxiliary loads, derived from recent historical observations, to express the forecasts in the same "as generated" basis for comparison with Transgrid’s 2026 NSW forecast
- Taking into account that most BSP forecasts have minimal or negligible adjustments for the future uptake of rooftop solar and household batteries, comparing the top-down high (Accelerated Change) scenario forecast to aggregate DNSP forecasts for the comparison to become meaningful.

Figure 4.11 and Figure 4.12 show aggregate BSP summer and winter maximum demand forecasts compared with Transgrid’s 10 per cent and 50 per cent POE High NSW Region summer and winter maximum demand forecasts respectively for the NSW Region.

The charts show that DNSP and Transgrid forecasts are similar in initial years but diverge later in the 10-year outlook. This is expected, as they use different methodologies and input assumptions. Comparing them shows high-level differences but does not indicate which forecast is more accurate.

Figure 4.11: Transgrid’s top-down forecast vs aggregate BSPs forecast for summer maximum demand

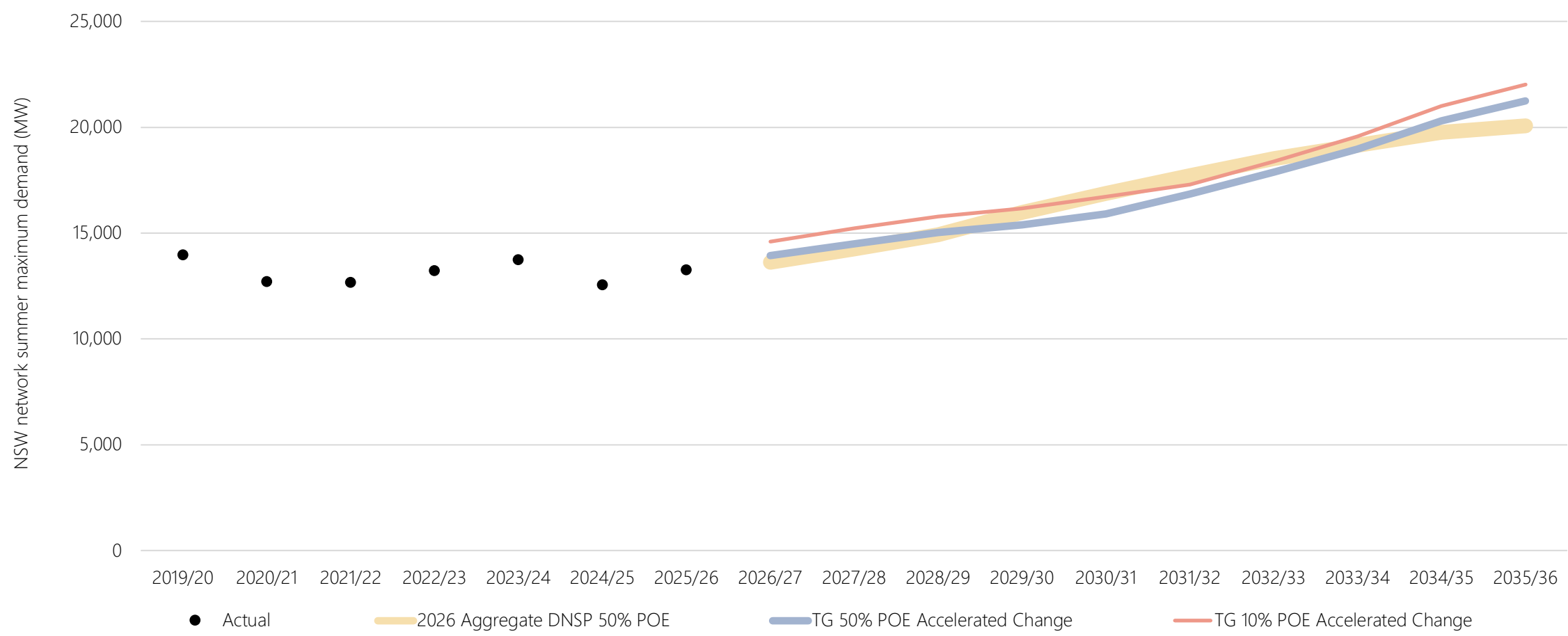
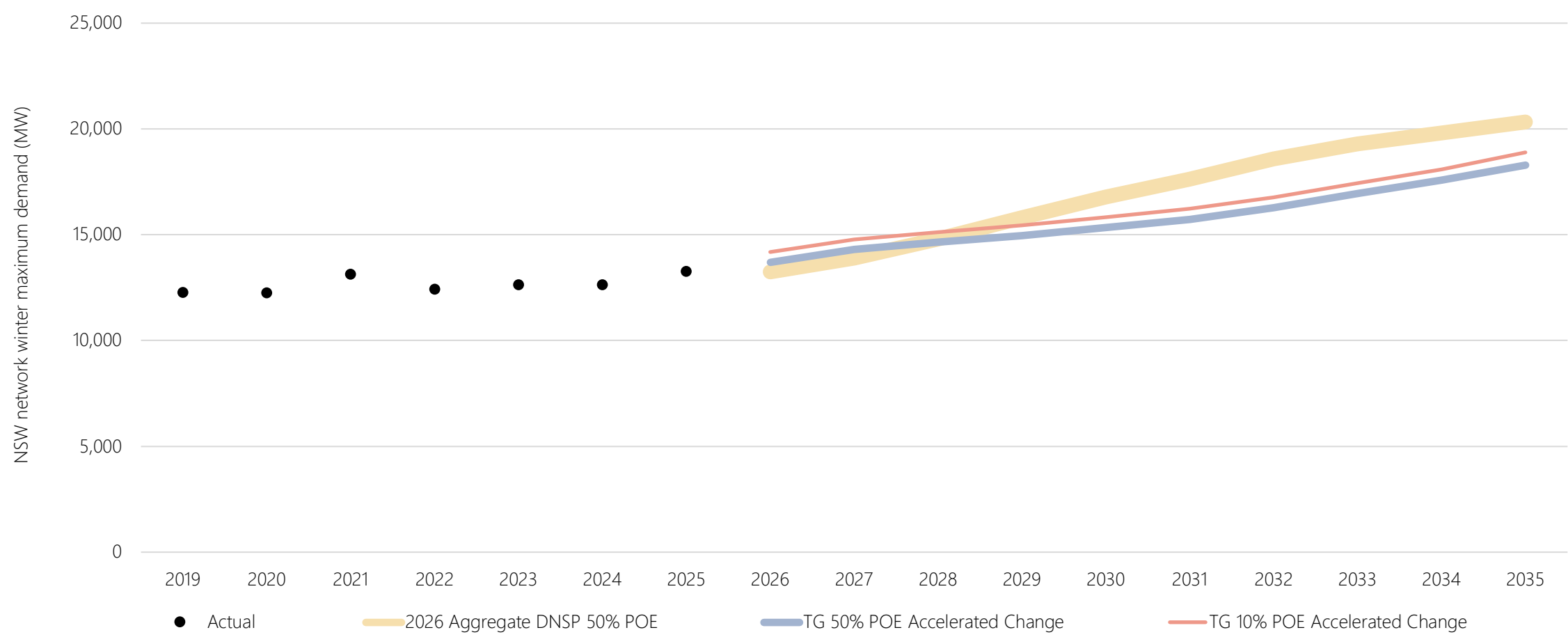


Figure 4.12: Transgrid’s top-down forecast vs aggregate BSPs forecast for winter maximum demand



57 Econometric data like GSP and HDI are not generally available at a BSP level. Hence DNSP forecasting methodologies tend to rely on time-series forecasting with upward adjustments for future localised spot load developments.



4.5 Changes from the 2025 Transmission Annual Planning Report

Compared with the 2025 Transmission Annual Planning Report, this chapter:

- Provides a more detailed outlook for NSW energy consumption and maximum demand
- Incorporates new spot loads (including substantially more data centre loads) in its forecasts
- Uses new forecast methods, including new models, evaluation methods, input variables and scenarios (see Appendix 1)
- Provides a new comparison of annual energy consumption and maximum demand between Transgrid's 2026 forecast and AEMO's 2026 Electricity Statement of Opportunities forecast.⁵⁸

These changes are consistent with the requirements of NER Clause 5.12.2(c)(1), (6A), (9), (10) and (12).



Jess Evans - 3rd
Year Substation
Technician Apprentice

⁵⁸ <https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-reliability/nem-electricity-statement-of-opportunities-esoo>

System security

Throughout the deep transition, Transgrid is responsible for ensuring sufficient system security services are available to keep the NSW power system operating within its safe and secure technical envelope.



Trent Gillespie - Substations
Field Coordinator
Brodie Grant - 4th Year
Substation Technician
Apprentice



Maintaining power system security is becoming increasingly complex as coal generators retire and new renewable generators and loads connect, requiring new assets and non-network security services. Without adequate system security services, generators may be unable to remain connected during disturbances to the power system, control of the system voltage becomes more difficult and protection systems that ensure safe operation of the network may not operate correctly.

Historically, maintaining the security of the NSW electricity system has relied on several coal-generating units being online at all times. Yet in the next decade, more than 80 per cent of NSW coal capacity is projected to retire, and 26 GW of new utility-scale wind and solar plants are projected to connect in NSW under a ‘Step Change’ scenario.⁵⁹ This will create significant gaps in system security that Transgrid is working to address.

To meet our system security obligations, Transgrid is working with market proponents to assemble a diverse portfolio of system strength solutions, that can also meet inertia requirements and provide significant voltage support. Based on an extensive RIT-T assessment, the portfolio includes:

- Synchronous condensers that spin freely (with no fuel combustion or power generation), used specifically to provide system security services
- Grid-forming BESS that can participate in the energy market while also providing system strength support, synthetic inertia, fast frequency response and voltage support

- Services outside the energy market, such as existing synchronous hydro generation units that can operate in synchronous condenser mode, or generators with units upgraded to operate in synchronous condenser mode
- Existing and committed synchronous generators dispatched in the energy market, such as hydro and coal and gas, where necessary

The system strength RIT-T process is now complete and a Material Change in Circumstances (MCC) assessment has been undertaken. Transgrid will continue to monitor and assess emerging non-network solutions with the potential to further revise the preferred portfolio through future MCCs.

59 AEMO's Final 2026 Integrated System Plan, June 2026

5.1 Assessing power system security

To plan the best way to decouple system-security provision from coal generation, we assess power system security against the criteria that contribute to system stability (Table 5.1).

Table 5.1: Definitions and characteristics of criteria affecting system security

Criteria	Description
System adequacy	The ability of the power system to maintain sufficient available generation capacity to meet electricity demand and required reserve levels at all times, including following the loss of a major generating unit or other credible contingency.
Maximum demand (or peak demand)	The highest amount of electricity used at any instant in a period of time.
Minimum demand	The lowest amount of electricity used at any instant in a period of time. Low minimum demand can challenge the voltage profile and stability of the power system.
Voltage control	The ability to maintain voltages throughout the power system within stable and safe limits. Voltage control is provided by controlling generators and network assets, such as transformer tap changers, capacitor banks, reactors, Static VAR Compensators and synchronous condensers.
System strength	The power system’s ability to maintain and control the voltage waveform at any given location in the network so the network can return to normal operation after a disturbance or fault. System strength is a fundamental service required for the power system to operate in a secure state and to ensure the safe operation of protection devices. It has traditionally been provided by synchronous generators as an intrinsic by-product of producing energy and reserves.
System strength requirements	Transgrid is the System Strength Service Provider (SSSP) for NSW and the ACT, responsible for providing both the minimum level of system strength required for power system security, and the additional level of the service required to ensure stable voltage waveforms when hosting new inverter-based resources (the ‘efficient’ level).
Frequency control	The ability to maintain the frequency of the power system within stable limits. Traditional frequency control acts quickly for small changes in frequency under normal conditions, but slowly for large changes in frequency during disturbances. Therefore, it needs to be complemented by inertia. Fast frequency response (FFR) is a newer approach enabled by high-speed power electronics. Battery storage devices and solar generators use these electronics in their inverters. FFR also has the potential to act quickly during disturbances.
Inertia	The power system’s ability to ‘ride through’ disturbances without significant frequency variation. Inertia measures the physical capability of the power system to resist changes in frequency by means of inertial response from a generating unit, network element or other equipment that is electro-magnetically coupled with the power system and synchronised to the frequency of the power system.

5.1.1 Changing generation mix and network requirements

The 2026 Integrated System Plan (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.

The 2026 ISP forecasts that coal generators may not retire as early as previously anticipated. However, up to 80% of NSW’s coal-fired power station capacity is still projected to retire before 2035, with the entire NSW fleet expected to be decommissioned before 2040. As these assets approach end-of-life, their operation has become more difficult and expensive. Transgrid is considering a range of potential retirement dates to assess system security needs under different scenarios.

Figure 5.1: Capacity of coal generators available in NSW, based on projected retirement dates

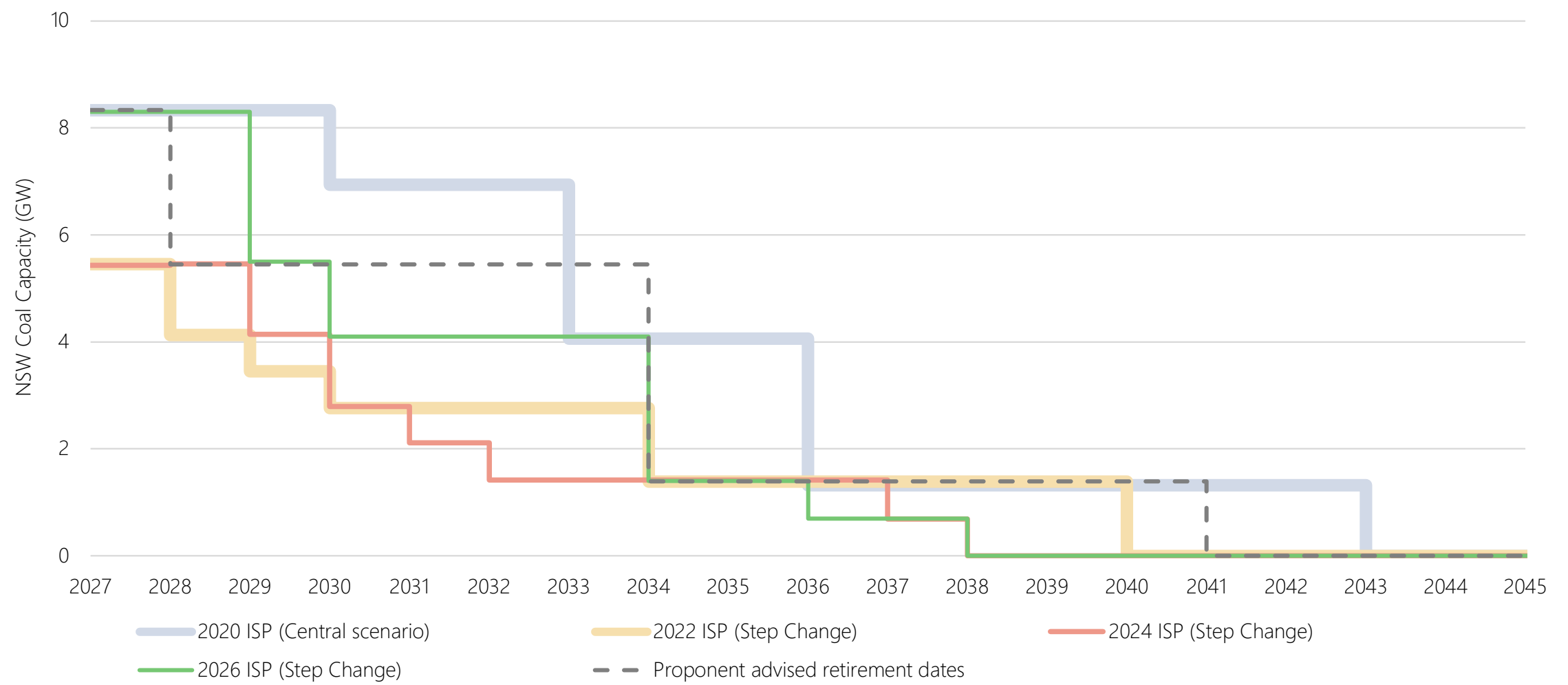
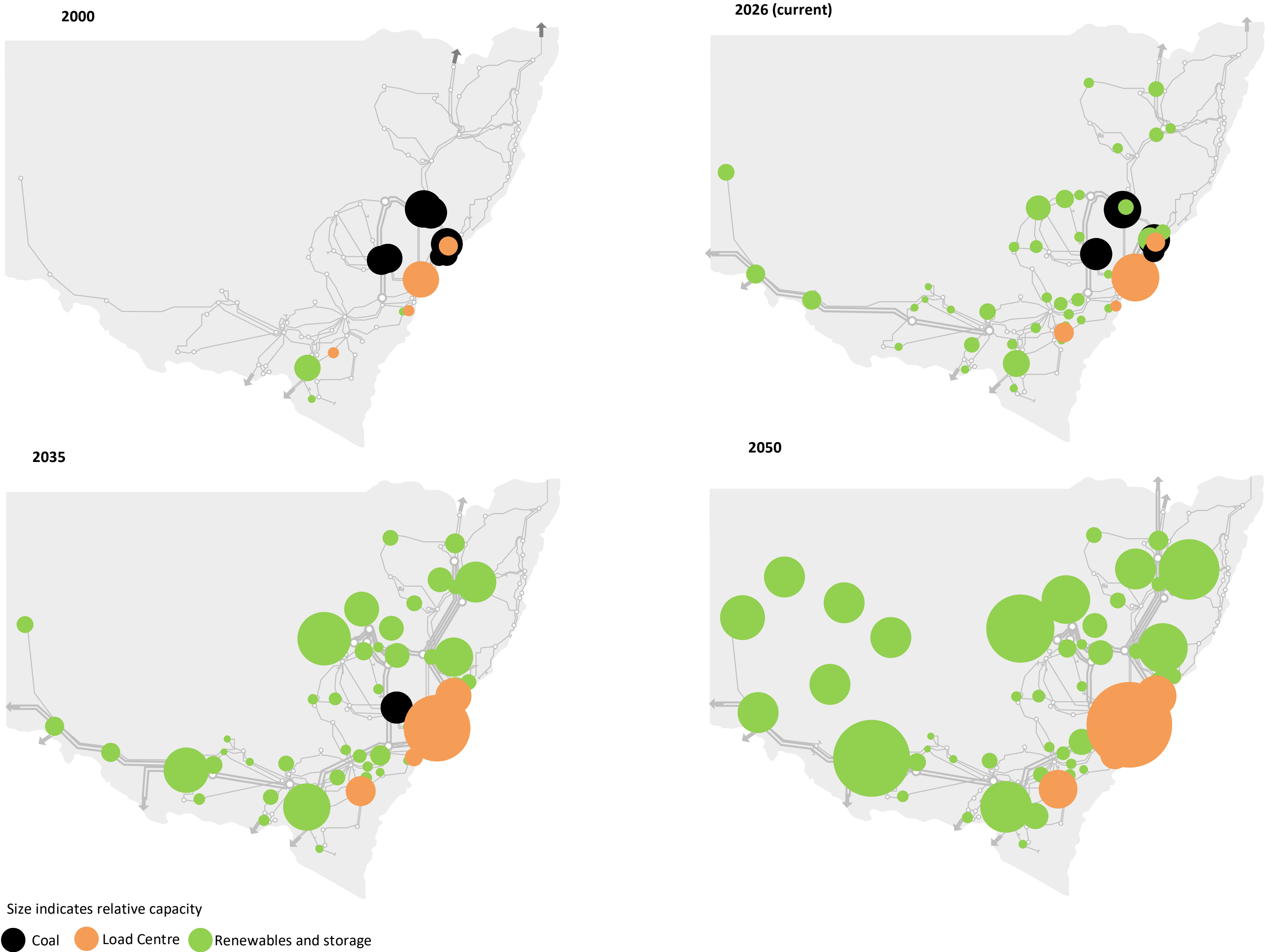


Figure 5.2: Evolution of NSW generation, load centres and transmission network (2000-2050)

As the NSW coal fleet ages, the risk of unexpected outages increases. By 2030, Bayswater, Vales Point and Mt Piper will be 45, 52, 38 years old, respectively. As stated in the AEMO 2026 General Power System Risk Review, “Ageing coal fleet may be exposed to increased age-related reliability risks, elevating the likelihood of unplanned outages and power system security challenges”⁶⁰.

Outages may also occur as coal generators continue to adjust their operational patterns to the energy market, with AEMO’s 2025 Thermal Audit, November 2025 noting, “Flexible operation is expected to bring forward the well-known bathtub upward curve of plant breakdowns and may introduce new failure modes”. Our system security planning considers coal outage patterns and operating behaviours to ensure the NSW power system remains resilient.

NSW’s transition to renewable energy relies on integrating the existing transmission network with new directly connected loads and generators, Renewable Energy Zones (REZs) and changing distribution networks, to align with changing demand. As coal retires and renewables and storage scale up (in locations away from load centres, see figure 5.2), Transgrid will need to provide the transmission capacity and system security to maintain stability across the state during all times of the year. This will require strengthening the backbone, implementing new forms of system strength and inertia, managing new power flows and ensuring the entire system can operate securely as NSW shifts to a renewable dominated grid.



60 AEMO 2026 General Power System Risk Review Report, July 2026

5.1.2 Growing and evolving demand presents new system security challenges

Electricity demand is growing, becoming more location specific and changing in character due to electrification, industrial decarbonisation, population growth, data centres, large loads, consumer energy resources (CER) and flexible demand. These shifts are occurring at different speeds across NSW, which means the overall demand profile is becoming harder to generalise. The 2026 ISP’s Step Change scenario forecasts total electricity consumption could almost double by 2050 — a scale of change that means the system can’t rely on historic patterns. Meeting both emerging maximum demand conditions and increasingly challenging minimum demand periods will require more deliberate planning and earlier decisions to keep ahead of where demand is forming.

The complexity is also showing up in how demand interacts with system security. Large industrial loads and data centres are creating demand that doesn’t behave like traditional load. At the same time, CER and flexible demand is shifting and flattening parts of the demand curve, but not in a way that always aligns with system needs. This change on the demand side compounds with changes on the supply side, making network planning more complicated. To maintain power system stability, we must ensure that the type and location of future generation mix can meet the needs of this emerging demand.

The continued growth of rooftop solar, now installed on around one in three Australian homes, is also reshaping the daily demand profile. As household generation pushes daytime demand lower, the timing of maximum grid demand is shifting later into the evening. These emerging evening peaks occur when little large-scale solar is available, increasing reliance on other firming technologies. This pattern has already been observed during both summer and winter maximum-demand periods (see Section 4.2).

NSW has seen significant growth in the uptake of batteries under the Cheaper Home Batteries scheme, with installations increasing by more than four times since Q3 2025. This increase in home batteries will help flatten peak demand in the evenings, charging from excess solar generation during the middle of the day and discharging when solar isn’t available.

Both transmission and distribution networks are managing increasingly complex demand patterns driven by new forms of customer connections, local reliability needs and growing CER uptake. Visibility of where new loads are appearing is critical to effective system planning. Aligning Distributor forecasts with state-wide modelling helps identify where transmission investment is needed and where planning assumptions need to be tightened. This coordination supports a more integrated network and helps ensure the electricity system can reliably meet future demand as the deep transition continues.

5.1.3 System adequacy

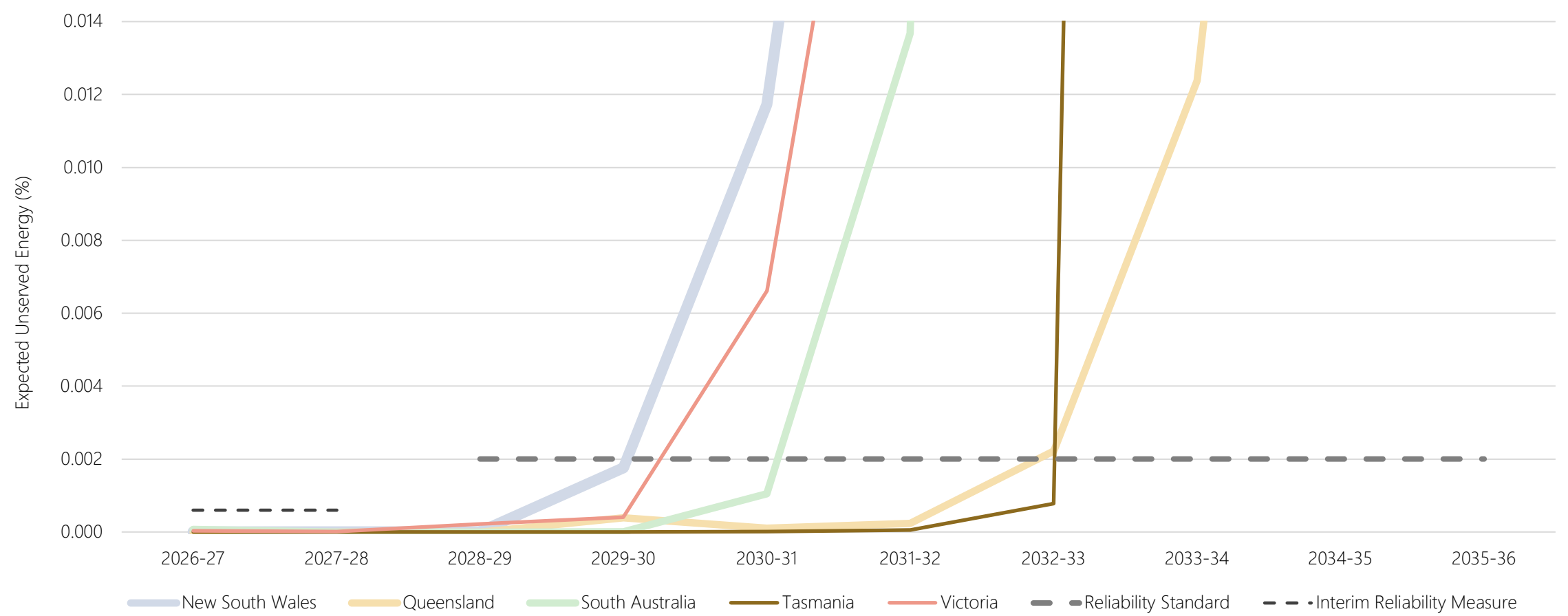
The power system is built and operated with a level of generation reserve to maintain system reliability. AEMO informs the market of Lack of Reserve (LOR) conditions to encourage market participants to provide additional capacity. The LOR in NSW is defined as:

- LOR1: The total reserve in NSW is lower than the two largest supply resources
- LOR2: The total reserve in NSW is lower than the single largest supply resource
- LOR3: The total available electricity supply is equal to or less than the operational demand, which is likely to result in unserved energy or unmet energy demand if no action is taken after the event is declared.

As coal generators retire, projected shortfalls in electricity supply must be mitigated by new scheduled generation connections, energy storage and network augmentation projects to increase network capacity (see Chapter 2).

Each year, AEMO forecasts reliability gaps in NSW via the Electricity Statement of Opportunities (ESOO), where shortfalls in available energy supply to meet demand are projected to exceed the standards set by the AEMC Reliability Panel under the “Committed and Anticipated Developments” assessment. AEMO’s 2026 ESOO projects⁶¹ this to occur from FY31 against the reliability standard (see Figure 5.3). In other words, if further investment beyond current committed and anticipated projects is delayed or does not materialise, reliability will become an increasingly serious issue in NSW.

Figure 5.3: 2026 ESOO "Committed and Anticipated Developments" for all regions, from FY27 to FY36, in expected unserved energy (%)



61 AEMO 2026 Electricity Statement of Opportunities, August 2026

Transgrid undertakes an annual assessment of system adequacy based on in-service, committed and anticipated generators and future network augmentations, including those under committed, anticipated and actionable status from the latest ISP at the time when the study was performed. Unlike AEMO’s ESOO, which is based on market simulations and quantifies potential issues as “expected unserved energy”, Transgrid’s studies consider potential snapshot scenarios, representing periods when high system demand coincides with relatively low renewable availability. Specifically, our system adequacy assessment assumes that, at peak demand times:

- The retirement dates for large-scale coal-fired units are as per AEMO’s NEM generator information.
- Solar farms, wind farms and batteries will be generating at 5 per cent, 20 per cent and 100 per cent of their rated active power, respectively.
- Each synchronous generator will have 100 per cent capacity available if it is not retired in the study year, excluding the scenarios when one coal-fired unit is offline to reflect scenarios when there are planned or unplanned outages.

- The system demand is assumed to be 10 per cent Probability of Exceedance, the maximum summer demand forecast.
- In addition to the NSW demand forecast, data centres that are in committed status or under construction are modelled as constant loads with unity power factor at their points of connection.

The assessment also considers the preferred Sydney Ring South option identified in the 2026 ISP. Under this option, Stage 1 comprises works to enable power flow control by installing series reactors and shunt capacitors, while Stage 2 involves broader network augmentations, including constructing and/or upgrading 500 kV and 330 kV transmission lines. These augmentations are expected to increase transfer capacity to supply the Sydney load centre, as outlined in the RIT-T PADR.

The assessment also considers a generator’s location, since one megawatt of system reserve at a specific location may not be equivalent to the same amount of reserve at another. As a result, noting that the Sydney-Newcastle-Wollongong region is the NSW load centre,

our assessment defines the reserve in NSW as the total headroom of available dispatchable generation from BESS, coal and gas generators within or close to the Sydney-Newcastle-Wollongong region.

The assessment results are presented in Figure 5.4 and should be considered indicative only. The deliverable reserves may differ due to network constraints and the way generators are dispatched by the National Electricity Market Dispatch Engine when operating the whole system. For example, if the reserve far away from the Sydney-Newcastle-Wollongong region can be delivered when a generator trips, the true reserve is expected to be higher than the calculated values. Similarly, if the reserve in or near the Sydney-Newcastle-Wollongong region cannot be fully delivered when a generator trips, the true reserve is expected to be lower than the provided numbers.

As the study only considers in-service, in-commissioning, committed and anticipated generators defined by Transgrid or from AEMO’s NEM generator information page, reserve levels are expected to be higher as more generators, either connected to the Transgrid backbone network or via REZs, become committed.

As shown in Figure 5.4, expected reserves remain sufficient throughout the assessment period under both normal operating conditions, when all generating units are in service, and contingency conditions, when the largest generating unit is out of service. This outcome is primarily driven by the continued growth of utility-scale battery capacity and planned network augmentations. In particular, although four generating units at Vales Point and Bayswater are expected to retire in FY34, system adequacy is projected to remain satisfactory

due to the increased transfer capacity into the Sydney region delivered by the Sydney Ring South project. Nevertheless, if planned or unplanned outages of the remaining large generating units or critical transmission lines coincide with stronger-than-expected demand growth from new data centre connections, available reserves may be reduced, increasing the risk of system adequacy shortfalls.

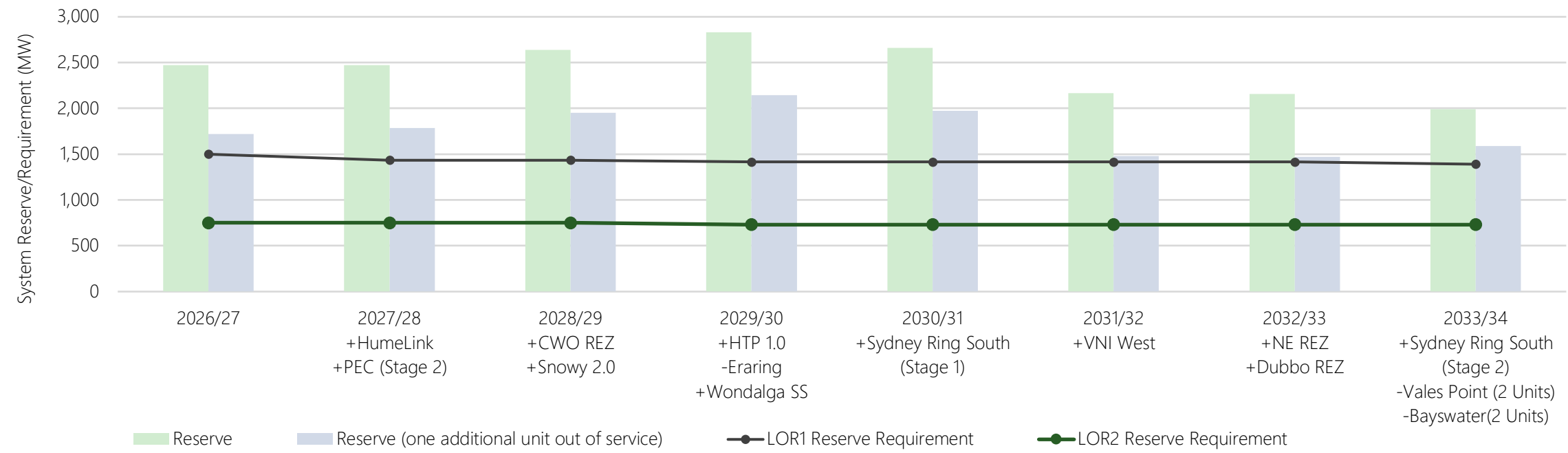
Challenges with high demand from data centres

The previous assessment only included data centres that were considered highly likely to proceed. However, the increasing demand from data centres will reduce system adequacy, unless sufficient generation sources and network transfer capacity are made available.

The precise magnitude and pace of future data centre load growth remain uncertain, which may create additional challenges for planning and coordinating the timely provision of generation and network capacity.

Interest in large, transmission-connected loads concentrated in the Greater Sydney region has expanded rapidly and is forecasted to exceed the capacity that can be supported under existing and committed network conditions. Addressing these challenges will require amendments to regulatory and planning frameworks to identify efficient, coordinated solutions that balance timely access to the grid with ensuring existing electricity consumers are no worse off.

Figure 5.4: Transgrid System Adequacy Assessment results from FY27 to FY34



The technical requirements of data centre developments will influence the type and timing of network support and augmentation needed to maintain system security. Large, concentrated loads of the scale now being proposed mean that even traditionally strong parts of the network will require additional voltage support to maintain secure operation under normal conditions.

Addressing this level of demand will depend heavily on the timely delivery of major transmission augmentations, such as the Hunter Transmission Project and Sydney Ring South. Studies indicate that future system adequacy is closely linked to the network’s ability to transfer power from northern and southern NSW, particularly as reliance on geographically remote generation increases.⁶² Without sufficient augmentation of key transmission paths and supporting infrastructure, the network will not be able to accommodate additional large loads, particularly given the underlying demand growth in Greater Sydney.

At the same time, demand can be better balanced across the broader network by facilitating connections outside of the Greater Sydney area. Locating large loads closer to emerging generation could reduce pressure on constrained transmission interfaces. This approach, alongside increased coordination of large-load connections and alignment with infrastructure planning, will help the network cope with data centre demand while maintaining reliability and cost efficiency.

5.1.4 Voltage control

Over the next decade, NSW will experience increasing voltage control issues reflecting the changing nature of demand, which is becoming more concentrated and variable. We are seeing a growing distinction between

firm and flexible load, increasing the likelihood of both low and high voltage risks.

Growing demand from electrification, industrial development, population growth and large new loads such as data centres is contributing to low-voltage risks during peak periods. At the same time, increasing rooftop solar exports are contributing to high-voltage conditions during low demand periods, especially in regional areas. Transgrid is looking into up to 10 projects to remediate these issues, as discussed in Chapter 2. The rising influence of CER and flexible demand is making power flows across the network more dynamic and less predictable. Periods of high renewable generation combined with low underlying demand are expected to become more common, changing system operating conditions. We are addressing these challenges with targeted network augmentation, voltage control solutions and coordinated planning to maintain the secure and reliable operation of the power system.

5.1.5 System strength

System strength can be likened to the “heartbeat” of the power system. More technically, it’s the power system’s ability to maintain and control the voltage waveform anywhere on the grid, even after a disturbance. Without adequate system strength, our power system is at risk of instability and supply interruptions.

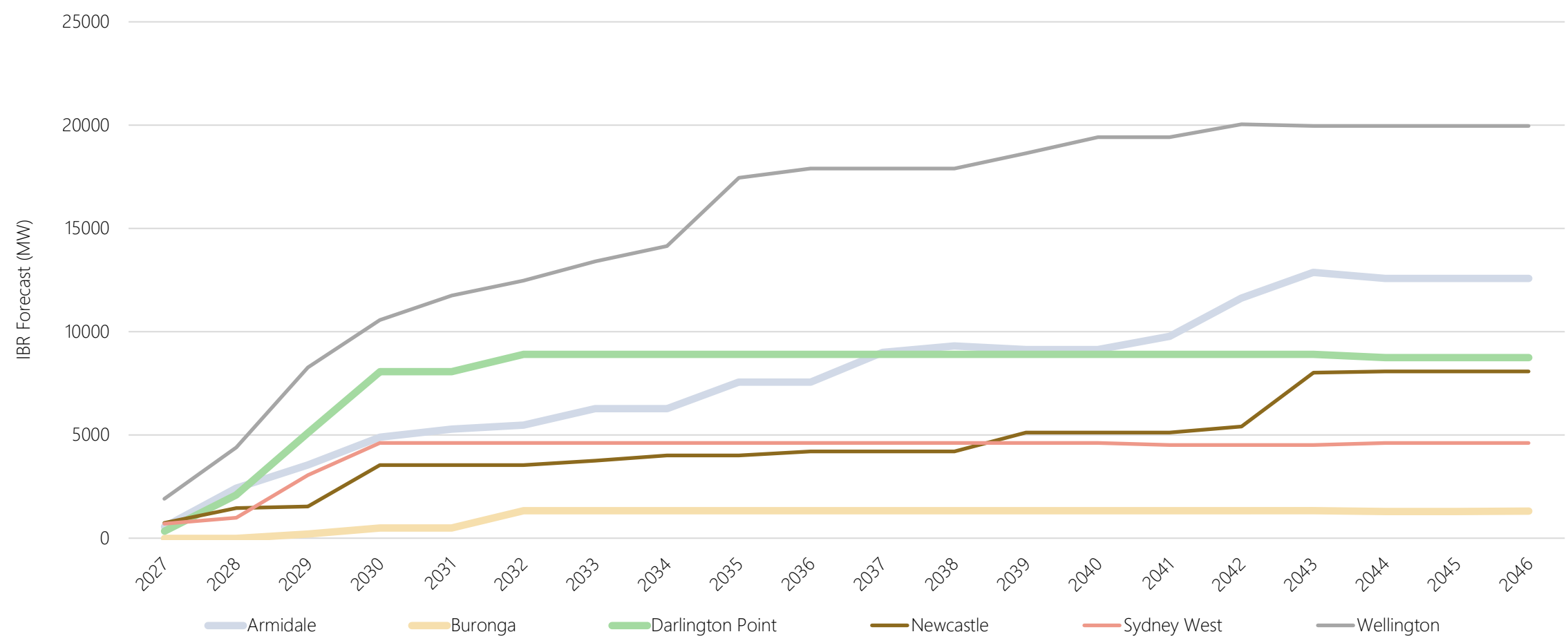
The changing landscape of system strength in NSW

System strength has traditionally been provided by synchronous machines, such as coal, gas and hydro generators. With more than 80 per cent of NSW’s

coal capacity projected to retire within the next 10 years, we will see increasing periods when we do not have enough synchronous units online to keep the NSW power system secure under typical energy market operations.

As we connect more inverter-based resources (IBR) to the grid, new system strength services must be available to support their connection and stable operation. By FY35, approximately 37 GW of new utility-scale wind plants, solar plants and utility-scale storage is projected to be connected in NSW (2026 ISP Step Change). Figure 5.5 shows this forecast IBR growth at each of the six system strength nodes in NSW.

Figure 5.5: Forecast of inverter-based resources projected to connect surrounding system strength nodes in NSW⁶³



Transgrid’s system strength obligations

Under the NER,⁶⁴ Transgrid, as the NSW System Strength Service Provider, is responsible for planning to ensure sufficient system strength is available to meet the system strength standards reported by AEMO in its annual Transition Plan for System Security.⁶⁵

Our job is to establish a portfolio of solutions to ensure minimum system strength requirements are met in full at all times. We are also required to maintain system strength above minimum level requirements to facilitate the stable connection and operation of new IBR as they are forecast to progressively come online in NSW.

62 <https://www.transgrid.com.au/about-us/network/network-connections/data-centres-and-electricity-capacity-in-nsw/>
63 AEMO 2026 ISP Step Change scenario - Utility-scale solar, wind and storage outlook
64 AEMC, 2021, Efficient management of system strength on the power system, Final determination, 21 Oct 2021, <https://www.aemc.gov.au/rule-changes/efficient-management-system-strength-power-system>
65 AEMO, 2025, Transition Plan for System Security <https://www.aemo.com.au/-/media/files/major-publications/tpss/2025-transition-plan-for-system-security.pdf>

Planning to meet system strength needs in NSW

To fulfil our system strength obligations, Transgrid has completed Regulatory Test for Transmission (RIT-T)⁶⁶ identifying a preferred portfolio of system strength solutions. Since completing the RIT-T, Transgrid identified Material Changes in Circumstances (MCC) that required us to reassess the preferred portfolio option. These changes included increased capital costs and extended deployment timeframes for synchronous condensers, driven by heightened global competition and geopolitical disruptions associated with the conflict in the Middle East. In addition, delays to projected coal-fired generation retirement dates, as outlined in AEMO’s 2026 ISP, further contributed to the need for reassessment. Transgrid’s MCC reassessment determined that, while the preferred technology mix remains unchanged, the number of Transgrid synchronous condensers in the preferred portfolio reduced from 10 to eight, subject to the commercial feasibility of Phase 2 synchronous condensers being resolved.

Grid-forming BESS are not currently considered a credible option for meeting minimum system strength requirements, consistent with both AEMO’s position and independent advice from Aurecon.⁶⁷ However, if proven capable of meeting minimum system strength in the future, grid-forming BESS could provide a low-cost system strength solution by delivering multiple services from a single asset. Reflecting this potential, Transgrid has provided a pathway for grid-forming BESS to contribute to future minimum level system strength requirements in NSW. Our assessment included a potential future role for 900 MW of grid-forming BESS towards minimum level system strength requirements

from FY33 in the preferred portfolio, subject to the technology being proven credible. Transgrid continues to work with industry, AEMO and other network service providers to assess and validate the future role of grid-forming BESS in supporting system strength in NSW, including as an industry partner in the UNSW PROFILES project.⁶⁸

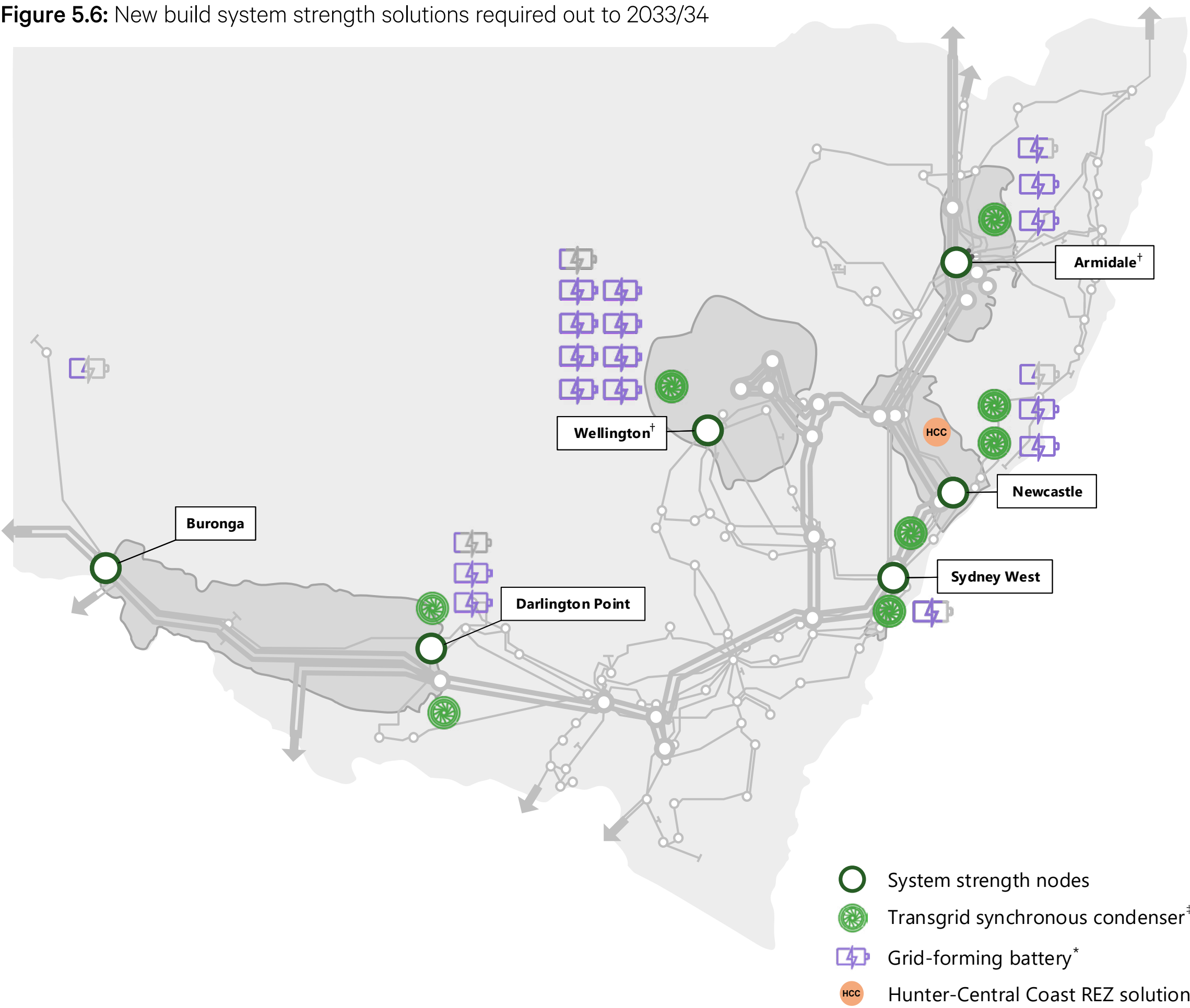
Transgrid will continue to monitor changes in the energy market to ensure the portfolio of system strength solutions remains robust.

Optimal portfolio of system strength solutions

Our modelling identified a diverse portfolio of existing and new build system strength solutions to meet system strength requirements into the future. The preferred portfolio option blends network and non-network solutions, including:

- 8 network (Transgrid) synchronous condensers, providing approximately 930 MVA fault current each (or a configuration of smaller synchronous condensers)⁶⁹
- 4 smaller synchronous condensers (each providing 275 MVA fault current) or 200 MW of grid forming BESS in Hunter-Central Coast REZ
- 650 MW of synchronous generation units to be modified to enable operation in synchronous condenser mode
- 5 GW of new build grid-forming BESS towards efficient level requirements by FY33⁷⁰
- 900 MW of new build grid-forming BESS towards minimum level requirement by FY33,⁷¹ if credibility can be proven prior.
- Redispatch⁷² of synchronous generation, as required beyond their typical energy market operation.

Figure 5.6: New build system strength solutions required out to 2033/34



*Each grid-forming battery icon represents the equivalent contribution to the efficient level of system strength as one synchronous condenser.
*System strength remediation for Central-West Orana and New England REZ is being coordinated by EnergyCo. Transgrid is involved with joint planning on these REZs.
*The inclusion of 'Phase 2' synchronous condensers in the preferred portfolio is conditional on their commercial feasibility being resolved.

66 Transgrid 2026, System Strength RIT-T <https://www.transgrid.com.au/projects-innovation/meeting-system-strength-requirements-in-nsw/system-strength-rit-t/>
67 Advice on maturity of grid-forming inverter solutions for system strength, Aurecon, March 2024
68 <https://arena.gov.au/projects/unsu-protection-relay-operation-for-inverter-based-low-inertia-electricity-systems-profiles-project/>
69 Subject to confirming the commercial feasibility of Phase 2 synchronous condensers
70 While the portfolio of grid-forming batteries is aggregated by nameplate capacity for ease of communication, their stable voltage
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waveform provision is heavily influenced by the design and tuning of the inverter. Detailed power system studies during the procurement of grid-forming batteries will be used to identify the optimal configuration and size to meet the need.
71 Grid-forming BESS may provide both minimum and efficient services from FY33, if proven credible, and therefore the amount of grid-forming BESS towards efficient level and minimum level requirements is not necessarily cumulative.
72 The words 're-dispatched' or 're-dispatching' represent system strength solutions (typically existing or future synchronous generators) which are 'enabled' or 'scheduled-on' by AEMO to provide system strength services.



Xavier Robens - 2nd Year
Transmission Line Apprentice

Implementation of system strength solutions

Transgrid is assessing and delivering multiple network and non-network solutions to meet our system strength requirements.

Network synchronous condensers

- **Phase 1 (5):** In September 2025, the NSW Government directed Transgrid to deliver synchronous condensers at the first five substations as a Priority Network Infrastructure Project. The accelerated procurement of these synchronous condensers will deliver significant economic benefit and mitigate system strength gaps.
- **Phase 2 (3):** Three Phase 2 synchronous condensers are included within the revised preferred portfolio, subject to the commercial feasibility of Phase 2 synchronous condensers being resolved. Transgrid will continue to monitor and assess emerging non-network solutions that have the potential to further revise the preferred portfolio of Phase 2 synchronous condensers through future MCCs.

Non-network solutions

- **Synchronous machines:** Transgrid's first system strength network support contract, which took effect on 2 December 2025, is with Snowy Hydro to operate its Tumut 3 hydro units in synchronous condenser mode. Additional contracts may be required, particularly before new synchronous condensers are delivered.

- **Grid-forming batteries for efficient level system strength services:** These will form half of the total portfolio of system strength solutions in NSW by the early 2030s. Initial procurement of up to 2 GW of grid-forming batteries is underway, with services expected to start this year. Annual procurement rounds will ultimately bring on up to 5 GW of grid-forming batteries by the early 2030s.
- **Grid-forming batteries for minimum level system strength services:** Transgrid is engaging with industry, AEMO and other network service providers to determine the credibility of grid-forming BESS to provide protection-quality fault current. Proponents of grid-forming BESS in the Sydney West region interested in supporting the credibility assessment should contact Transgrid at systemstrength@transgrid.com.au. A system strength Expressions of Interest form can be found [here](#).⁷³

EnergyCo is now leading the design of system strength solutions for the New England REZ. Transgrid is supporting this work through joint planning, including detailed dynamic power system studies, to help confirm efficient level requirements and identify preferred system strength solutions.

Mitigating modelled risks of system strength gaps

Modelling within the system strength Project Assessment Conclusions Report (PACR, July 2025)⁷⁴ identified potential system strength gaps in FY28 and FY29, after Eraring Power Station was expected to close and before Phase 1 synchronous condensers were delivered. This risk has been removed following the

extension of the Eraring retirement date to April 2029, after the expected delivery of synchronous condensers in February 2029.

More recent modelling, published in August 2026, identified the risk of system strength gaps between FY31 to FY33 under the final 2026 ISP Step Change scenario for coal retirement, if Phase 2 synchronous condenser delivery occurs in FY34.⁷⁵ These risks dissipate when assessed against coal retirement dates stated by their proponents. However, without Phase 2 synchronous condensers, large gaps occur from FY34 onwards under both coal retirement scenarios. Transgrid is continuing to engage with industry and suppliers to close these gaps.

5.1.6 System strength information provision

Under clause 5.20C.3⁷⁶ of the NER, Transgrid must publish information in this report relating to activities, methodologies, assumptions, results and forecasts associated with providing system strength at system strength nodes in NSW. This section constitutes Transgrid's response and should be read in conjunction with Transgrid's system strength Project Assessment Conclusions Report⁷⁷ and system strength Material Change in Circumstance Report.⁷⁸

Activities undertaken or planned to satisfy system strength obligations⁷⁹

The activities described in Table 5.2 have been undertaken to satisfy system strength obligations under clause S5.1.14. See Section A3.20 for the modelling methodologies, assumptions and results used in planning the activities referred to in the table.

⁷³ <https://www.transgrid.com.au/projects-innovation/meeting-system-strength-requirements-in-nsw/>

⁷⁴ Transgrid, Meeting system strength requirements in NSW - PACR, July 2025

⁷⁵ Subject to resolving the commercial feasibility of Phase 2 synchronous condensers

⁷⁶ [NER Clause 5.20C.3](#)

⁷⁷ Transgrid, Meeting system strength requirements in NSW - PACR, July 2025

⁷⁸ Transgrid, Meeting system strength requirements in NSW - Material Change in Circumstances Report, August 2026

⁷⁹ [NER Clause S5.1.14](#)

Table 5.2: Summary of key activities undertaken or planned to satisfy system strength obligations

Milestone	Date	Activity undertaken
Project Specification Consultation Report (PSCR)	December 2022	Published a PSCR for the ‘meeting system strength requirements in NSW’ RIT-T, which includes a system strength shortfall at Newcastle and Sydney West fault level nodes from July 2025 and obligations to provide the minimum and efficient level of system strength in full at all nodes in NSW from 2 December 2025. Transgrid engaged stakeholders through a 12-week consultation period where five submissions were received.
Expression of Interest (EOI) for non-network solutions	December 2022	Engaged with non-network system strength proponents to accurately reflect their solutions in the PADR modelling process. Transgrid received EOI submissions from 25 parties, covering more than 60 individual solutions, including more than 10 GW of existing or conversions of existing synchronous generators, a pipeline of more than 10 GW of innovative grid-forming batteries, and more than 5 GW of other new generation and energy storage projects, including pumped hydro and gas.
System Strength Unit Prices 2024/25	May 2024	Published System Strength Unit Prices FY25 on our website ⁸⁰ and added an explainer on the System Strength Charge for new connecting parties on our website ⁸¹
Project Assessment Draft Report (PADR)	June 2024	Published a PADR for the ‘meeting system strength requirements in NSW’ RIT-T, which conducted a techno-economic assessment to identify a preferred portfolio of system strength solutions to meet the minimum and efficient level at all nodes in NSW from 2 December 2025. Transgrid engaged stakeholders through a 12-week consultation period where two submissions were received. Additional documents were published via Transgrid’s website providing information on modelling, technical performance of synchronous machines and grid-forming BESS and non-network proponent guidance.
Non-network solution EOI re-engagement and re-opening for new solutions	June 2024	Engaged with new and existing and non-network system strength proponents to accurately reflect their solutions in the PACR modelling process. Submissions for non-network solutions were received from 30 parties, covering more than 60 individual potential solutions.
Industry engagement of technical requirements for non-network solutions	June 2024	Held two public industry briefings to provide guidance for proponents of non-network solutions.
Non-network solution commercial EOI	August 2024	All proponents of EOI non-network solutions were requested to return a commercial component to the EOI containing indicative pricing information.
Supplementary Report to the PADR	October 2024	Published a supplementary report to the PADR to incorporate developments since completion of the PADR and provide opportunity for stakeholder consultation ahead of the PACR being prepared. Submissions were requested over a four-week consultation period and one submission was received.
Project Assessment Conclusions Report (PACR)	July 2025	Published the final stage of the ‘meeting system strength requirements in NSW’ RIT-T, which conducted a techno-economic assessment to identify a preferred portfolio of system strength solutions to meet the minimum and efficient level at all nodes in NSW from 2 December 2025. The system strength shortfall from July 2025 previously declared by AEMO has been deferred until FY28.
NSW Government direction to deliver synchronous condensers	September 2025	The NSW Government directed Transgrid to deliver synchronous condensers at the first five substations across NSW as a Priority Network Infrastructure Project.
Environmental approvals for synchronous condenser sites	Late 2025	Completed environmental approvals for each of the five synchronous condenser sites.
System strength network support contract with Snowy Hydro	Late 2025	Signed a system strength network support contract with Snowy Hydro to operate its Tumut 3 hydro units in synchronous condenser mode.
Notification to the AER of an MCC	April 2026	Notified the AER of a material change in circumstances (MCC) since the publication of the PACR.
Material Change in Circumstances Report	July 2026 (draft) and August 2026 (final)	Published a draft and then final MCC Assessment report containing an assessment of the MCC event on the preferred portfolio option. Analysis determined the need to revise the number of Transgrid synchronous condensers from 10 to 8 (subject to the commercial feasibility of Phase 2 synchronous condensers being resolved) and include 900 MW of grid-forming batteries in the preferred portfolio for the minimum-level need, pending confirmation of technical feasibility. Within the MCC Assessment, for the preferred portfolio option under the final 2026 ISP Step Change coal retirement scenario with assumed Phase 2 synchronous condensers delivery timing (FY34), the total present value cost of the three Phase 2 synchronous condensers is expected at \$272 million (\$FY25). The total estimated underlying economic cost of non-network options is \$897 million (present value, \$FY25); note this does not reflect expected contract costs.

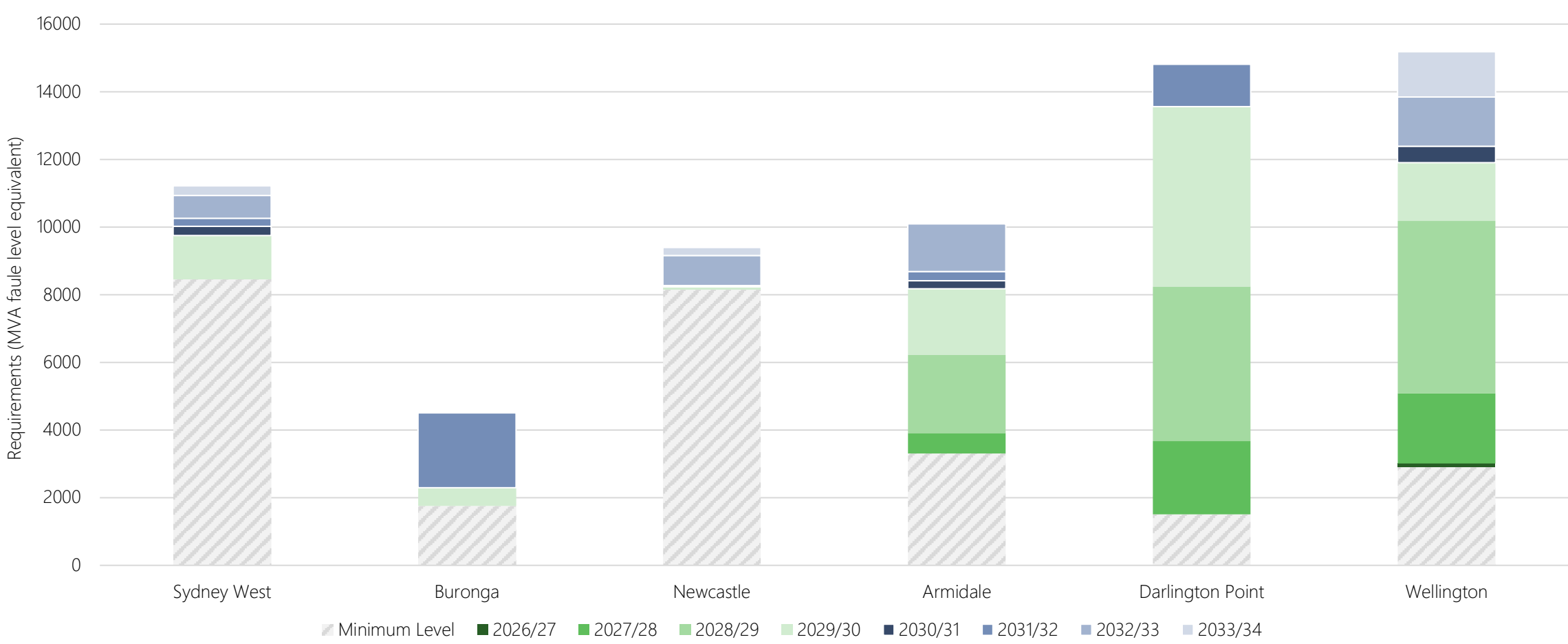
80 Transgrid, System Strength Unit prices – 2024/25
81 Transgrid, System strength for network connections

Forecast of Available Fault Level at each system strength node

Under the system strength framework, Transgrid must make sufficient system strength services available to AEMO to achieve stable voltage waveforms for the IBRs and schedule 5.3a plant facilities projected in steady state conditions and following any credible contingency or protected event.⁸²

Figure 5.7 and Table 5.3 document minimum and ‘efficient’ fault level projections to FY33.

Figure 5.7: NSW’s combined minimum pre-contingency fault level requirements from 2 December 2025⁸³ and efficient fault level projections to FY34⁸⁴, as a proxy for stable voltage waveform*



*The estimated efficient fault level required to ensure a stable voltage waveform for new connecting renewables in this chart uses an available fault level measurement as a proxy. This is consistent with the methodology outlined in AEMO’s System Strength Impact Assessment Guidelines⁸⁶

As part of the system strength RIT-T, we published an assessment of the stable voltage waveform remediation required using the Available Fault Level (AFL) proxy method versus detailed PSCAD™ studies⁸⁵. We concluded that the AFL method is a useful long-term planning proxy for stable voltage waveform requirements, with PSCAD™ studies providing more accurate results. For the system strength RIT-T and ongoing assessment of stable voltage waveform requirements, Transgrid uses a combination of Root Mean Square analysis (using AFL calculation in PSS®E) and electromagnetic transient analysis (PSCAD™). This enables us to accurately model the benefits of grid-forming BESS, whose contribution to stable voltage waveform is not adequately represented in Available Fault Level calculations.

Table 5.3: NSW’s minimum pre-contingency fault level requirements from 2 December 2025⁸³ and efficient fault level projections to FY34, as a proxy for stable voltage waveform (MVA fault level)

Node	Minimum Level	Efficient fault level projection, as a proxy for stable voltage waveform (MVA)							
		2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Sydney West	8450	0	0	0	1301	1575	1814	2484	2775
Buronga	1755	0	0	0	540	459	2748	2751	2751
Newcastle	8150	0	0	0	81	94	122	1008	1249
Armidale	3300	0	614	2919	4881	5108	5383	6790	6712
Darlington Point	1500	0	2167	6736	12066	12065	13316	13320	13320
Wellington	2900	114	2180	7285	9011	9489	9201	10947	12285

82 Clause S5.1.14 of the National Electricity Rules

83 AEMO 2025 Transition Plan for System Security, December 2025

84 AEMO 2026 ISP IASR projects and Step Change Generation outlook

85 Aghanoori et. al., 2025, Comparison Between Synchronous Condensers and Grid-Forming BESS in Providing System Strength Support to IBRs in Weak and Strong Power Systems Using EMT Simulation, CIGRE, accessible here.

86 AEMO, System Strength Impact Assessment Guidelines, <https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/participate-in-the-market/network-connections/system-strength-impact-assessment-guidelines>



Possible future system strength nodes in NSW

Transgrid will continue to monitor AEMO’s Transition Plan for System Security to ensure requirements are met at all system strength nodes, including any new nodes introduced in the future.

System strength locational factors for Transgrid’s bulk supply points

We have calculated system strength locational factors (SSLF) for each of Transgrid’s main supply points based on the latest version of the system strength impact assessment guideline.⁸⁷ SSLF is one of the variables that must be used along with System Strength Unit Price to calculate the system strength charge.⁸⁸

System strength and protection system correlation

Power electronics devices will constitute an indispensable part of the transitioned power system. However, these devices will give the current power system different fault characteristics, like limited short-circuits and distorted phase angles. Also, as system strength declines, the three-phase fault level is decreasing in NSW. This imposes operational challenges and creates a risk of protection malfunction. Accordingly, we are investigating the performance of protection settings across the NSW network.

5.1.7 Inertia

Under the AEMC’s security framework rule change,⁸⁹ TNSPs can now co-optimize inertia and system strength requirements. From 2 December 2027, TNSPs must ensure inertia services are available continuously within three years of the requirements being published. AEMO’s 2025 Transition Plan for System Security confirmed an inertia sub-network allocation of 9,600 MW for NSW.

The AER Efficient management of system strength framework guidance note⁹⁰ recognises that adding a flywheel to a synchronous condenser is prudent and efficient expenditure, given the marginal cost of addressing inertia is typically relatively low. Transgrid’s synchronous condensers will be equipped with flywheels, providing the dual benefit of supporting inertia in NSW.

Under clause 5.20B.4⁹¹ of the NER, Transgrid must publish information in this Report relating to activities, methodologies, assumptions, results and forecasts associated with providing inertia at system strength nodes in NSW.

Transgrid’s assessment of projected inertia levels in NSW concluded that synchronous condensers being deployed for system strength purposes will also be sufficient to meet future inertia requirements. Transgrid anticipates that its Phase 1 synchronous condensers will be deployed by February 2029, at a total cost of \$1.19 billion (September 2026 cost basis).⁹² Transgrid will re-assess in the contracting timeframe whether non-

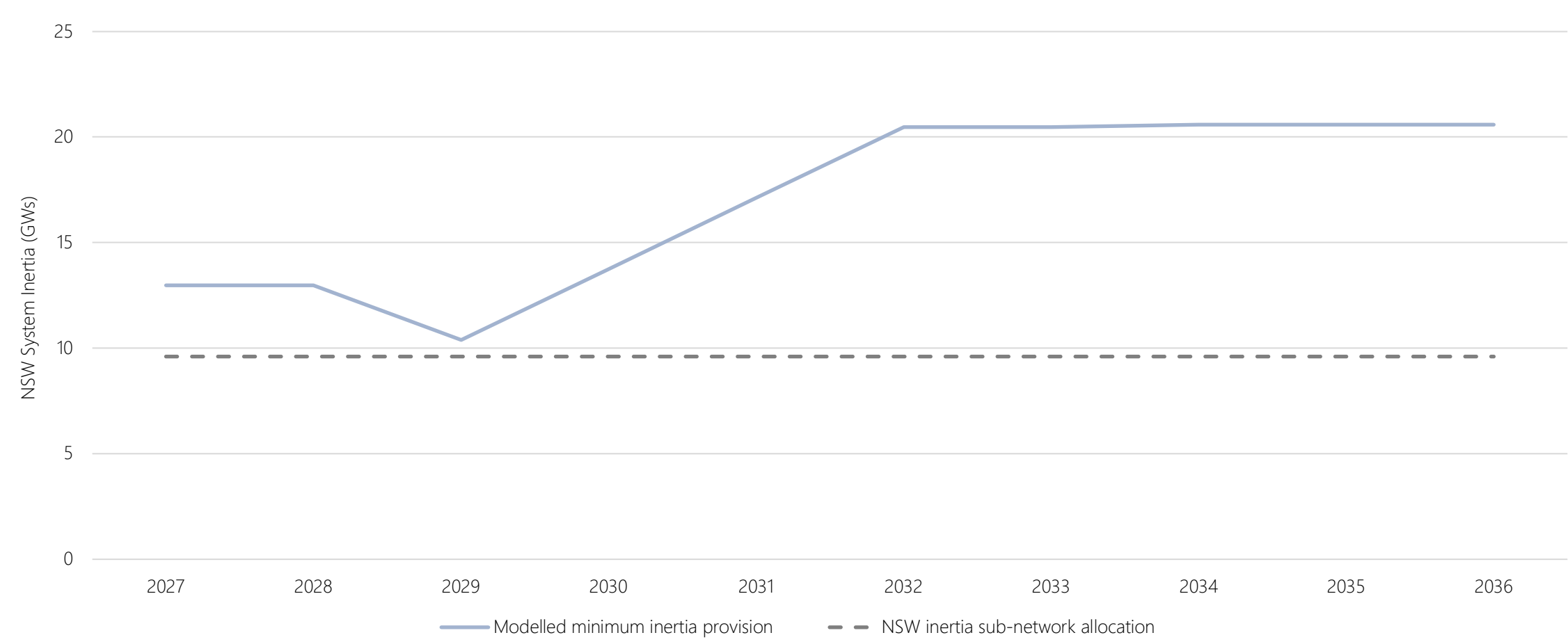
network contracts are required to support inertia prior to the delivery of the Phase 1 synchronous condensers. At this stage, non-network solutions are not expected to be required to meet this need.

Transgrid’s projection of the minimum level of inertia in NSW is presented in Figure 5.8, following the deployment of solutions identified in the system strength RIT-T and MCC Assessment.

5.1.8 Frequency control

Frequency control is provided across the NEM through inertia, Fast Frequency Response (FFR) and Frequency Control Ancillary Services. FFR has the potential to act quickly during disturbances and is a partial substitute for synchronous inertia. Based on Transgrid’s inertia modelling, which includes network synchronous condensers deployed to meet system strength requirements, the NEM will have sufficient frequency control capability over the next 10 years.

Figure 5.8: Projected NSW Minimum Inertia Levels



87 AEMO, System Strength Impact Assessment Guidelines
88 <https://www.transgrid.com.au/about-us/network/system-strength-for-network-connections/>
89 Available at: <https://www.aemc.gov.au/rule-changes/improving-security-frameworks-energy-transition>

90 AER, Efficient Management of System Strength Framework – Guidance note, December 2024, pg 15
91 NER Clause 5.20B.4
92 [Transgrid System Strength Project \(hybrid\)](#), Transgrid, April 2026

5.1.9 Remedial action schemes for system security

Transgrid's Emergency Control Schemes do not currently meet the definition under NER clause S5.1.8 Stability. Our studies show a risk of widespread over-voltage conditions on the main transmission network after a rare automatic under-frequency load-shedding event. To address this, a project is progressing to install an overvoltage control scheme following such an event. Risk will also be partially reduced as individual schemes are commissioned.

Transgrid already has automatic under-frequency load-shedding schemes at substations in: Armidale, Coffs Harbour, Gunnedah, Inverell, Kempsey, Koolkhan, Moree, Muswellbrook, Narrabri, Port Macquarie, Tamworth, Taree, Panorama, Griffith, Tumut, Wagga Wagga and Yanco.

There are no known issues or conflicts between these schemes with either protection or control systems.



Joseph Arrowsmith - Site Manager
Rod Pomfrett - Site Manager

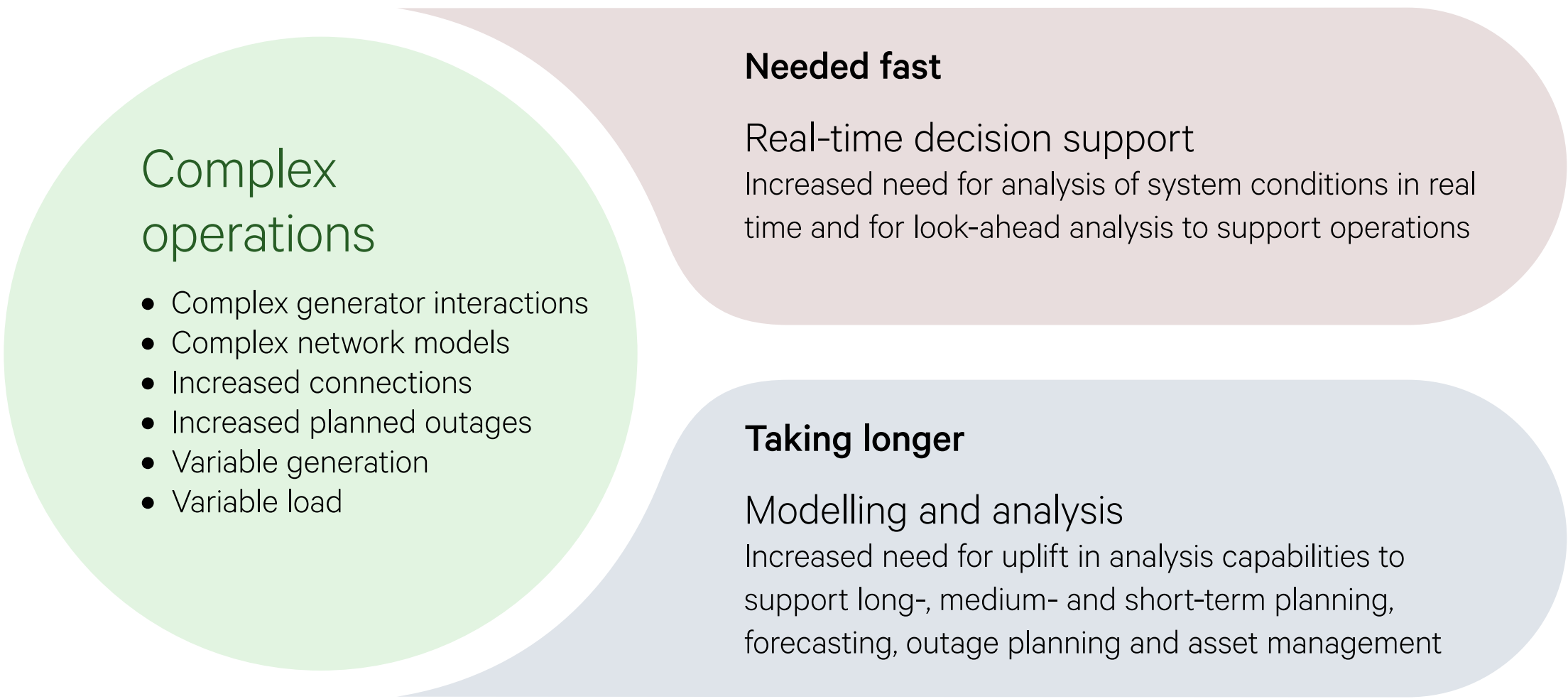
5.2 Modern tools and skills for an evolving power system

The deep transition is rapidly changing the power system, requiring operators to make faster decisions in more dynamic conditions. To maintain the secure and reliable operation of the network, Transgrid is investing in modern control room capabilities and digital tools to support the management of the future grid. To optimise this investment, Transgrid is planning a three-phase approach for uplifting operational tools and capabilities:

- **Phase 1 (completed 2024–2025):** addressing immediate risks to deliver short-term results that lay the foundation for future phases. This included rationalised and improved alarm handling for the control room.

- **Phase 2 (2026–2031):** addressing the operational needs to manage the power system requirements outlined in AEMO’s ISP Step Change scenario. The scope and funding required for enhanced operational systems and data management was submitted on 1 May 2026 as a contingent project application to the AER.
- **Phase 3 (beyond 2031):** setting capability uplift based on long-term energy transition projections to mature and build on the value generated from Phases 1 and 2. The need and scope will be considered in alignment with AEMO, the pace of the energy transition and potential industry wide developments through a Transmission System Operator capability framework. Where capability uplift is required, this will be presented in Transgrid’s 2028-2033 regulatory submission.

Figure 5.9: The growing complexity of the electricity system is driving capability gaps



5.2.1 Phase 1 – Operability 2024 to 2025

Completed alarm rationalisation, refer to 2025 Transmission Annual Planning Report Section 5.2.1 pg122.

5.2.2 Phase 2 – Operability 2026 to 2031

Phase 2 focuses on ensuring our operational capabilities keep pace with the increasing scale and complexity of the power system. The essential requirement is to upgrade and integrate the core systems used to monitor, plan and operate the transmission network. This includes the systems that support real-time network operations, asset monitoring and outage management.

Many of these systems currently operate as separate applications. Greater integration between operational, asset and planning information would provide operators with a more complete view of network conditions, improve situational awareness and support more efficient assessment of planned and real-time operating scenarios. It would also enable more sophisticated modelling of network behaviour and contingency events, helping ensure the network remains secure under a broader range of operating conditions.

Phase 2 will transition the control room from reacting to network events to proactively managing system risk through advanced analytics, forecasting and early identification of emerging constraints. This will enable pre-emptive intervention to maintain system security and minimise customer impacts.

We have worked closely with AEMO to determine the most appropriate and future-proof suite of operational systems and skills required to satisfy the Phase 2 goals.⁹³ Our proposed uplift aligns with AEMO’s Operations Technology Roadmap⁹⁴ and Engineering Roadmap.⁹⁵ We also engaged with Transgrid’s Consumer Advisory Group to ensure consumers are top of mind as we plan for a modern control room.⁹⁶

In May 2026, Transgrid lodged a Contingent Project Application seeking regulatory approval for the critical investment needed to operate the future network safely and reliably. This investment will set the long-term foundational SCADA and Advanced Energy Management System environments and introduce common information data models.

93 [AEMO letter of support](#)

94 AEMO, Operations Technology Roadmap

95 AEMO, Engineering Roadmap to 100% Renewables

96 [Consumer Outcome Document](#)



5.2.3 Phase 3 – Operability beyond 2031

In this phase, Transgrid expects a further capability uplift will be required to support a secure, efficient and increasingly dynamic power system (See Figure 5.10). These capabilities will build on Phase 2 investments to enable predictive, system optimising control room functions, underpinned by increasing levels of capability maturity. Development and implementation will be progressed in a staged and consultative manner, informed by ongoing engagement with AEMO, industry participants, and consumers

We expect Phase 3 to deliver three key control room capabilities:

1. System and market integration

We will see closer alignment between network operations and market dynamics, enabling coordinated management of dispatch outcomes, household participation and network constraints. This will support more efficient utilisation of network capacity and improved market outcomes.

2. Automation-enabled decision making

Increased use of automation, supported by integrating high-resolution operational data sources, such as Phasor Measurement Unit (PMU) unit data, to enhance situational awareness and decision speed. This will streamline routine actions, allowing operators to focus on mitigating complex system risks.

3. Interoperability and coordination

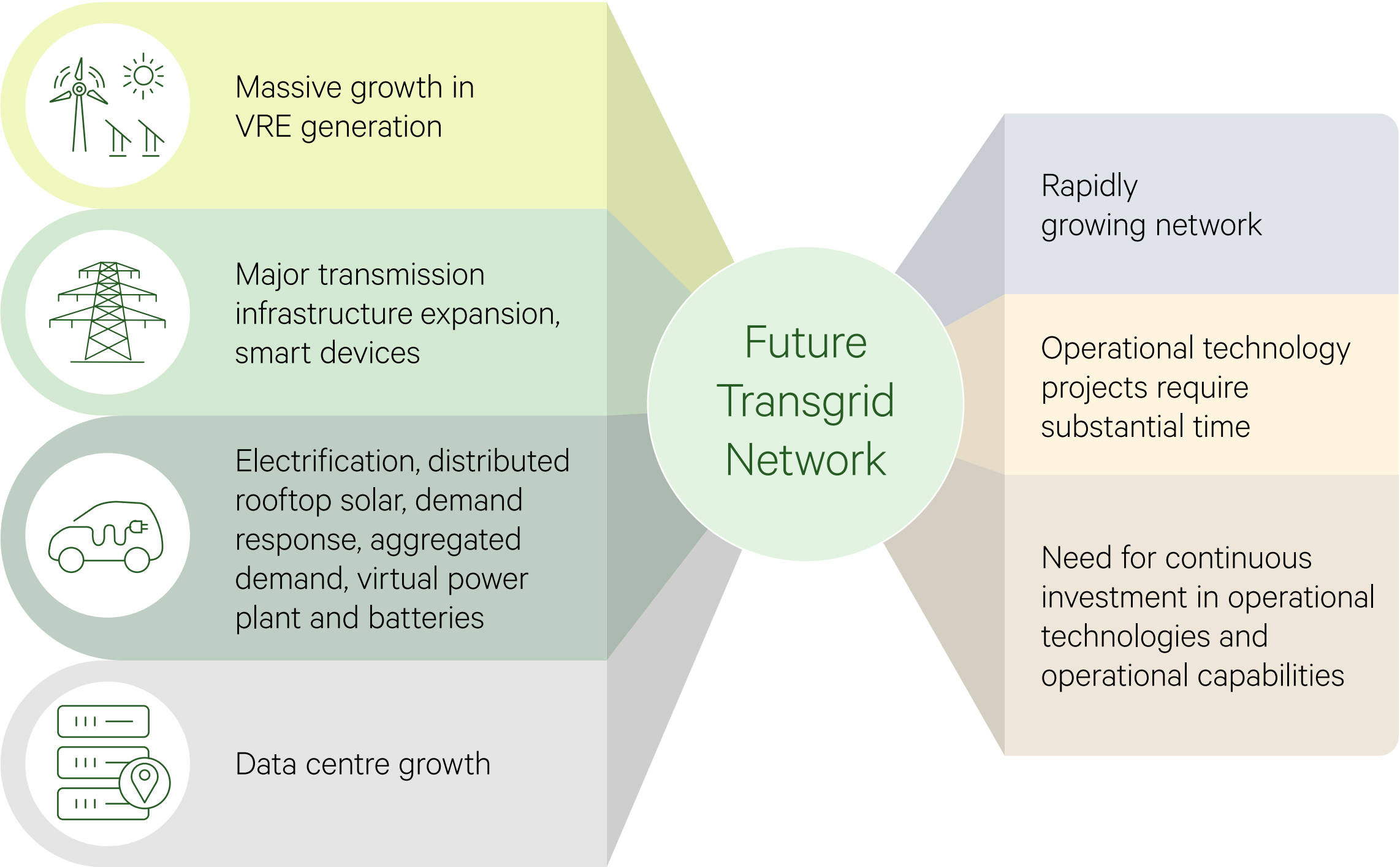
The control room will be able to coordinate across AEMO, generators, distribution networks and other stakeholders, supported by interoperable systems and improved data exchange. This will enable a cohesive, whole-of-system response to emerging conditions.

Delivering this evolution will require a coordinated uplift across:

- **People:** Workforce capability uplift to support data-driven and increasingly automated operations.
- **Process:** Standardised, streamlined operational procedures aligned to more predictive and automated workflows.
- **Data:** Improved data quality, availability and integration, including incorporation of high-fidelity sources such as PMUs.
- **Technology:** Modern platforms, tools and interfaces to support analytics, automation and interoperability.

Together, these elements will ensure that capability uplift is sustainable, scalable and embedded in day-to-day operations while continuing to meet the requirements of the Security of Critical Infrastructure Act.

Figure 5.10: Network evolution drives need for continuous investment in operational technologies



2026 NSW Region demand forecast methods, inputs and assumptions, model testing and independent review



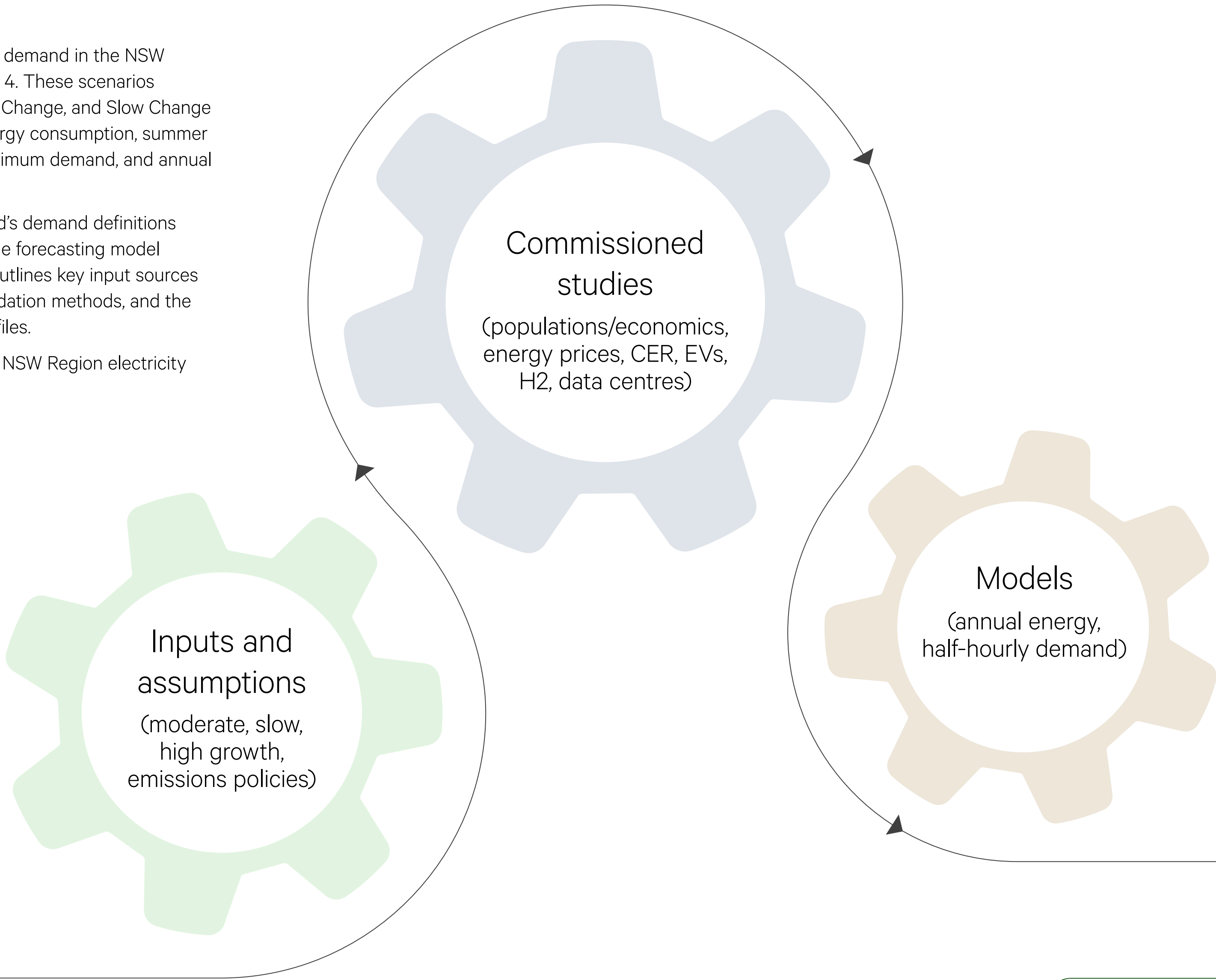
A1.1 Introduction

Transgrid developed the 2026 energy and demand forecasts by integrating inputs and assumptions derived from independently commissioned studies with in-house modelling, supported by GHD, as illustrated in Figure A1.1.

Future scenarios for electricity demand in the NSW Region are outlined in Chapter 4. These scenarios comprise Central, Accelerated Change, and Slow Change forecasts, covering annual energy consumption, summer maximum demand, winter maximum demand, and annual minimum demand.

This appendix details Transgrid’s demand definitions and provides an overview of the forecasting model development process. It also outlines key input sources and assumptions, forecast validation methods, and the model-derived future load profiles.

Figure A1.1: Preparation of the NSW Region electricity demand forecasts



A1.2 Measurement of electricity demand

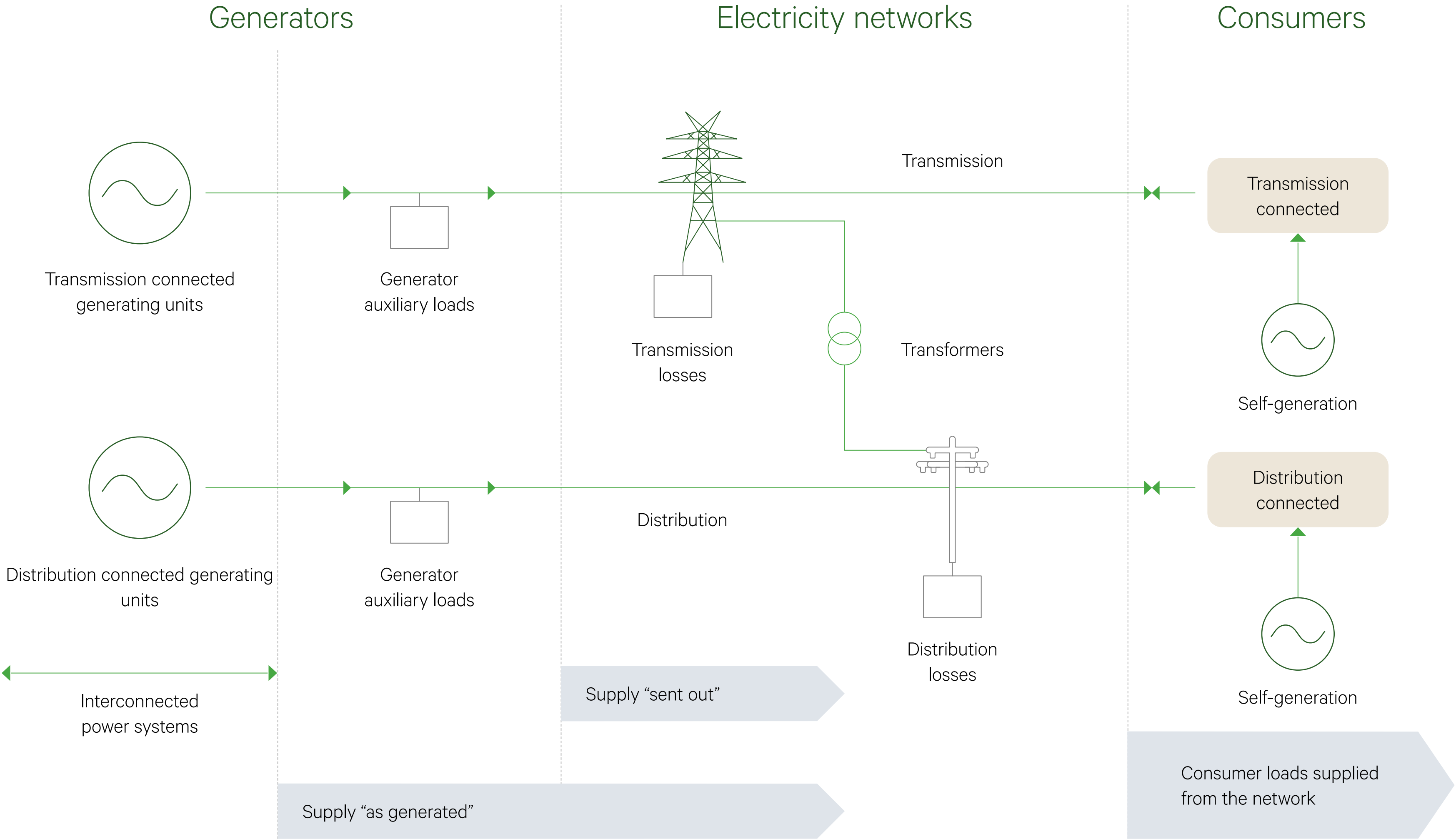
Figure A1.2 shows a stylised diagram of a power system representing the NSW Region of the NEM, in which separately metered larger generating units may be transmission or distribution connected, consumers may self-generate at least part of their energy consumption, and larger loads may be transmission or distribution connected. AEMO classifies each unit of generation connected to the NEM as either a scheduled, semi-scheduled or a non-scheduled generating unit. Energy flows can be measured at different points of the supply chain as described below.

“As generated” refers to energy or demand that includes generator auxiliary loads, and “sent out” refers to consumption or demand that excludes generator auxiliary loads.

“Native” (or network) energy or demand is equal to “operational” energy as defined by AEMO, with the addition of energy or demand supplied by non-scheduled generating units of less than 30 MW capacity, measured in GWh over a financial year. The operational measure includes generation by scheduled, semi-scheduled and non-scheduled generating units greater than or equal to 30 MW. Transgrid measures and forecasts native energy on a “sent out” basis, and native demand on an “as generated” basis.

“Underlying” energy or demand refers to consumers’ collective need for power to run their appliances. Transgrid estimates underlying demand by removing the effects of consumer energy resources (i.e., behind-the-meter solar generation and battery discharging are added to network demand, and electric vehicle and behind-the-meter battery charging are subtracted from network demand).

Figure A1.2: Preparation of the NSW Region electricity demand forecasts



A1.3 Forecasting model development, input sources and assumptions

A1.3.1 Overview of the modelling approach

Demand forecasts are critical for planning a reliable and efficient electricity network that delivers long-term value to consumers. However, increasing adoption of CER such as rooftop solar, batteries, and electric vehicles is making demand more variable and uncertain.

Transgrid focuses on how CER affects underlying demand, the total electricity used for lighting and power, whether sourced from the grid or generated on-site. This demand is influenced by factors like population growth, income, energy prices, weather, and time of use.

The forecasting approach assesses the likelihood of extreme demand levels, including both maximum and minimum demand, using probability of exceedance (POE) metrics (10 per cent, 50 per cent, and 90 per cent).

Transgrid's models, developed with GHD and reviewed by Frontier Economics, are based on sound economic drivers and standard industry practices, with previously identified issues now addressed.

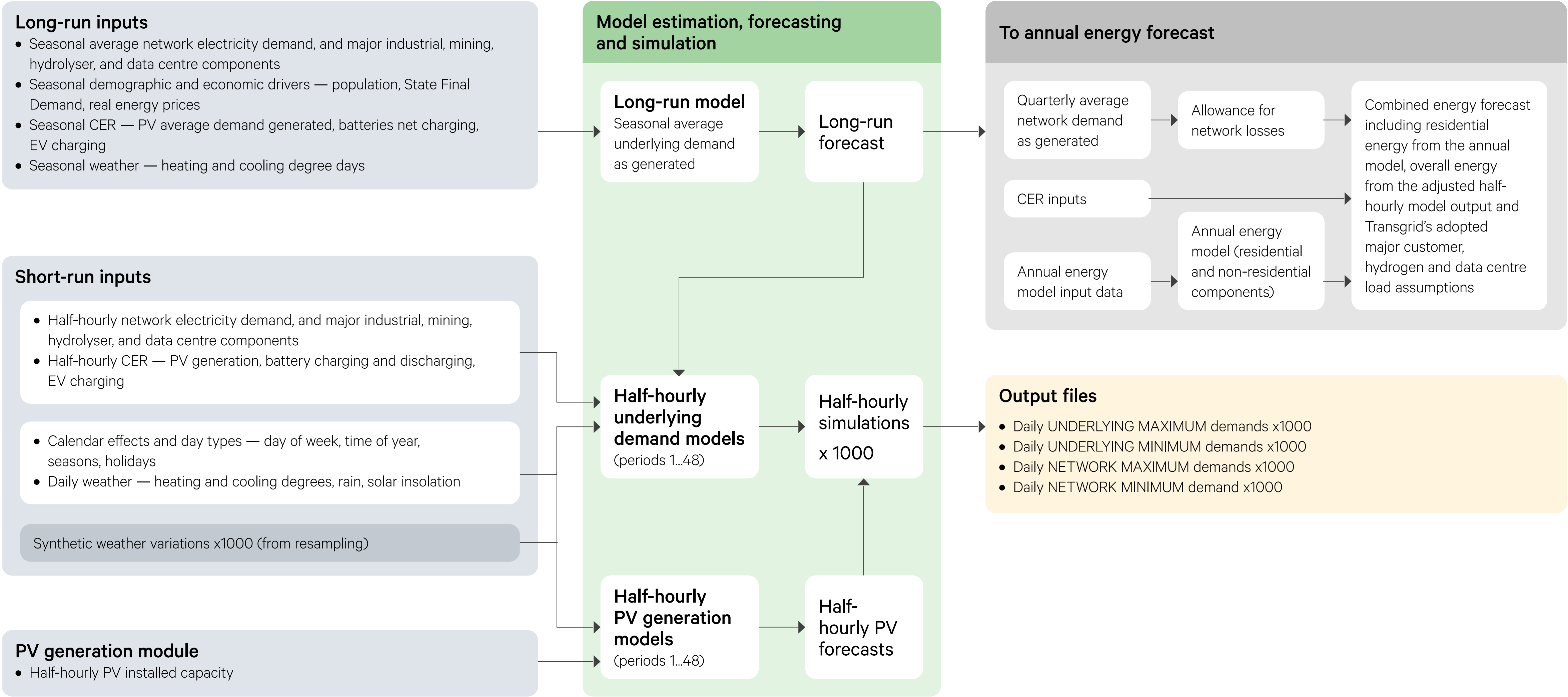
The models used include:

- A half-hourly model that
 - forecasts long-run average demand (as generated)
 - forecasts half-hourly changes in underlying demand around the long-run path, and then adds CER
 - simulates NSW Region maximum and minimum demands by season
 - calculates POE levels
- An annual energy model that
 - forecasts residential and non-residential underlying energy components separately, and then adds CER
 - converts long-run average demand from the half-hourly model to annual energy sent out
 - combines forecast components

Each model including minor updates from those used for the 2025 Transmission Annual Planning Report, is separately described below.



Figure A1.3: NSW half-hourly electricity demand forecast model and annual energy model





A1.3.2 Half-hourly underlying demand model

The half-hourly model is used to estimate frequency distributions and exceedance probabilities of half-hourly NSW power system demand over a 20-year horizon, under various economic and technological scenarios. The framework incorporates insights from over four decades of modelling research.

Key features of the model include:

- Representation of demand as a daily matrix of 48 half-hour intervals.
- Use of autoregressive distributed lag (ARDL) with cointegration to capture long-term forecast reliability.
- Multiple simulations to derive probability distributions of extreme demand.
- PV generation forecasts based on installed capacity, weather conditions, time of day and seasonality.

As illustrated in Figure A1.3, the model comprises of:

- 48 short-run equations estimated daily, representing half-hourly demand at each time of day.
- Long-run, slow changing input variables, including:
 - population
 - state final demand
 - average real electricity price

- Weather variables, based on historical observations to estimate the equations, and synthetic weather series for forecasting, generated by random resampling a 20-year data sample into seasonal sequences, including:
 - temperature (converted to heating or cooling degrees)
 - solar insolation
 - rainfall
- CER and major industry inputs including:
 - industrial and mining loads
 - electrolyzers
 - data centres
 - electric vehicles
 - rooftop solar capacity
- Day types and calendar effects, allowing for:
 - day of week
 - time of year
 - various holiday effects

Table A1.1 provides full details of all the variables included in the half-hourly model.

The model equations use underlying demand, which is constructed from NSW “as generated” network demand as shown in equation A1.1.

Equation A1.1 Construction of underlying demand

$$UD=ND-(IND+HYD+DAT)+PV+BAT-EV$$

Where:

- UD = Underlying demand
- ND = as generated network demand (demand supplied by the transmission network)
- IND = major customer industrial and mining load
- HYD = hydrolyser load
- DAT = large data centre load
- PV = rooftop solar PV generation
- BAT = consumer battery discharging (positive) or charging (negative)
- EV = plug-in electric vehicle charging

The model produces forecasts of underlying demand, which are then converted to network demand using separate component forecasts in the above relationship in reverse.

Table A1.1: Half-hourly demand model inputs (daily data)

Name	Description	Definition
Seasonal		
TOY	Time of year	A Fourier series sinusoid function with two full cycles a year, ranging from +1 at midsummer and midwinter, to – 1 in mid-April and mid-October
Days of week		
SUN	Sunday	A binary variable equal to 1 if the day of the week is Sunday, and equal to 0 at other times
MON	Monday	A binary variable equal to 1 if the day of the week is Monday, and equal to 0 at other times
TUE	Tuesday	A binary variable equal to 1 if the day of the week is Tuesday, and equal to 0 at other times
THU	Thursday	A binary variable equal to 1 if the day of the week is Thursday, and equal to 0 at other times
FRI	Friday	A binary variable equal to 1 if the day of the week is Friday, and equal to 0 at other times
SAT	Saturday	A binary variable equal to 1 if the day of the week is Saturday, and equal to 0 at other times
Holidays		
XMAS	Christmas Day	A binary variable equal to 1 if the date is 25 December, and equal to 0 at other times
BOX	Boxing Day	A binary variable equal to 1 if the date is 26 December, and equal to 0 at other times
AHOL	Additional holiday	A binary variable equal to 1 if it is either (a) a Monday following a fixed date holiday on the previous Saturday (XMAS, BOX, NEW, AUS, ANZ), (b) a Monday following a fixed date holiday on the previous Sunday (NEW, AUS, ANZ), or (c) a Tuesday following a fixed date holiday on the previous Sunday (BOX), and equal to 0 at other times
NEW	New Year’s Day	A binary variable equal to 1 if the date is 1 January, and equal to 0 at other times
AUS	Australia Day	A binary variable equal to 1 if the date is 26 January, and equal to 0 at other times
GFRI	Good Friday	A binary variable equal to 1 if it is Good Friday, and equal to 0 at other times
ESAT	Easter Saturday	A binary variable equal to 1 if it is Easter Saturday, and equal to 0 at other times
ESUN	Easter Sunday	A binary variable equal to 1 if it is Easter Sunday, and equal to 0 at other times

Name	Description	Definition
EMON	Easter Monday	A binary variable equal to 1 if it is Easter Monday, and equal to 0 at other times
ANZ	ANZAC Day	A binary variable equal to 1 if the date is 25 April, and equal to 0 at other times
KING	King’s Birthday	A binary variable equal to 1 if it is the second Monday in June, and equal to 0 at other times
LAB	Labour Day	A binary variable equal to 1 if it is the first Monday in October, and equal to 0 at other times
PHOL	Monday preceding a public holiday	A binary variable equal to 1 if it is Monday and the following day will be Christmas Day (XMAS), New Year’s Day (NEW), Australia Day (AUS) or Anzac Day (ANZ), and equal to 0 at other times
FHOL	Friday following a public holiday	A binary variable equal to 1 if it is Friday and the previous day was New Year’s Day (NEW), Australia Day (AUS) or Anzac Day (ANZ), and equal to 0 at other times
SHOL	Summer break	A binary variable equal to 1 if it the date is between 25 December of the current year and 14 January of the following year, and equal to 0 between those dates if any other holiday variable is in effect, and 0 outside those dates
DLS	NSW daylight savings	A binary variable equal to 1 if it the date is between the first Sunday of October of the current year and the first Saturday of April of the following year, and equal to 0 outside those dates
Weather		
HD, HD(-1) and HD(-2)	Heating degrees and lags of heating degrees	Variation below 18 in the calculated representative daily temperature (equal to zero if the temperature is 18 or above)
CD, CD(-1) and CD(-2)	Cooling degrees and lags of cooling degrees	Variation above 21 in the calculated representative daily temperature (equal to zero if the temperature is 21 or above)
TMAXP	Maximum temperature (Parramatta)	Maximum temperature recorded in the 24 hours to 9 a.m. the following morning at a Western Sydney site
TMINP	Minimum temperature (Parramatta)	Minimum temperature recorded in the 24 hours to 9 a.m. of the current day at a Western Sydney site
TMAXS	Maximum temperature (Sydney Airport)	Maximum temperature recorded in the 24 hours to 9 a.m. the following morning at an eastern Sydney site
TMINS	Minimum temperature (Sydney Airport)	Minimum temperature recorded in the 24 hours to 9 a.m. of the current day at an eastern Sydney site

Resampling and simulation

Random resampling (also referred to as bootstrapping) refers to the creation of artificial but realistic series by joining together several historical observations or blocks of historical data chosen randomly and with replacement from a set of historical data. Following each sample selection, replacement ensures that the probability of selecting any subsequent block of data remains the same.

Transgrid aims to generate artificial weather samples and use them to generate sufficient estimates of half-hourly demand to be able to determine an empirical probability distribution for extreme seasonal demand whenever it may occur. To do this, 20 years of historical weather series are repeatedly resampled, without replacement, by replacing 10-day blocks randomly drawn from the same season (summer, autumn, winter or spring). A 10-day block is used with the intention of capturing plausible weather sequences. The resampling process occurs once at the beginning of the forecasting cycle and results in daily synthetic data in various files covering both the historical and future periods, including cooling degrees, heating degrees, solar insolation and rainfall. We restrict the historical weather sample to the last 20 years, as such a restriction results in POE levels more aligned with recent climate norms, compared to a longer sample.

The overall modelling process also includes the estimation of PV generation for each synthetically generation measure of solar insolation, subject to prevailing weather, time of year and capacity installed. The primary model output is for underlying demand, after which the model calculates equivalent network demands using pre-determined battery and vehicle charging estimated or forecast values and the estimated PV generation for each half hour.

The inputs relating to behind-the-meter half-hourly battery operation, which are otherwise fixed for all days in the same season, are modified within the model to respond to days with little or no PV generation (i.e., battery use is reduced to one tenth of the values originally input for that season). This step is an innovation introduced in the 2026 Transmission Annual Planning Report to avoid projections of unrealistically high morning demands on days with low PV generation.

The initial model half-hourly output is reduced to daily maximum and minimum values for both underlying and network demand, by season, for each of the synthetically resampled inputs. This data is used to determine the distribution of maximum and minimum demand and hence POE levels for each season, for each year. Model residual variation is accounted for by adjusting the projections on the assumption that the residuals follow a normal distribution.

Long-run quarterly demand model as input to the half hourly demand model

The long-run model provides the foundation for underlying demand growth over medium- to long-term horizons. It produces seasonal average demand, which feeds into the half-hourly model and informs annual energy forecasts.

- The model was developed and validated following the steps below:
- Choose driver variables using previous experience and knowledge of demand theory
 - Select ARDL lag length automatically using Akaike information criterion
 - Test model residuals for absence of autocorrelation and presence of homoskedasticity

- Test for cointegration using the bounds test, where a finding of cointegration adds reliability to forecasts made with the model
- Transform to error-correction form to easily identify the speed of adjustment coefficient and long-run elasticities, where:
 - speed of adjustment should be less than zero and greater than minus one for stability
 - income elasticity should be between zero and one to align with the direction of influence and previous findings of inelastic demand for electricity
 - price elasticity should be between zero and minus one to align with the direction of influence and previous findings of inelastic demand for electricity.

Analyse forecast performance both within and out of sample, testing both goodness of fit and consistency across different periods.

The long-run model component has a quarterly/seasonal resolution. This enables us to simultaneously estimate annual energy as generated, which we use in combination with the separately prepared annual residential energy projection. The long-run model of underlying average demand incorporates the drivers shown in Table A1.2.

Table A1.2: Long run demand model drivers (quarterly data)

Name	Description	Definition
POP	Population	Resident population of NSW and the ACT
SFD	State Final Demand (\$millions chain value measure)	State Final Demand of NSW and the ACT
PE	Average electricity price	Weighted average, for NSW and the ACT, of consumer and producer price indices
PG	Average price of gas and other fuels	Weighted average of NSW and the ACT gas price indices
HDD	Heating degree days	Accumulated degree days (deviations below 18 degrees Celsius) using a weighted average of Sydney Airport and Parramatta daily minimum and maximum temperatures
CDD	Cooling degree days	Accumulated degree days (deviations above 21 degrees Celsius) using a weighted average of Sydney Airport and Parramatta daily minimum and maximum temperatures
DAYS	Number of days	Days in the current season (summer varies with leap years)
CPI	Consumer Price Index	Weighted average of All Groups Index for NSW and the ACT

A1.3.3 Annual energy model

The published annual energy forecast is derived from:

- Quarterly energy forecasts from the long-run component of the half-hourly model (Section A1.3.2)
- Outputs from the standalone annual energy model described in this section.

The annual energy model complements the half-hourly model. The annual model provides a distinct perspective on residential and non-residential energy consumption and aligns total energy projections with the conventional “sent-out” measure of network energy.

Residential energy modelling framework

Consistent with the half hourly model, the residential annual energy model defines underlying residential energy consumption as:

URES=RES+PV_RES-BAT_RES-EV_RES

- Where:
- URES = underlying residential energy consumption
 - RES = residential energy consumed via the network
 - PV_RES = residential rooftop solar PV generation
 - BAT_RES = residential consumer battery net charging load
 - EV_RES = plug-in electric vehicle charging at homes

This component is used to forecast underlying residential energy consumption (URES). These forecasts are then converted into network-supplied residential energy (RES) by applying separate projections of CER components in the above relationship.

Forecasts for large industrial and emerging loads including mining, grid-connected electrolysers, and data centres are incorporated directly in the overall energy model as direct inputs.

Energy forecast derivation

Seasonal average demand (as generated) is obtained from the long-run component of the half-hourly model. As seasonal periods do not align with the Australian financial year, annual energy sent out is derived as follows:

- Seasonal energy as generated is average demand in any season times the number of hours in that respective season
- Annual energy as generated is taken to be the total of the four seasons that run from 1 September in any year to 31 July in the following year (i.e., the sum of energy forecast for spring, summer, autumn and winter)
- Annual energy sent out is estimated by:
 - multiplying annual energy generated by a timing alignment factor derived from historical average differences between energy for the four seasons and financial year energy
 - forecasting of generator auxiliary use as a proportion of as generated energy.

In practice, the timing factor and the generator auxiliary adjustments are rolled into a single adjustment factor, using judgement based on the adjustment factor needed to provide a realistic estimate of the first (or partial) forecast year. This is because the timing of the forecast preparation is such that the year to date up to the end of March is already known with certainty.⁹⁷ Future year adjustment factors evolve from the initial factor in accordance with an expectation that generator auxiliary loads will diminish over time in line with coal fired generator retirements.

Model estimation

- The residential model is estimated using a constructed historical dataset comprising:
- Australian Energy Statistics (total and residential energy)
 - Metered data for major customers
 - Estimated CER generation and load components.

A network loss adjustment is applied to reconcile total consumption with AEMO sent out energy.

- The model is specified with:
- Dependent variable: underlying residential energy consumption
 - Explanatory variables:
 - real household disposable income
 - real electricity prices
 - heating degree days

Price and income elasticity and temperature sensitivity

Table A1.3 shows that for a 1 per cent increase in price or income, the long-run impact on energy consumption (for the respective sector) is estimated to be the percentage change as indicated in the corresponding column. For example, an increase in the residential electricity price of 1 per cent would lead to a long-run decrease in residential electricity consumption (all other things remaining the same) of 0.55 per cent.

The p-values, presented in brackets in Table A1.3 after the price and income elasticities, indicate the likelihood (in percentage terms) of an estimated value not being significantly different from zero. That is, a p-value close to zero indicates there is a very high likelihood the real value is not zero. All estimated elasticities with the exception of the combined income elasticity are estimated to a high degree of confidence.

Table A1.3: Long-run demand model drivers (quarterly data)

	Price (p-value)	Income (p-value)
Residential (annual model)	-0.55 (0.00)	0.77 (0.00)
Non-residential (annual model)	-0.27 (0.00)	0.26 (0.01)
Combined (seasonal long-run model)	-0.63 (0.00)	0.39 (0.19)

97 Subject to potential later AEMO data revisions.



In the forecasting models, direct weather impacts are quantified as either heating or cooling degree days, or the temperature below or above the human comfort range inside buildings each day, for all days in a year. Future weather is modelled as a continuation of average warming trends over the last 20 years.

Table A1.4 shows estimated temperature impacts on energy consumption. The table shows that for an average temperature increase of 1 degree on any day during summer, NSW Region residential and non-residential energy consumed increases by 18 GWh a day due to cooling requirements. Similarly, for an average temperature fall of 1 degree on any day during winter, NSW Region residential and non-residential energy consumed increases by 21 GWh for heating requirements.

Table A1.4: Estimated temperature sensitivities of energy (GWh/degree >21 or <18 degrees)

	Cooling	Heating
Residential (annual model)	n.a.	4
Non-residential (annual model)	49	33
Combined (seasonal long-run model)	18	21



A1.4 Model validation and forecast accuracy

A1.4.1 Current 2026 model accuracy

Simulated POE demand levels (weather correction)

The purpose of weather correction of historical demands is to remove the influence of weather variation, and to calculate levels of maximum or minimum demand that correspond to given probabilities of exceedance.

We carried out historical simulations using the half-hourly demand model in an identical manner to that used to prepare future forecasts. This process involves resampled daily weather data to input repeatedly to the model. From the 1,000 or so resulting simulations, we calculate percentiles of the most extreme demands reached in each season across the simulated outcomes. The historical simulations provide guidance in the preparation of future forecasts.

Figures A1.4 to A1.7 show actuals and simulated 10 per cent, 50 per cent and 90 per cent POE bands for summer maximum demand, winter maximum demand and spring and summer minimum demand, respectively. As the number of observations increases, we would expect that the mean actual values would converge towards the mean of the 50 per cent POE values, and that the actual values would have an increasing tendency to being above the 10 per cent POE line or below the 90 per cent POE line one year in every 10 years. While the number of observations is limited, the results provide no indication that the simulated POE levels are materially inconsistent with the available observations.

Figure A1.4: NSW Region summer maximum demand and 10% POE, 50% POE and 90% POE estimates

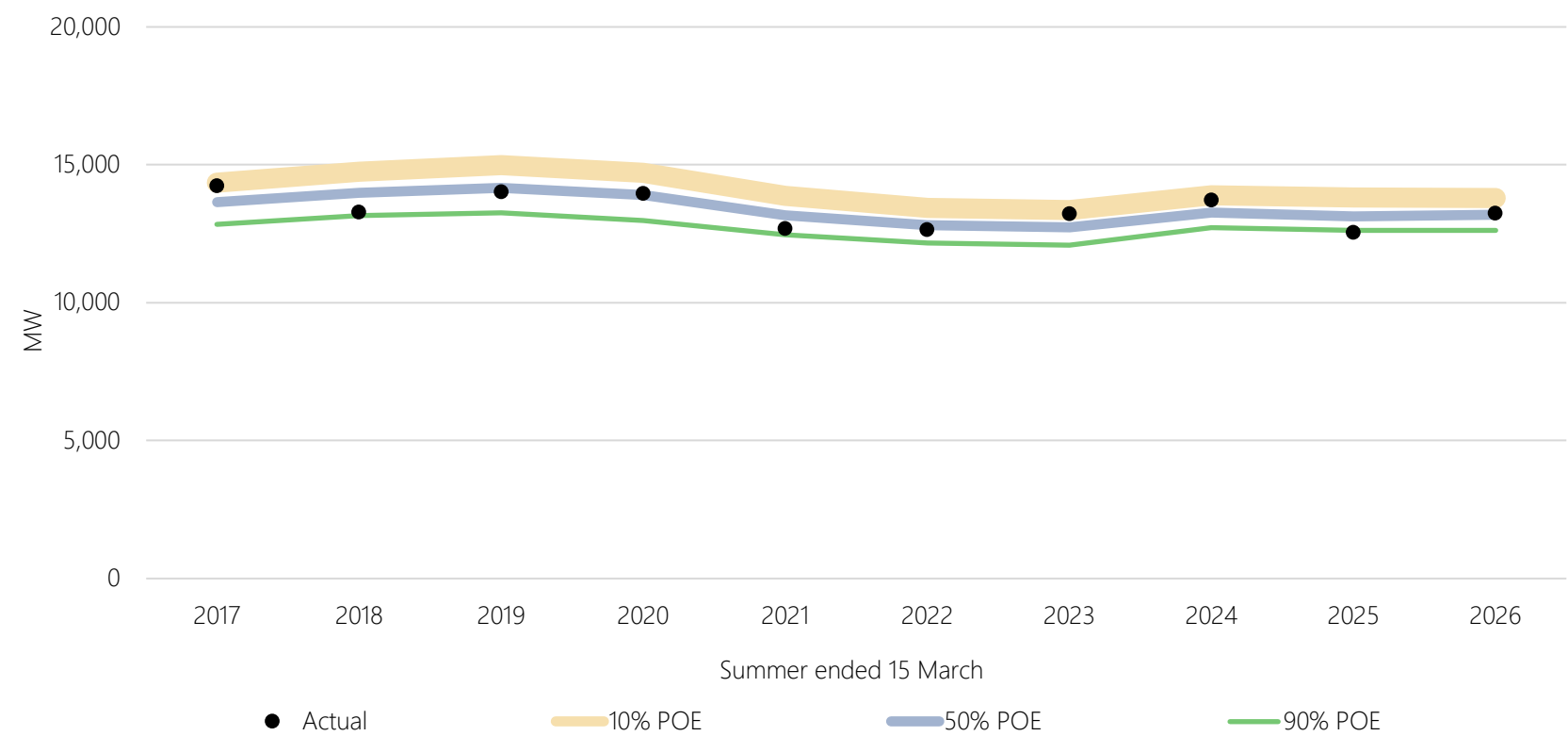


Figure A1.5: NSW Region winter maximum demand and 10% POE, 50% POE and 90% POE estimates

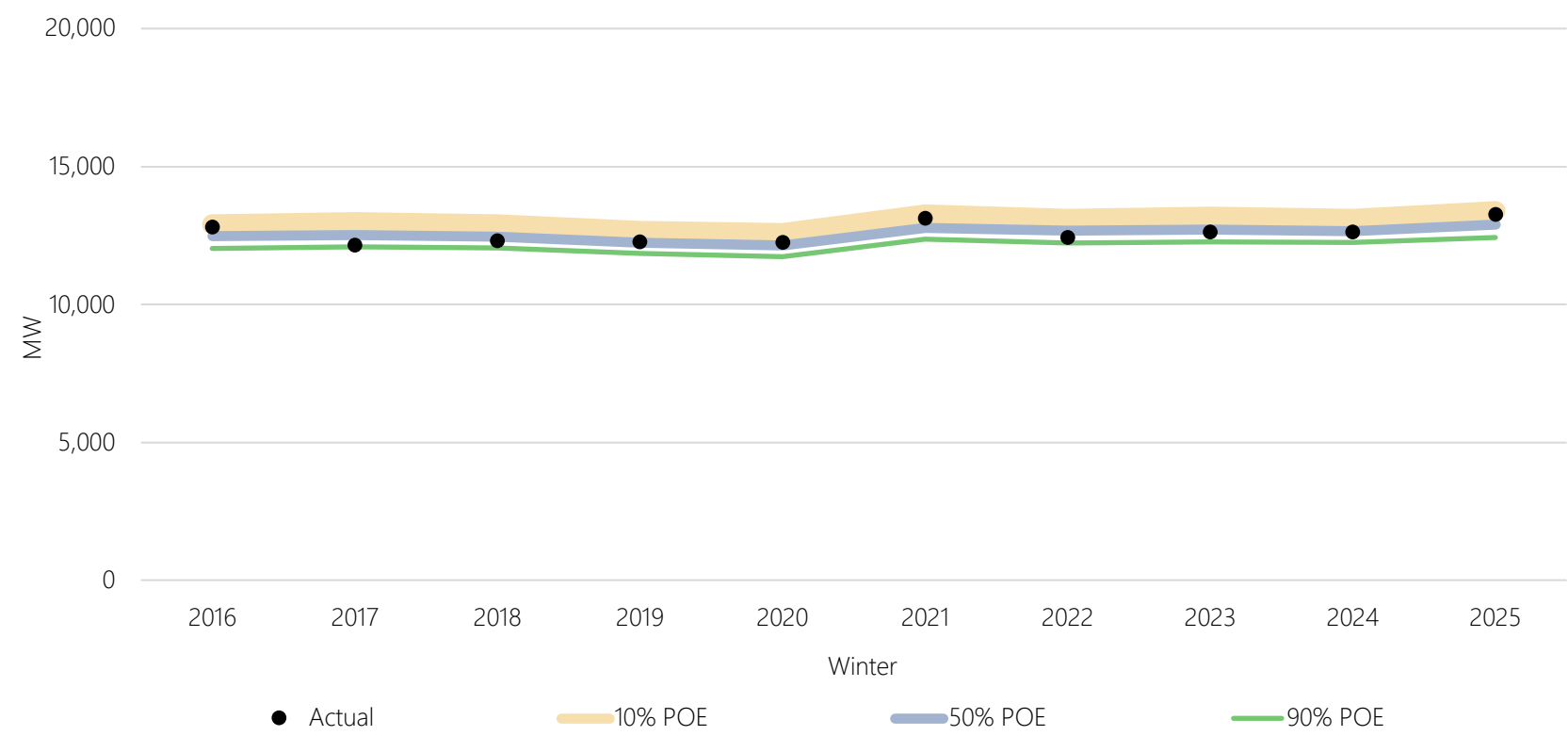


Figure A1.6: NSW Region spring minimum demand and 10% POE, 50% POE and 90% POE estimates

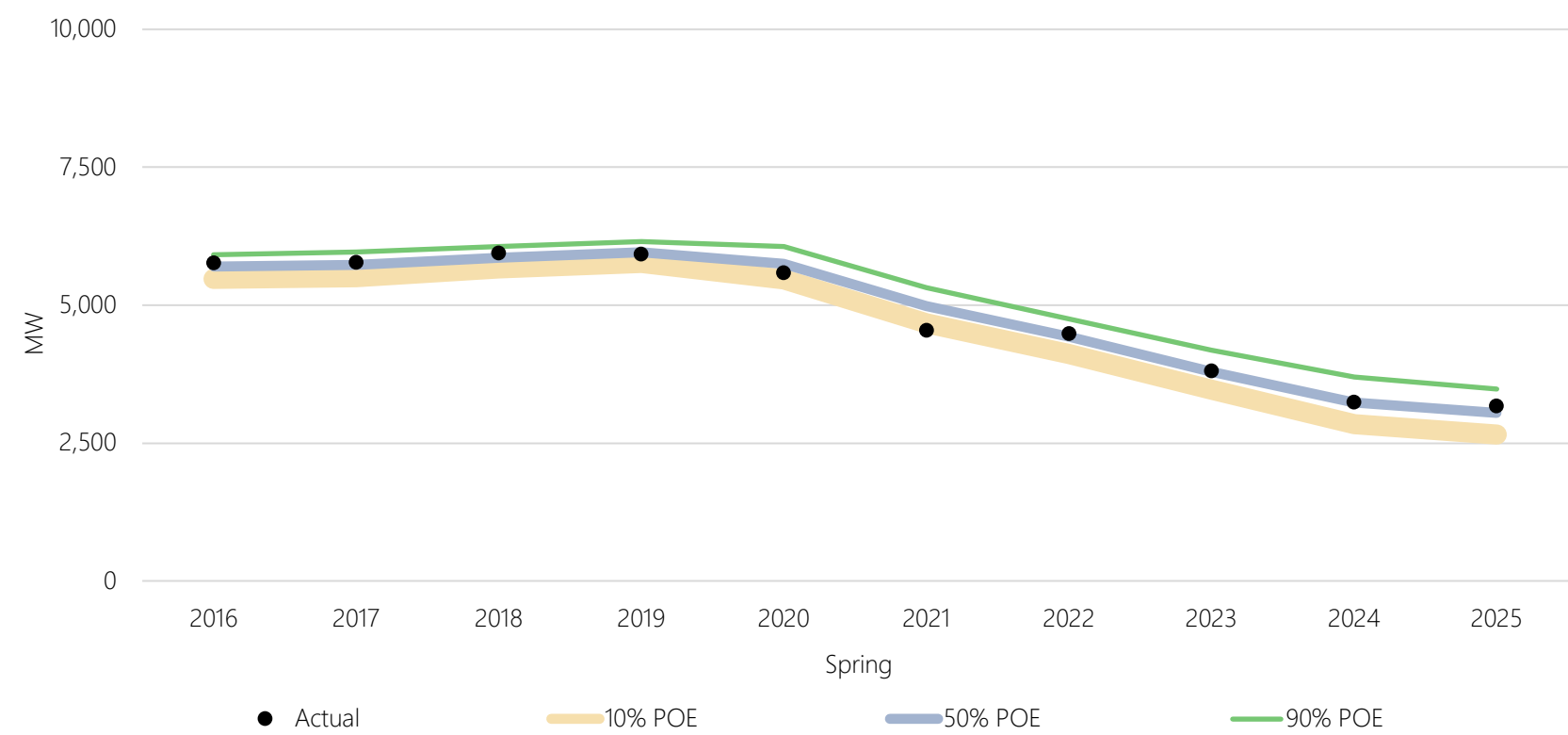
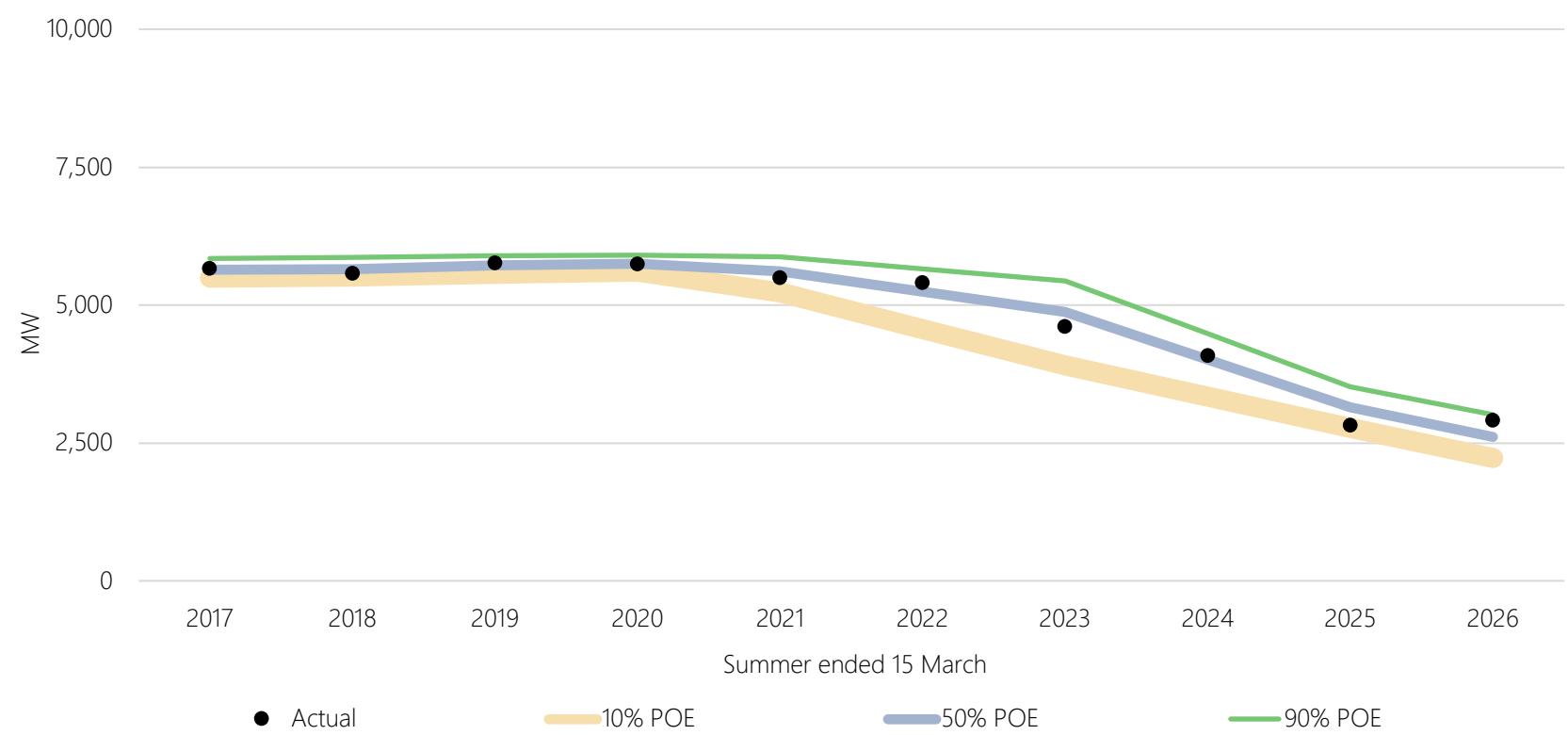


Figure A1.7: NSW Region summer minimum demand and 10% POE, 50% POE and 90% POE estimates



A1.4.2 Annual energy model performance

The performance of the current 2026 annual energy model, comprising residential and non-residential components, was assessed using both in-sample and out-of-sample testing approaches:

- The model was estimated using all currently available data and applied to backcast historical outcomes using full hindsight (in-sample forecast).
- The model was then re-estimated using data available only up to FY2016 to generate a forecast, representing the outcomes that would have been produced if the forecast had been prepared in 2016, assuming perfect foresight of input variables (out-of-sample forecast).

The fit of the combined annual energy model to historical data is presented in Figure A1.8, Figure A1.9, and Table A1.5. Indicators of forecast reliability include:

- Fitted values remaining within the 95 per cent confidence interval
- Relatively low Mean Absolute Percentage Errors
- No material bias in the out of sample forecast relative to actual outcomes

Table A1.5: NSW Region energy forecast (annual model) error analysis performed over the period FY16 to FY26

	In-sample fit	Out-of-sample forecast
Mean absolute percentage error (MAPE)	0.9%	5.0%
Thiel's inequality coefficient (U)	0.005	0.032
Bias proportion (UB)	0.001	0.600
Variance proportion (UV)	0.071	0.258
Covariance proportion (UC)	0.928	0.142

Overall, the tests indicates that the model performs reasonably well across the full historical sample. While the model is generally accurate, it exhibits some potential upward bias in the longer term.

Although the in-sample forecasts provide a good fit to historical data, the out-of-sample forecasts deviate from actual outcomes by more than 6,000 GWh in some years, with the divergence narrowing toward the end of the forecast period.

Consistent with this assessment, Transgrid did not rely on the annual energy model to determine total energy forecasts. Instead:

- The residential component was used to provide insights into the composition of future energy consumption (refer to Figure 4.3 in Chapter 4).
- The long-run quarterly average demand model was used to develop the overall energy forecast.

Figure A1.8: Energy sent out (annual model) in-sample⁹⁸ forecast

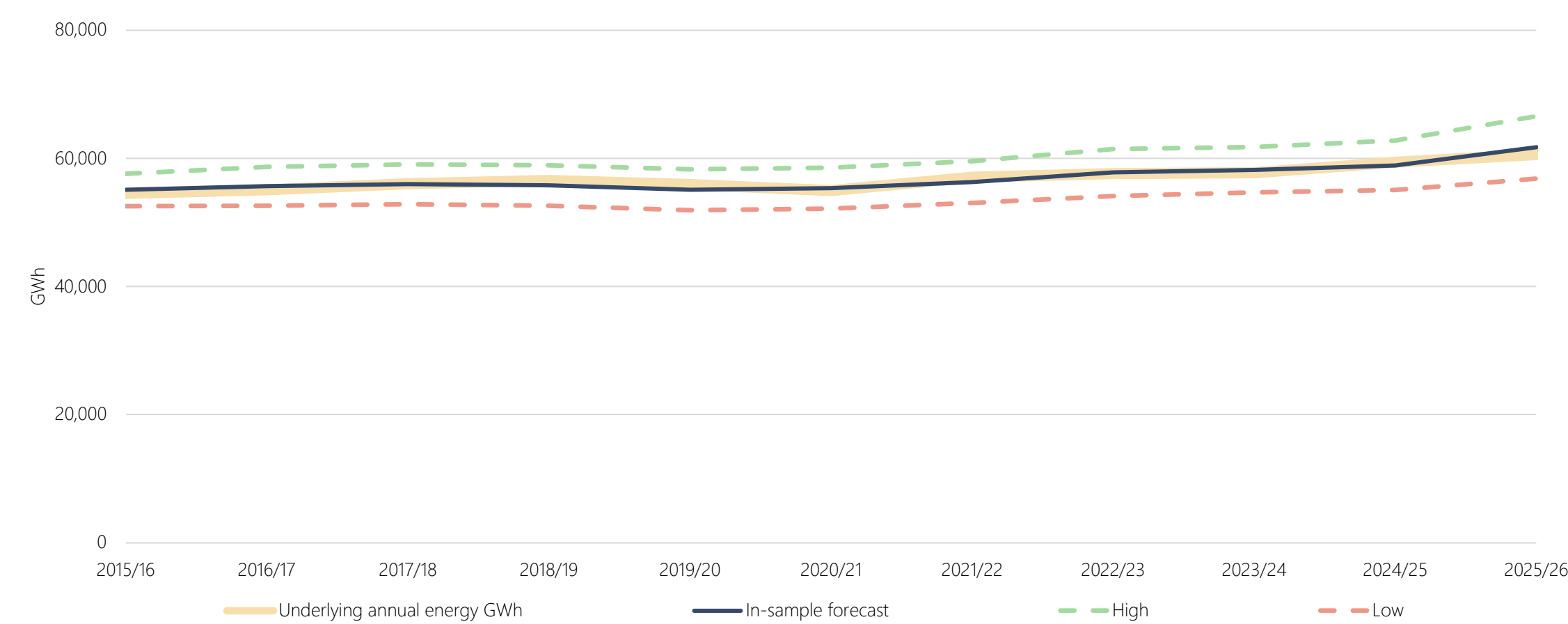
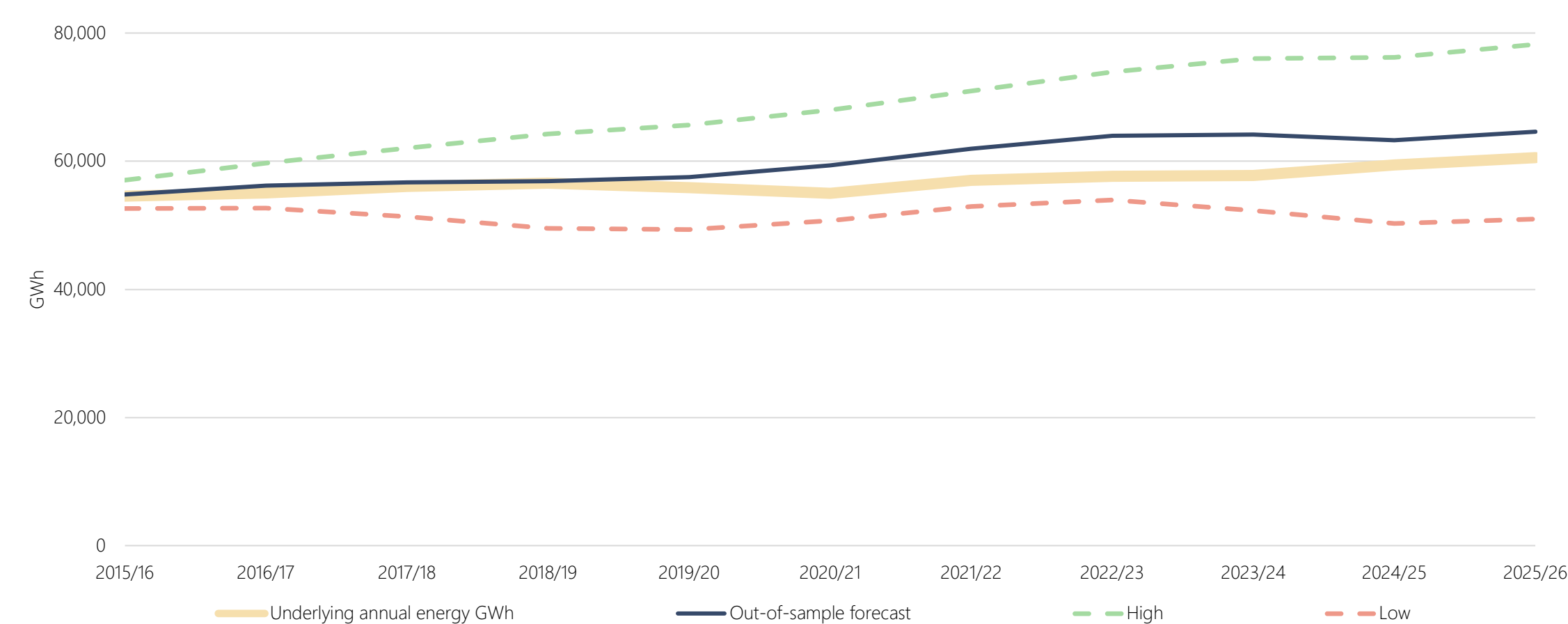


Figure A1.9: Energy sent out (annual model) out-of-sample⁹⁹ forecast



98 An in-sample forecast is prepared by using a model that was estimated with a given sample of historical data to forecast over all or some of the same period. Forecast accuracy can be tested by comparing the forecast with actual data, and if estimated by least squares, the mean of the forecast is likely to equal the mean of the actuals.

99 An out-of-sample forecast is prepared by using a model that was estimated with a given sample of historical data to forecast outside the sample. Typically, this is done by reserving some of the historical data available for estimation, so that the forecast can still be compared with actual data for accuracy. This is the most stringent test for the model's ability to predict the future.

A1.4.3 Quarterly energy model performance

The fit of the quarterly energy model (derived from the long-run component of the half hourly model) to the historical data is shown in Figure A1.10, Figure A1.11 and Table A1.6. The data for this figure were produced by replicating the forecasting process using all the available input data to produce the in-sample fit. However, we also re-estimated the entire model using only the input data up to FY14 to produce a new out-of-sample forecast that mimics the performance of the model had it been used to prepare a 10-year forecast at that time.

Table A1.6: NSW Region energy forecast (quarterly model) error analysis performed over the period FY16 to FY26

	In-sample fit	Out-of-sample forecast
Mean absolute percentage error (MAPE)	0.9%	2.6%
Thiel's inequality coefficient (U)	0.006	0.016
Bias proportion (UB)	0.246	0.557
Variance proportion (UV)	0.011	0.293
Covariance proportion (UC)	0.743	0.150

Some key indications of the reliability of the forecasts are that:

- Fitted lines are contained within a 95 per cent confidence interval
- Derived Mean Absolute Percentage Errors are relatively low (0.5 in sample and 2.2 out-of-sample)
- Despite some upward bias, the out-of-sample forecast remains relatively close to the actual throughout the forecast period.

The evidence suggests that the overall model is valid across the entire 10-year sample period. The model is relatively accurate and is not given to significant bias up or down.

Figure A1.10: Underlying energy generated (quarterly model) in-sample¹⁰⁰ forecast

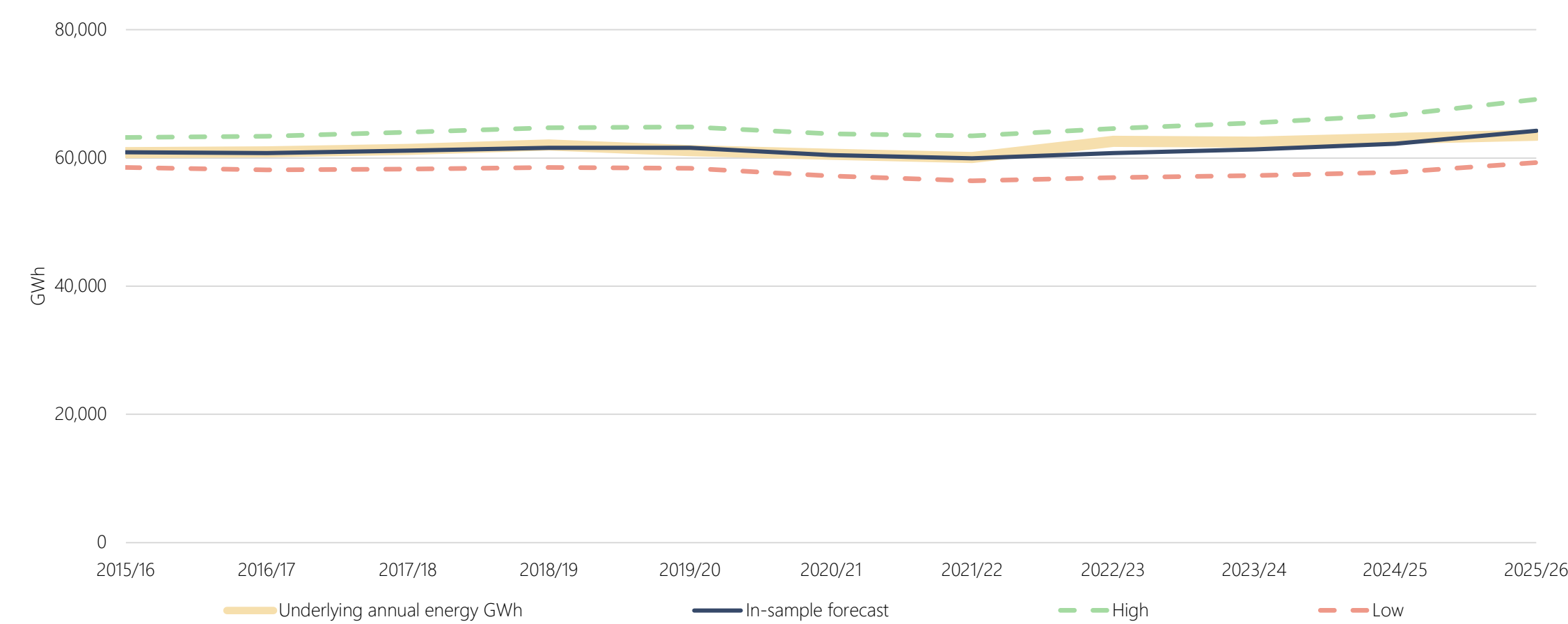
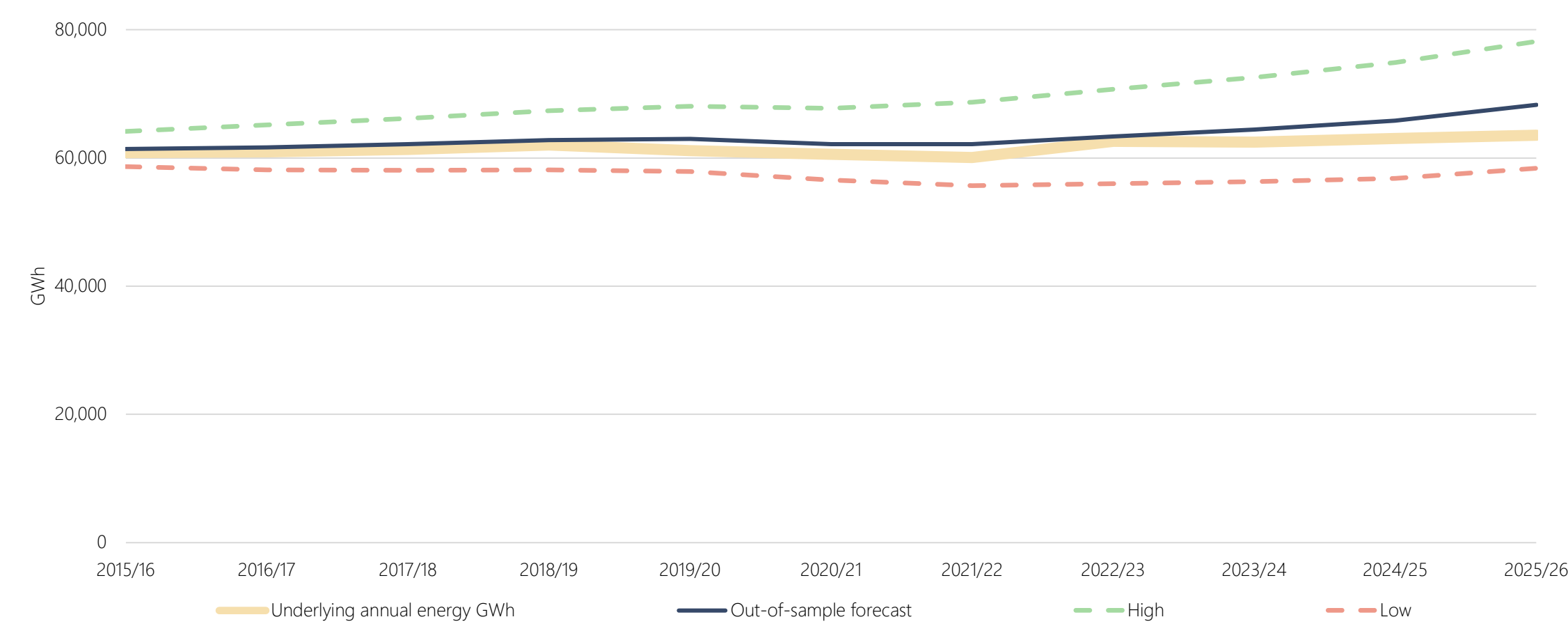


Figure A1.11: Underlying energy generated (quarterly model) out-of-sample¹⁰¹ forecast



¹⁰⁰An in-sample forecast is prepared by using a model that was estimated with a given sample of historical data to forecast over all or some of the same period. Forecast accuracy can be tested by comparing the forecast with actual data, and if estimated by least squares, the mean of the forecast is likely to equal the mean of the actuals.

¹⁰¹ An out-of-sample forecast is prepared by using a model that was estimated with a given sample of historical data to forecast outside the sample. Typically, this is done by reserving some of the historical data available for estimation, so that the forecast can still be compared with actual data for accuracy. This is the most stringent test for the model's ability to predict the future.

A1.4.4 Performance of 2025 Transmission Annual Planning Report forecasts

This section reviews the accuracy of the 2025 Transmission Annual Planning Report electricity demand and energy forecasts one year out.

Annual energy FY25

Projected NSW Region annual energy for FY25 in the 2025 Transmission Annual Planning Report was 65,970 GWh, compared with an actual outcome of 65,594 GWh, an apparent over-projection of 376 GWh or 0.6 per cent.

The energy projection was based on a forecasting model informed by predicted input variables. Transgrid re-ran the forecasting model using actual right-hand side input variables to determine the extent to which the

forecast outcome was driven by errors in predicted input variables, and the extent to which the model itself was inaccurate.

Real electricity prices fell and real income rose during FY25 by less than we expected at the time of preparing the 2025 Transmission Annual Planning Report. Rooftop PV and small battery installation was also higher, resulting in lower electricity consumption.

Table A1.7 shows the published Medium energy projection for FY25, the actual outcome and a new prediction using the same model with actual, rather than forecast values, for the input variables. The measures below show that the model inputs were the greatest source of projection error, with model inaccuracy driving the forecast in the opposite direction to partially offset the impacts of the inaccurate inputs.

Table A1.7: 2025 TAPR Medium energy projection compared with actual outcome

Measures:	GWh	
Current actual	65,594	
Forecast published in 2025 TAPR	65,970	
Updated prediction using same model as in the 2025 TAPR, but with actual instead of forecast inputs	65,431	

Forecasting gaps:	GWh	Difference
Due to model inaccuracy — current actual less updated prediction using actual input data	163	0.2%
Due to inaccurate inputs — total gap less portion due to model inaccuracy	-539	-0.8%
Total gap — current actual less published 2025 TAPR forecast	-376	-0.6%

Summer maximum demand FY26

Projected NSW Region 50 per cent POE summer maximum demand for FY26 was 13,260 MW in the 2025 Transmission Annual Planning Report, compared with our updated estimated 50 per cent POE actual of 13,176 MW, a slight over-projection of 84 MW.

Table A1.8 shows the 2025 Transmission Annual Planning Report forecasts of 10 per cent, 50 per cent and 90 per cent POE NSW Region summer maximum demand. These forecasts were within 0.6 per cent of the currently estimated POE values, based on actual data for the recent summer.

Table A1.8: 2025 TAPR Medium summer maximum demand forecasts compared with actual outcomes (MW)

	Actual MW	Estimated POE %	10% POE MW	50% POE MW	90% POE MW
Actual MD Saturday 10 Jan 2026 and estimated POEs	13,240	46%	13,784	13,176	12,615
Published 2025 TAPR forecast [†]			13,870	13,260	12,680
Difference (estimated actual less published forecast)			-86 (-0.6%)	-84 (-0.6%)	-65 (-0.5%)

	Temperature degrees	Estimated POE %
Parramatta average temperature on 10 Jan 2026	32.1	38%*
Sydney Airport average temperature on 10 Jan 2026	33.3	19%*

^{*}Temperature probabilities of exceedance are calculated from seasonal maxima and minima for the last 20 years, using observations from Parramatta North and Sydney Airport weather stations.
[†]Both last year’s forecast POE levels for summer 2025–26 and the recently estimated actual POE levels are based on multiple simulations of daily maximum demands occurring at a typical time of day on a typical day of the week. Neither the forecast nor the actual POE levels are specific to a particular future time or date.

Winter maximum demand 2025

Projected NSW Region 50 per cent POE winter maximum demand for 2025 was 12,930 MW in the 2025 Transmission Annual Planning Report, compared with our updated estimated 50 per cent POE actual of 12,893 MW, an over-projection of 37 MW.

Table A1.9 shows the 2025 Transmission Annual Planning Report forecasts of 10 per cent, 50 per cent and 90 per cent POE NSW Region winter maximum demand. These 50 per cent POE forecasts for winter 2025 were highly accurate, but due to the increased probability range, the

10 per cent POE was under-forecast by 129 MW (1.0 per cent) and the 90 per cent POE was over-forecast by 193 MW (1.6 per cent).

We estimate that the actual maximum demand of 13,246 MW, which occurred in the half hour ended 18:00 hours EST (NEM time) on Tuesday 1 July 2025, represented a 18 per cent POE level of demand.

The daily average temperature on the day of the 2025 winter maximum demand was 13.5 degrees at Sydney Airport and 12.2 degrees in Parramatta. Both temperatures are above the range of recorded winter minimum average temperatures for the previous 20 years.

Table A1.9: 2025 TAPR Medium winter maximum demand forecasts compared with actual outcomes (MW)

	Actual MW	Estimated POE %	10% POE MW	50% POE MW	90% POE MW
Actual MD Tuesday 1 July 2025 and currently estimated POEs	13,246	18%	13,389	12,893	12,427
Published 2025 TAPR forecast [†]			13,260	12,930	12,620
Difference (estimated actual less published forecast)			129 (1.0%)	-37 (-0.3%)	-193 (-1.6%)

	Temperature degrees	Estimated POE %
Parramatta average temperature on 1 July 2025	12.2	n.a.
Winter minimum Parramatta average temperature 15 July 2025	8.6	29%
Sydney Airport average temperature on 1 July 2025	13.5	n.a.
Winter minimum Sydney Airport average temperature 15 July 2025	11.0	94%

^{*}Temperature probabilities of exceedance are calculated from seasonal maxima and minima for the last 20 years, using observations from Parramatta North and Sydney Airport weather stations.
[†]Both last year's forecast POE levels for winter 2025 and the recently estimated actual POE levels are based on multiple simulations of daily maximum demands occurring at a typical time of day on a typical day of the week. Neither the forecast nor the actual POE levels are specific to a particular future time or date.

Yearly minimum demand FY26

Table A1.10 shows the 2025 Transmission Annual Planning Report forecasts of 10 per cent, 50 per cent and 90 per cent POE NSW Region Minimum Demand. These forecasts for FY26^{*} were between 70 MW and 81 MW lower than (and up to 3.2 per cent variance) the currently estimated actual POE values, based on actual data for the year to March 2026.

The actual minimum demand of 2,915 MW, which occurred in the half hour ended 13:30 hours EST (NEM time) on Saturday 29 December 2025, represented an 83 per cent POE level of demand. This was a clear, weekend day, with mild temperatures but high solar exposure.

Predicted consumer solar installations are critical to the accuracy of minimum demand forecasts. The 2025 Transmission Annual Planning Report allowed for around 345 MW more installed consumer solar generation than we now estimate was actually produced, and 34 GWh less EV charging than our current estimate. This contributed to around double the overall gap between projected and actual minimum demand, with model inaccuracy contributed a roughly equal offsetting amount.

Table A1.10: 2025 TAPR Medium winter maximum demand forecasts compared with actual outcomes (MW)

Measures	Minimum demand MW	POE % [*]	10% POE	50% POE	90% POE
Actual minimum demand Saturday 29 December 2025 and currently estimated POEs [†]	2,915	83%	2,230	2,614	3,011
Published 2025 TAPR forecast [†]			2,160	2,540	2,930
Difference due to input assumptions (net change in estimated solar generation, battery charging and EV charging)			332	332	332
Difference due to model inaccuracy (total difference minus difference due to input assumptions)			-262	-258	-251
Total difference (estimated actual less published forecast)			70 (3.2%)	74 (2.8%)	81 (2.7%)

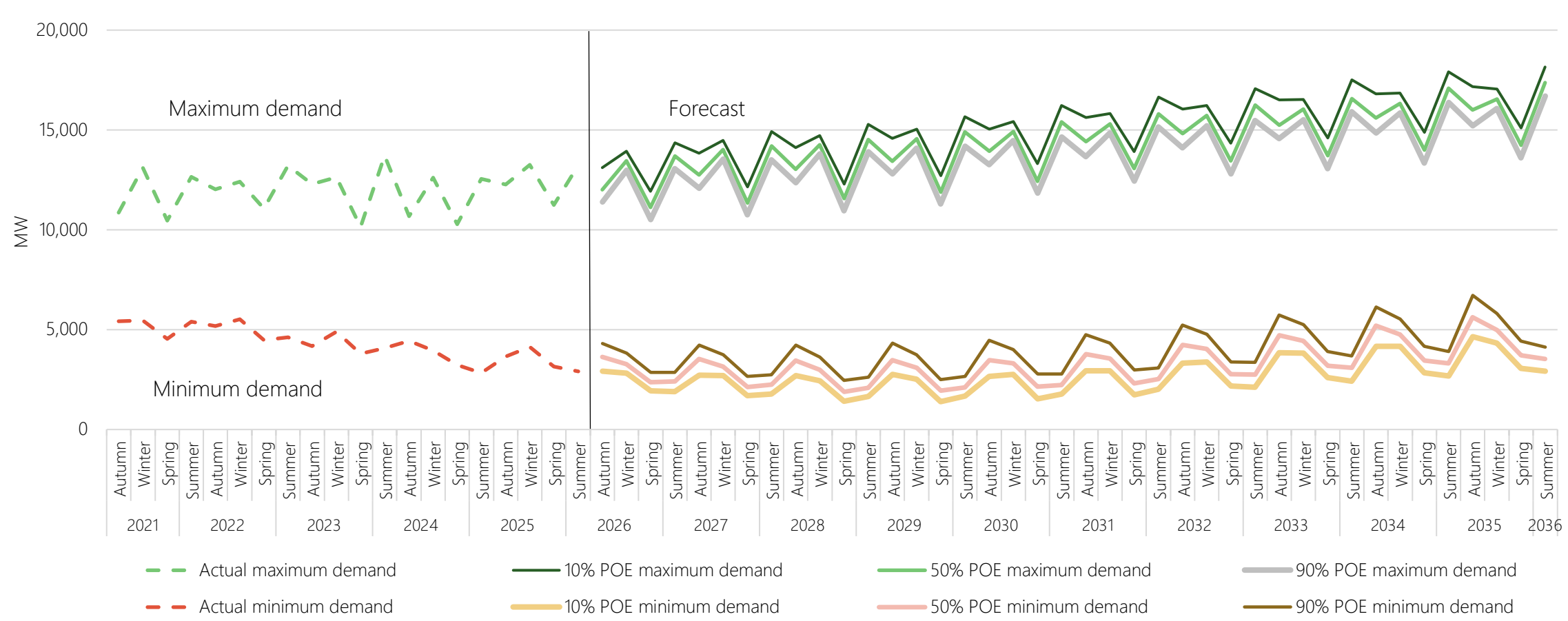
A1.5 2026 Transmission Annual Planning Report half-hourly model outputs

Additional output from the 2026 load forecasting model is shown in this section.

A1.5.1 Maximum and minimum demands

Figure A1.12 shows recent widening gaps between maximum and minimum demand, and the expected impact of rapidly growing data centre demand in both raising maximum demand and arresting the decline in minimum demand. Minimum demands are likely to occur in spring or summer, and summer maximum demands are likely to exceed winter maximum demands.

Figure A1.12: Historical and Central scenario maximum and minimum demand



A1.5.2 Future demand profiles

The following figures show projected changing contributions of underlying demand, data centre loads, CER and EV charging to extreme network demands.

Summer maximum demand

Figure A1.13 shows the recent summer maximum demand day (10/01/2026) broken into estimated components and Figure A1.14 shows the equivalent 50 per cent POE projection for summer FY36. On a typical summer maximum demand day, the afternoon peak in underlying demand is offset by solar generation, pushing the actual network peak later. However, overcast days with otherwise high demand (not shown) could also start to draw high network loads earlier in the day due to the absence of consumer solar generation. An increase in evening battery discharging will contribute to a small but significant reduction in summer maximum demand. The largest increase in maximum demand by summer FY36 is projected to come from data centres.

Figure A1.13: Day profile of network FY26 summer maximum demand

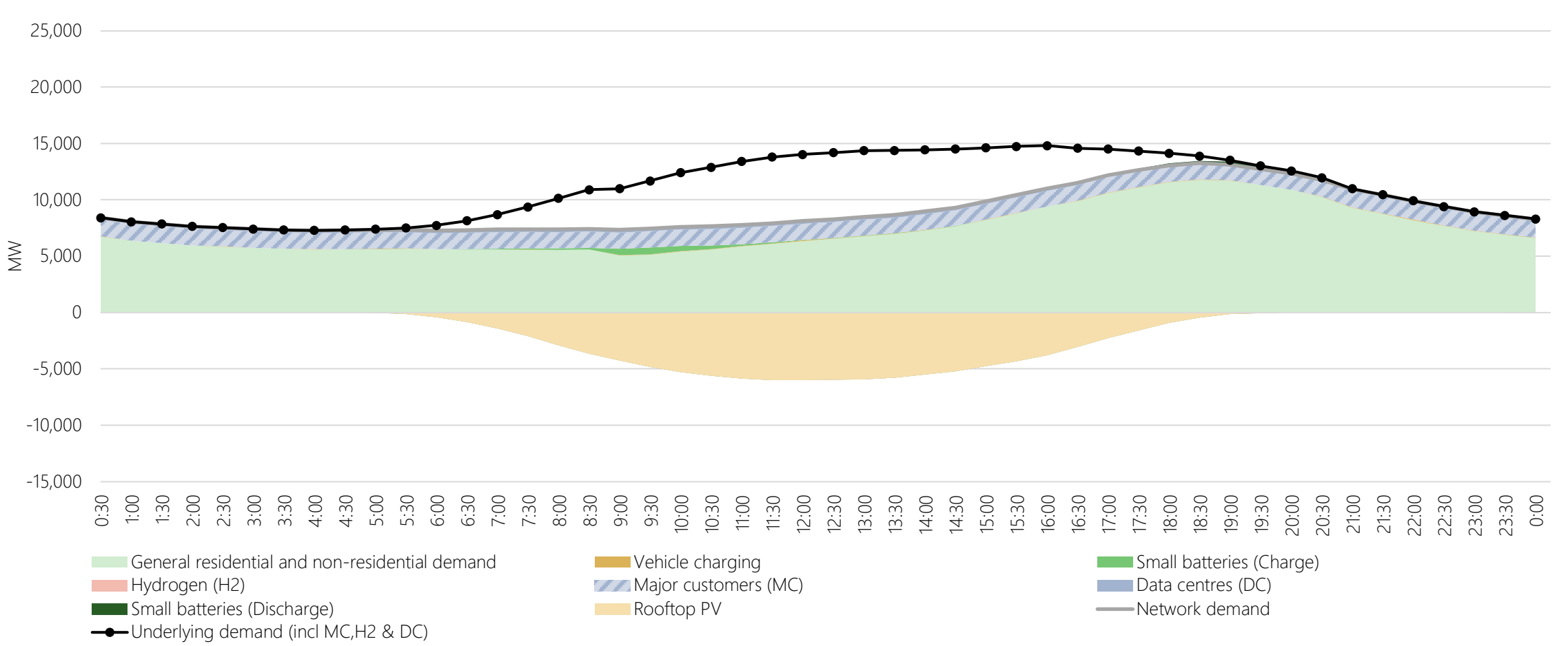
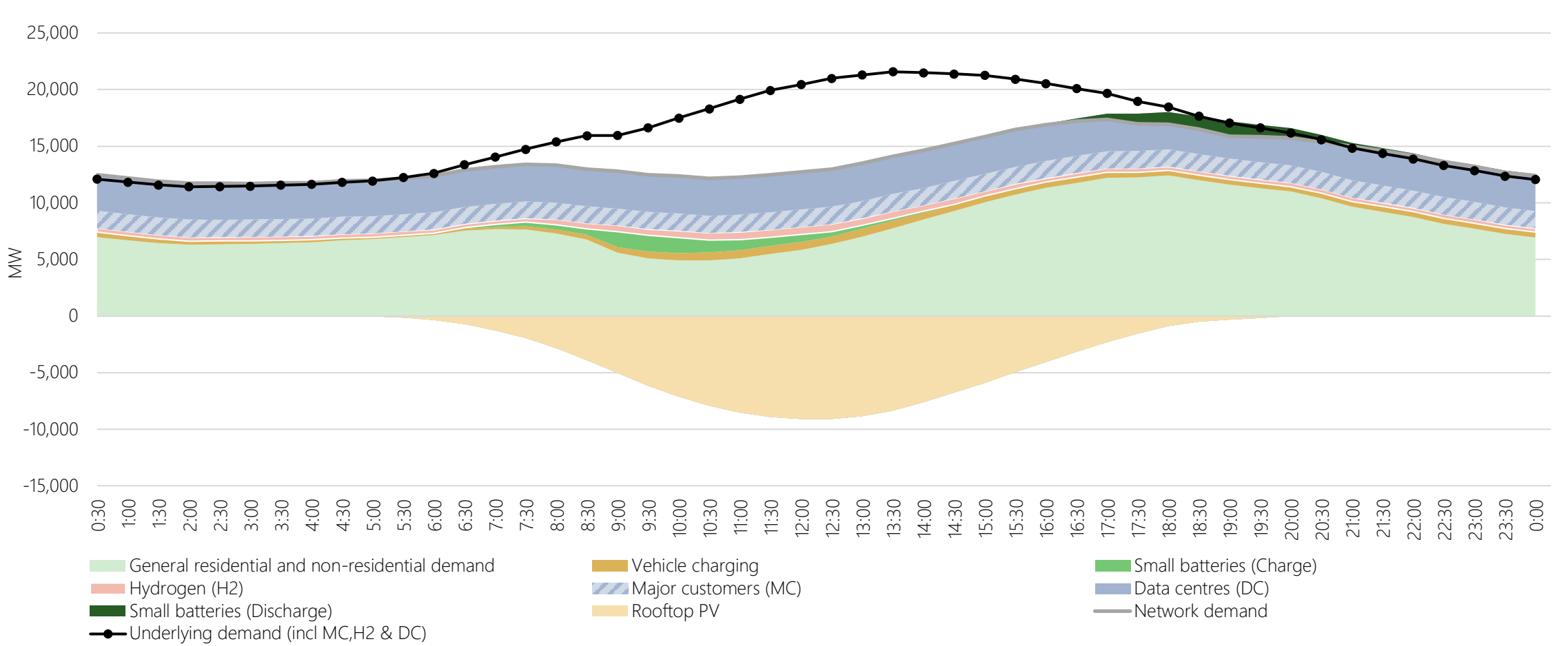


Figure A1.14: Day profile of FY36 50% POE summer maximum demand projection



Winter maximum demand

Figure A1.15 shows last year’s winter maximum demand day (1/07/2025) broken into estimated components and Figure A1.16 shows the equivalent for 2034. Significant projected growth in consumer solar generation will do nothing to reduce the evening network peak; however small battery discharging and a drop in EV charging at these times will make a significant contribution. The assumed patterns of future battery and EV charging are critical to these conclusions. There will nonetheless be a large increase in demand by 2035 due to projected growth in data centre loads centres.

Figure A1.15: Daily profile of network 2025 winter maximum demand

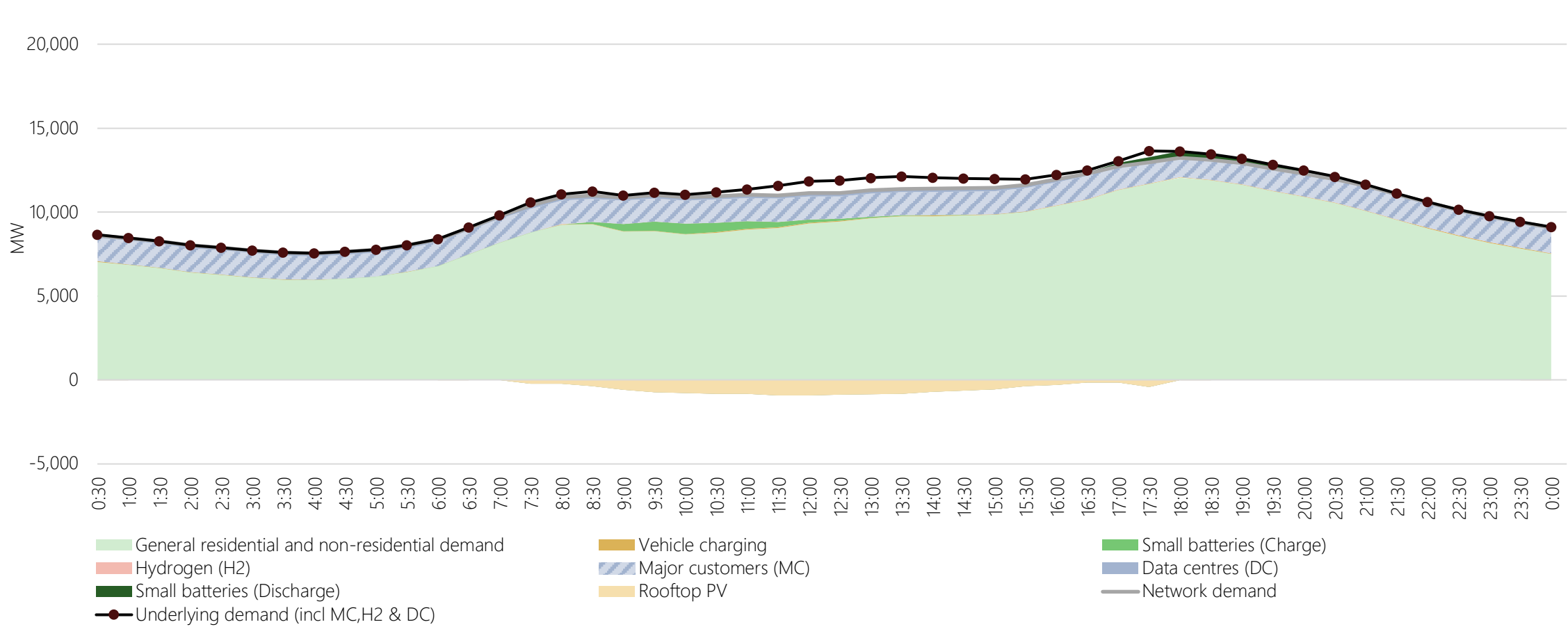
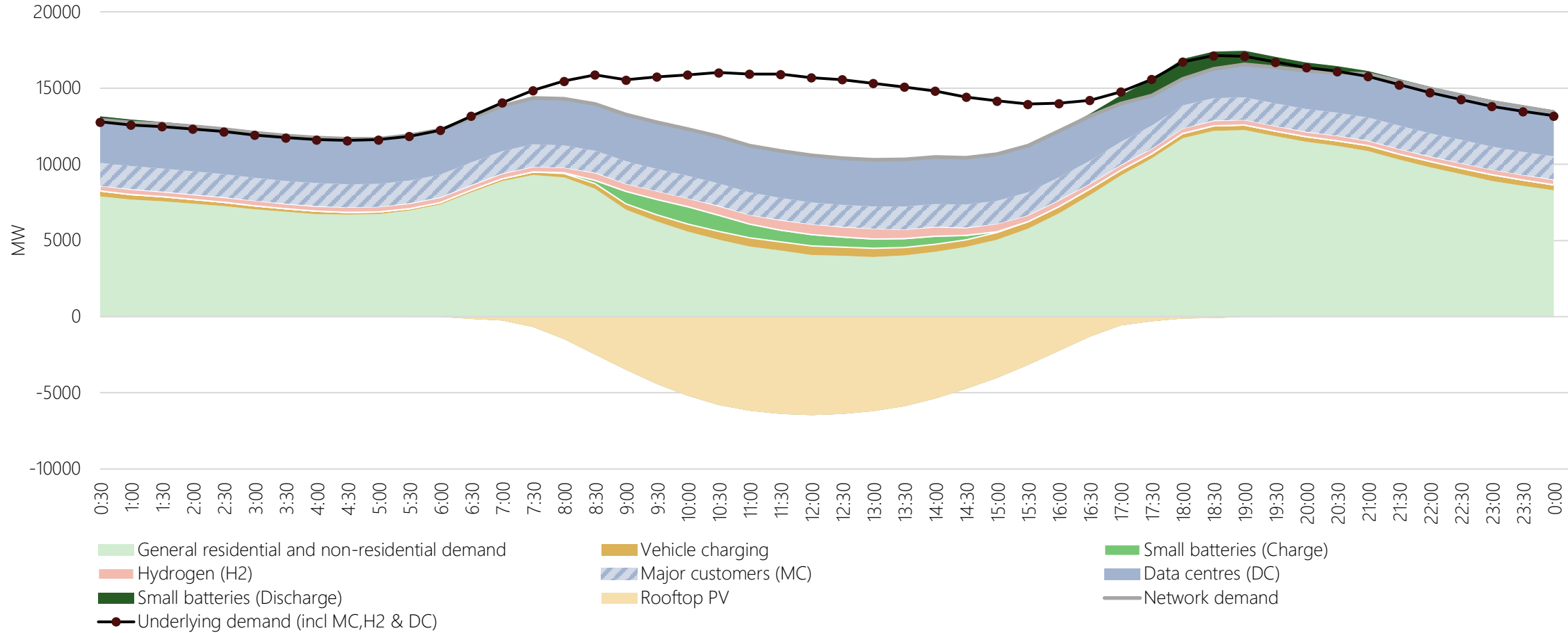


Figure A1.16: Daily profile of 2035 50% POE winter maximum demand projection



Yearly minimum demand

Figure A1.17 shows the day of yearly minimum demand (29/12/2025) broken into estimated components and Figure A1.18 shows the equivalent 50 per cent POE projection for FY36. Projected minimum demand is pushed lower by growing consumer solar generation, but this is projected to be eventually offset by new data-centre loads. EV and small-scale battery charging during the middle of the day, and the development of renewable hydrogen production, will also help to offset the impact of consumer solar generation.

Figure A1.17: Daily profile of network FY26 minimum demand

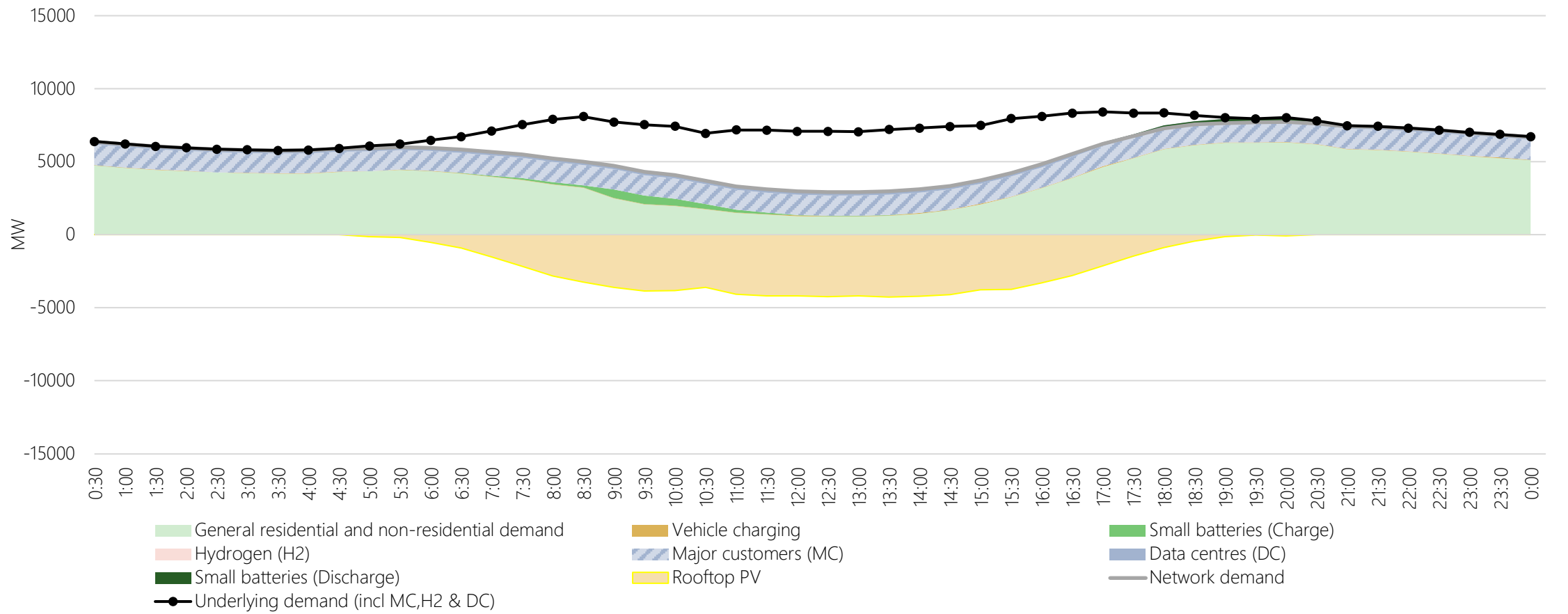
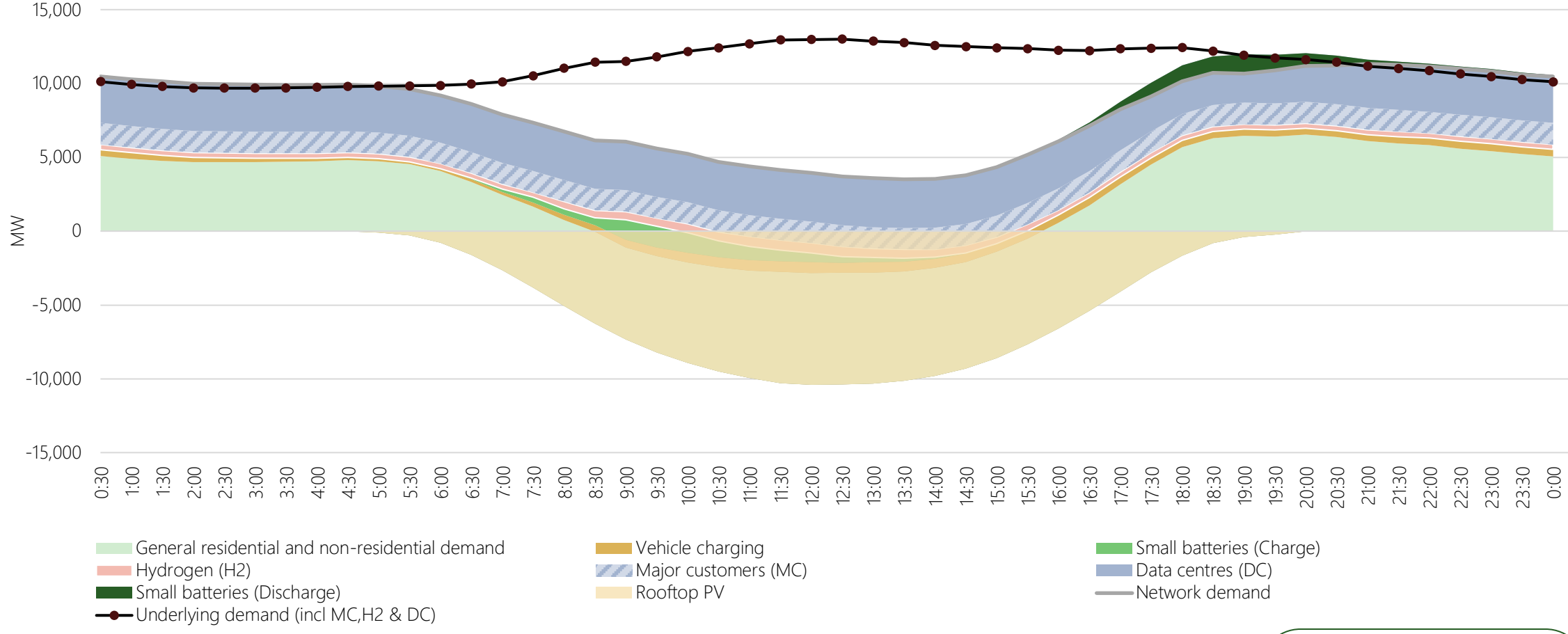


Figure A1.18: Daily profile of FY36 50% POE minimum demand projection



A1.6 Data centres

Transgrid and NSW Region DNSPs¹⁰² commissioned Baringa to develop a bottom-up forecast of data centre load in NSW, using data centre connection enquiries provided by Transgrid and DNSPs. Baringa then applies its methodology to derive a most likely Central forecast, along with High and Low scenarios. Differences between the Low, Central and High scenarios are driven by project progression and inclusion assumptions.

Baringa’s modelling process comprised the following process:

- **Data collection and validation**
Data centre pipeline information was collected from participating Transgrid and DNSPs during March 2026. A standardised template aligned with AEMO’s Standing Information Request was used. The survey captured project-level details, including developer, location, connection point, project status, capacity, ramp rate, and utilisation. Cross-checking was undertaken to identify and remove duplicate entries.
- **Application of project inclusion framework**
An inclusion framework was applied to determine the proportion of rated capacity to incorporate based on project status. Committed projects are fully incorporated, while some proposed or anticipated projects were included where there was credible evidence of project progression, varying by scenario.
- **Application of de-rating factors**
Developer and scenario specific de-rating factors were then applied to account for project realisation likelihood.

- **Conversion from capacity to final data centre demand**
The adjusted capacity was then converted into timeseries using ramp rate assumptions. NSP-provided ramp rates were used where available and considered reasonable. Otherwise, standard assumptions were applied by data centre type:
 - 14 years for hyperscale facilities
 - 11 years for co-location providers
 - 10 years for other facilities
- **Application of load realisation assumption**
Load realisation factors were applied to estimate peak demand by data centre type.
- **Results aggregation**
Peak demand was converted to average demand and then to annual energy consumption using a 96 per cent load factor. Results were aggregated at the project level and summed across NSW to produce regional data centre demand forecasts to 2040.

Figure A1.19: NSW Data centre peak demand forecast - Central scenario

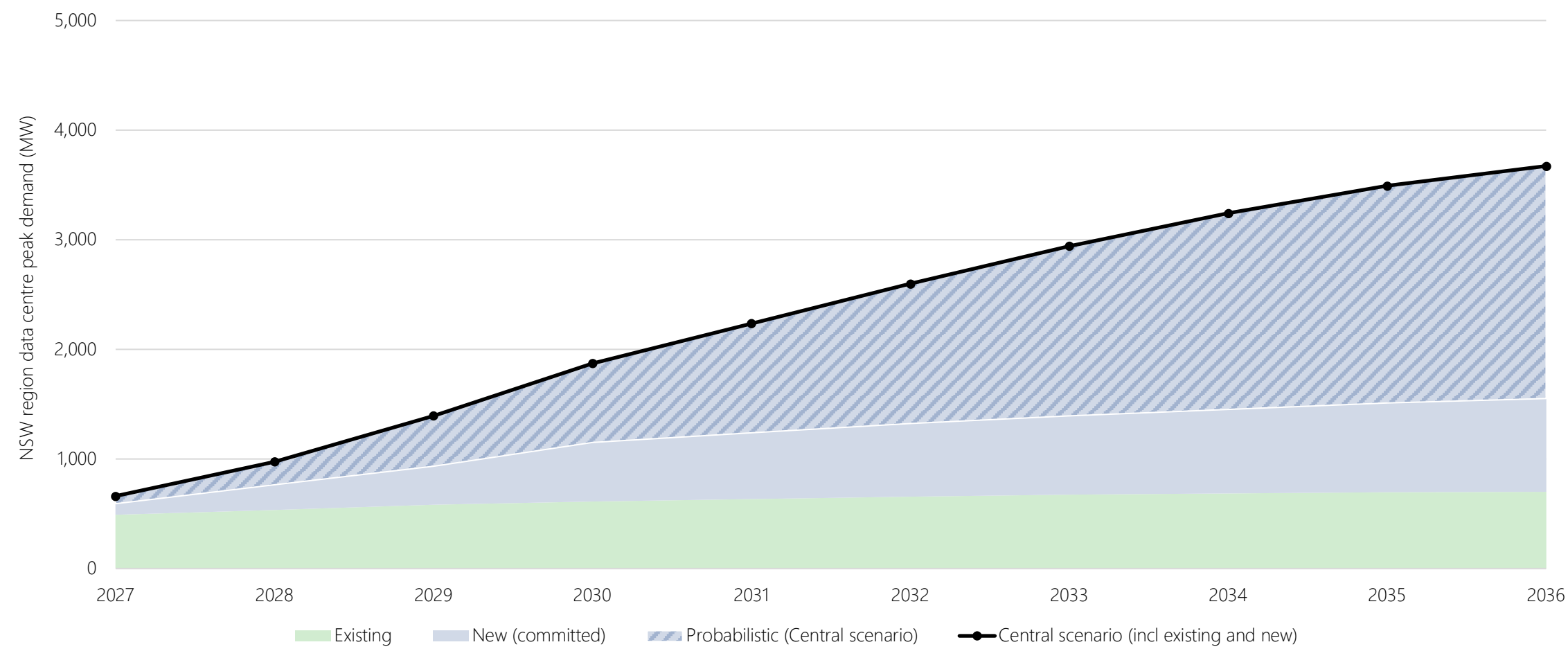


Figure A1.19 shows that under the Central scenario, total data centre peak demand is expected to exceed the 2027 data centre peak demand by six times, from 660 MW in 2027 to 3,670 MW in 2036.

102 Participating DNSPs in Baringa’s data centre study include Ausgrid, Endeavour Energy and Evoenergy.

A1.7 Review by Frontier Economics and Transgrid response

Frontier Economics was engaged by Transgrid to undertake an independent review of its approach to load forecasting for the NSW Region. Load forecasts are integral to transmission planning and investment decision-making. This review aimed to provide assurance on whether current forecasting practices align with industry best practices, and whether the resulting forecasts are reasonable considering available information.

The review comprised two key sections. The first was a landscape review of forecasting methodologies employed by comparable organisations, with the objective of identifying best practice in electricity demand forecasting. The second part involved an assessment of the reasonableness and robustness of Transgrid’s NSW load forecasts. This included an evaluation of the methodologies, inputs, and assumptions developed by Transgrid and GHD underpinning the forecasts, as well as the forecast outputs themselves. The review was conducted over April and May 2026.

Frontier Economics concluded that Transgrid’s NSW load forecasts are reasonable overall. They concluded that the models demonstrate strong statistical fit, are based on economically sound demand drivers, and are consistent with insights from the landscape review. While minor issues were identified, these were not considered material. These matters were raised with Transgrid and GHD, and these have since been fully addressed prior to the finalisation of the 2026 Transmission Annual Planning Report NSW load forecasts. A detailed summary of these issues is provided in Table A1.11.

Table A1.11: Summary of evaluation of Transgrid’s NSW load forecasting model

Model	Strengths	Potential issues	Transgrid response
Long-run component of the half-hourly model	Appropriate autoregressive structure and economically grounded demand drivers. The built-in lag-length selection reduces the risk of overfitting. While the variables are non-stationary in levels, they are cointegrated, which means that estimating the model in levels is valid. The model does not exhibit evidence of conditional heteroskedasticity.	The model exhibits evidence of serial correlation. Electrification has not yet been integrated into the model. Use of maximum and minimum demand day profiles in battery and EV modelling. Inconsistency between battery data and equations in the econometric software EViews.	We have adopted Frontier Economics’ advice in estimating the standard errors using Newey-West correction. Serial correlation may introduce bias in the forecasts. However, we have selected a parsimonious model using within-sample forecast bias as the final selection test. Historical electrification has been captured implicitly in demand trends within the model. Estimates of independent additional future electrification are difficult to identify. Use of the same day profile for all days in the season may unrealistically represent a continuous load trace. However, our primary purpose is to identify the maximum and minimum points for each season. After a review we have implemented a limited response of battery use to days of low PV generation (when it may be assumed there is lesser capability to charge batteries via self-generated energy). We have reviewed the sign in the equation for adjusting for battery demand and we believe Frontier Economics’ statement to be incorrect (as net charging enters the long-run adjustment equations as a positive number).
Weather sampling	The distributions of resampled weather data are preserved. The temporal dependence of resampled weather data is generally preserved. The joint relationships amongst resampled weather variables are preserved.		
Solar PV generation forecasts	The forecasts have a strong fit and economically grounded demand drivers.	Some of the models’ residuals exhibit time dependence, indicating potential model misspecification. The models embed a trending PV installed capacity term, which leads to conditional heteroskedasticity. The models exhibit evidence of multicollinearity.	We have modified the PV generation model, changing the left-hand-side variable to capacity factor. This should eliminate time dependency, conditional and heteroskedasticity multicollinearity.
Half-hourly demand equations	Appropriate autoregressive structure and economically grounded demand drivers. The built-in lag-length selection reduces the risk of overfitting. By disaggregating public holiday dummy variables, the models allow differing demand impacts across holidays. The models do not exhibit evidence of serial correlation or conditional heteroskedasticity.	Battery post model adjustments are scaled down unnecessarily.	We have revised how data is incorporated into the model inputs to address this issue.

Bulk supply point projections

A2.1 Individual bulk supply point projections

Understanding where electricity demand is expected to grow helps Transgrid and its customers identify where future network capacity may be needed. The following tables provide forecasts for local bulk supply point (BSP) demand and major industrial loads, giving a more complete picture of how demand is expected to evolve across the NSW transmission network.

Tables A2.1 to A2.10 provide the maximum demand projections supplied by our customers for individual BSPs, based on local knowledge and the availability of historical data. These projections are for the highest demand expected at each BSP during each season. Because these local peaks occur at different times, they should not be interpreted as demand during the NSW Region's overall peak, nor do these data represent all the industrial load in our forecasts. Some large, relatively stable industrial loads connected directly to Transgrid's network are modelled separately from BSP demand forecasts. These loads are excluded from the BSP projections and presented as aggregated forecasts. Other industrial loads are included in BSP forecasts provided by DNSPs.

Table A2.11 and Table A2.12 show the aggregate maximum demand projections for all identified major industrial loads in the NSW Region — including prospective data centres connecting directly to Transgrid, but excluding those already captured in the BSP forecasts.



Table A2.1: Ausgrid bulk supply point summer maximum demand¹⁰³

Location	2026/27			2027/28			2028/29			2029/30			2030/31			2031/32			2032/33			2033/34			2034/35			2035/36		
	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA
Beaconsfield West 132 kV	422	8	422	434	6	434	455	11	455	474	22	474	506	43	508	503	19	503	619	20	619	600	18	600	605	22	605	597	36	598
Rookwood Rd 132 kV	232	7	232	235	-10	235	249	15	250	260	22	261	280	20	280	281	12	281	340	6	340	330	14	330	333	16	334	328	14	328
Haymarket 132 kV	498	77	504	519	82	526	547	88	554	584	88	590	613	93	620	630	62	633	559	54	561	585	81	590	588	68	591	578	57	581
Liddell 33 kV	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15
Munmorah 132 kV & 33 kV	144	39	150	147	38	152	150	39	155	153	36	157	156	37	160	163	41	168	168	50	175	169	47	176	171	47	178	172	49	179
Muswellbrook 132 kV	154	83	175	18	75	77	63	22	66	67	23	71	69	24	73	83	28	88	84	28	89	85	28	90	86	29	91	87	29	92
Newcastle 132 kV	524	217	567	534	223	579	540	201	577	647	180	672	699	173	721	743	194	768	765	152	780	787	240	823	825	233	857	851	289	899
Sydney East 132 kV	687	108	695	738	136	750	752	138	764	813	173	831	867	207	891	900	240	932	939	265	975	939	249	971	959	275	998	940	255	974
Sydney North 132 kV	784	40	785	903	86	907	1028	135	1037	1192	202	1209	1305	251	1329	1429	328	1466	1562	405	1614	1629	465	1694	1701	516	1777	1702	522	1780
Sydney South 132 kV	1157	163	1169	1174	136	1182	1205	141	1213	1270	171	1282	1317	187	1331	1348	121	1353	1276	151	1285	1293	160	1303	1331	188	1345	1287	147	1296
Tomago 132 kV	327	89	339	343	91	355	170	28	172	169	14	170	174	15	175	182	22	183	185	24	187	218	6	218	218	6	218	219	5	219
Tuggerah 132 kV	274	59	281	280	75	290	278	72	288	285	81	297	285	75	295	292	82	303	300	81	311	311	89	323	312	87	324	315	90	328
Vales Point 132 kV	110	-2	110	111	-8	111	109	-5	109	101	-9	101	109	7	109	110	3	111	117	4	117	125	13	126	128	9	129	131	13	132
Waratah West 132 kV	69	19	71	66	18	69	141	26	144	155	29	158	168	34	172	181	37	185	194	41	199	207	46	212	221	50	227	231	53	237

103 Zone substation projections aggregated to Transgrid bulk supply points using agreed load flow models.

Table A2.2: Ausgrid bulk supply point winter maximum demand¹⁰⁴

Location	2026			2027			2028			2029			2030			2031			2032			2033			2034			2035		
	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA
Beaconsfield West 132 kV	394	26	395	408	53	411	430	50	433	444	59	448	454	45	456	465	51	468	476	47	479	585	32	586	544	29	544	551	47	553
Rookwood Rd 132 kV	212	29	214	217	25	219	231	34	234	240	40	243	255	34	257	263	39	266	262	35	264	318	30	320	303	33	305	304	24	305
Haymarket 132 kV	457	102	468	471	105	483	498	116	511	530	126	545	585	66	589	598	87	605	616	81	621	558	96	566	575	94	583	579	100	587
Liddell 33 kV	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15	14	7	15
Munmorah 132 kV & 33 kV	137	28	140	137	28	140	142	32	145	146	33	150	140	27	143	144	30	147	148	26	150	152	34	156	155	39	160	157	41	162
Muswellbrook 132 kV	160	84	181	161	84	182	90	70	114	21	23	31	23	23	33	38	25	45	40	26	47	53	25	59	56	25	61	59	27	65
Newcastle 132 kV	437	120	453	414	132	434	454	187	491	702	288	758	767	309	827	808	206	833	854	243	888	865	249	900	895	352	962	925	369	996
Sydney East 132 kV	691	119	701	744	147	759	757	153	773	812	185	833	880	215	906	918	244	950	957	271	995	955	273	993	976	272	1013	988	296	1032
Sydney North 132 kV	735	141	748	849	176	867	964	219	989	1125	166	1137	1235	225	1255	1352	293	1384	1540	414	1595	1615	470	1682	1620	458	1683	1650	499	1724
Sydney South 132 kV	1029	36	1030	1054	41	1055	1101	62	1103	1169	80	1172	1221	79	1223	1231	77	1234	1299	109	1304	1235	129	1242	1248	144	1256	1252	137	1259
Tomago 132 kV	296	14	297	262	4	262	322	37	325	220	24	222	240	18	240	245	22	246	247	24	248	248	23	249	281	40	284	282	41	285
Tuggerah 132 kV	257	57	263	262	54	268	269	60	276	285	65	293	284	71	293	288	72	297	294	71	302	299	71	307	296	52	300	299	54	304
Vales Point 132 kV	101	-19	103	102	-16	103	109	-14	110	127	-4	127	116	0	116	124	14	125	128	12	129	132	13	132	134	18	135	138	20	139
Waratah West 132 kV	107	24	110	105	23	108	172	32	175	186	36	189	200	41	204	213	45	218	227	49	232	239	53	245	252	57	258	262	61	269

104 Zone substation projections aggregated to Transgrid bulk supply points using agreed load flow models.

Table A2.3: Endeavour Energy bulk supply point summer maximum demand¹⁰⁵

Location	2026/27			2027/28			2028/29			2029/30			2030/31			2031/32			2032/33			2033/34			2034/35			2035/36		
	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA
Dapto 132 kV	709	-13	709	729	-18	729	740	-20	740	747	-22	747	757	-24	757	774	-28	775	794	-33	795	807	-36	807	808	-37	809	809	-37	810
Holroyd 132 kV	414	-19	415	438	-13	438	457	-8	457	473	-5	473	493	0	493	518	5	518	548	12	548	577	18	578	603	24	603	622	29	622
Ilford 132 kV	6	0	6	9	0	9	14	1	14	17	2	17	18	2	18	18	2	18	18	2	18	18	2	18	18	2	18	18	2	18
Ingleburn 66 kV	167	19	169	170	19	171	172	19	173	173	19	174	175	20	176	178	20	179	182	21	183	184	21	186	186	21	187	189	22	190
Kemps Creek 132kV	0	0	0	0	0	0	3	0	3	113	0	113	150	0	150	196	0	196	279	0	279	325	0	325	367	0	367	407	0	407
Liverpool 132 kV	617	46	619	638	50	640	656	54	658	675	57	677	699	61	702	726	66	729	755	71	758	777	75	780	795	78	799	817	80	821
Macarthur 66 kV	180	25	182	193	29	195	203	32	205	217	36	220	229	39	232	244	44	248	259	48	263	272	52	277	282	55	287	293	57	299
Macarthur 132 kV	194	9	194	225	20	226	248	27	249	234	23	236	253	29	254	275	37	278	301	45	304	327	55	332	355	64	360	384	73	391
Marulan 132 kV	97	19	98	103	22	105	108	25	111	112	27	115	115	29	118	118	30	122	123	33	127	126	35	131	129	36	134	132	38	138
Mount Piper 66 kV	29	10	30	29	10	30	29	10	30	28	10	30	28	10	30	29	10	30	29	10	31	29	10	31	29	10	30	28	10	30
Regentville 132 kV	317	-17	317	325	-17	326	332	-17	333	344	-18	344	357	-19	358	372	-19	372	385	-20	386	396	-21	397	405	-21	406	416	-21	416
Sydney North 132 kV	39	18	43	40	18	44	40	19	45	44	21	48	47	23	52	50	25	56	54	28	60	57	30	64	59	32	67	62	34	71
Sydney West 132 kV	1361	-246	1383	1482	-279	1508	1607	-314	1637	1650	-322	1681	1730	-343	1763	1825	-368	1862	1922	-394	1962	1984	-409	2026	2046	-424	2089	2101	-439	2147
Vineyard 132 kV	578	56	580	622	73	626	659	87	665	701	102	708	741	116	750	776	130	787	797	137	809	816	144	829	828	149	842	841	153	855
Wallerawang 66 kV	24	3	24	24	3	24	25	3	25	25	3	25	25	3	25	25	3	25	25	3	25	25	3	25	25	3	25	25	3	25
Wallerawang 132 kV	53	1	53	53	1	53	53	1	53	53	1	53	54	1	54	55	1	55	56	1	56	56	1	56	56	1	56	57	1	57

105 Marulan 132 kV: Both Endeavour Energy and Essential Energy take supply from Marulan. This forecast is for Endeavour Energy component.

Table A2.4: Endeavour Energy bulk supply point winter maximum demand¹⁰⁶

Location	2026			2027			2028			2029			2030			2031			2032			2033			2034			2035		
	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA
Dapto 132 kV	779	-30	780	811	-37	812	833	-43	834	845	-46	847	857	-48	859	873	-52	875	897	-58	898	916	-63	918	920	-64	922	918	-63	920
Holroyd 132 kV	331	-40	333	359	-34	360	382	-28	383	402	-23	402	418	-19	419	444	-13	444	471	-6	471	501	1	501	530	7	530	554	12	554
Ilford 132 kV	6	0	6	7	0	7	12	1	12	17	2	17	19	2	19	19	2	19	19	2	19	19	2	19	19	2	19	19	2	19
Ingleburn 66 kV	113	11	113	116	12	117	119	12	119	121	12	121	122	13	123	125	13	126	129	13	129	132	14	133	134	14	135	136	14	137
Kemps Creek 132kV	0	0	0	0	0	0	0	0	0	8	0	8	111	0	111	151	0	151	199	0	199	277	0	277	321	0	321	362	0	362
Liverpool 132 kV	423	10	423	446	14	446	467	18	467	485	22	486	508	25	509	532	30	533	558	34	559	582	38	583	601	41	602	620	45	622
Macarthur 66 kV	156	18	157	170	22	172	181	26	183	194	29	196	203	32	206	216	36	219	231	40	234	244	44	248	253	46	257	262	49	267
Macarthur 132 kV	186	6	186	208	14	208	236	23	237	256	30	257	246	27	248	265	33	268	288	41	291	312	49	315	336	57	341	361	66	367
Marulan 132 kV	110	26	113	116	29	119	121	32	125	125	34	129	128	36	133	131	37	136	135	39	141	139	42	145	142	43	148	144	44	151
Mount Piper 66 kV	28	10	29	28	10	30	28	10	30	28	10	29	28	9	29	28	10	29	28	10	30	28	10	30	28	10	30	28	9	29
Regentville 132 kV	286	-15	287	292	-15	293	301	-16	301	310	-16	311	324	-17	324	338	-18	339	353	-18	353	366	-19	367	376	-19	377	385	-20	385
Sydney North 132 kV	35	15	38	36	15	39	37	16	40	39	17	43	42	20	46	45	22	51	49	24	55	52	27	59	55	29	62	58	31	65
Sydney West 132 kV	1092	-164	1104	1196	-193	1212	1332	-232	1352	1455	-266	1479	1498	-275	1523	1597	-301	1626	1707	-330	1738	1790	-351	1824	1867	-371	1904	1930	-387	1968
Vineyard 132 kV	413	-4	413	451	10	451	490	24	490	528	38	529	568	53	571	604	66	607	630	76	635	650	83	655	666	89	671	679	94	685
Wallerawang 66 kV	28	4	28	28	4	29	28	4	29	29	4	29	29	4	29	29	4	29	29	4	29	29	4	29	29	4	29	29	4	29
Wallerawang 132 kV	55	1	55	56	1	56	56	1	56	56	1	56	57	2	57	58	2	58	59	2	59	60	2	60	60	2	60	60	2	60

106Marulan 132 kV: Both Endeavour Energy and Essential Energy take supply from Marulan. This forecast is for Endeavour Energy component.

Table A2.5: Essential Energy (North) bulk supply point summer maximum demand

Location	2026/27			2027/28			2028/29			2029/30			2030/31			2031/32			2032/33			2033/34			2034/35			2035/36		
	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA
Armidale 66 kV	27	-1	27	27	-1	27	27	-2	27	27	-2	27	27	-2	27	27	-2	27	27	-2	27	27	-2	27	27	-3	27	27	-3	27
Boambee South 132 kV	18	-1	18	18	-1	18	18	-1	18	18	-1	18	18	-1	18	18	-1	18	18	-1	18	18	-1	18	18	-1	18	18	-1	18
Casino 132 kV	34	7	34	34	7	34	34	6	34	34	6	34	34	6	34	34	6	34	34	6	34	34	6	35	34	6	35	34	6	35
Coffs Harbour 66 kV	61	-12	62	61	-10	62	62	-10	62	62	-8	62	62	-7	62	62	-6	62	62	-6	63	62	-5	63	62	-4	62	63	-3	63
Dorrigo 132 kV	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2
Dunoon 132 kV	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6
Glen Innes 66 kV	10	-5	11	10	-5	11	10	-5	11	10	-5	12	10	-5	12	11	-5	12	11	-5	12	11	-5	12	11	-5	12	11	-6	12
Gunnedah 66 kV	29	-2	29	38	2	38	39	2	39	39	2	39	39	2	39	39	2	39	39	2	39	39	2	39	39	3	39	39	3	39
Hawks Nest 132 kV	10	1	10	10	1	10	10	1	10	10	1	10	10	1	10	10	1	10	10	1	10	10	1	10	10	1	10	10	1	10
Herons Creek 132 kV	13	1	13	13	1	14	14	1	14	14	1	14	14	1	14	14	1	14	14	1	14	14	1	14	15	1	15	15	1	15
Inverell 66 kV	35	-6	36	36	-7	36	36	-7	36	36	-7	36	36	-7	36	36	-7	36	36	-7	36	35	-7	36	36	-7	36	36	-8	36
Kempsey 33 kV	32	4	32	32	4	33	32	4	33	33	4	33	33	4	33	33	4	33	33	4	33	33	4	33	33	4	34	33	4	34
Koolkhan 66 kV	53	-9	54	53	-10	54	53	-11	54	53	-12	54	53	-12	54	53	-13	54	53	-14	55	53	-14	55	53	-15	55	53	-15	55
Lismore 132 kV	95	-12	95	95	-14	96	96	-16	98	97	-17	99	98	-19	100	99	-20	101	99	-22	102	100	-23	103	101	-25	104	102	-26	105
Macksville 132 kV	9	0	9	9	0	9	9	0	9	9	0	9	9	0	9	9	0	9	9	-1	10	10	-1	10	10	-1	10	10	-1	10
Moree 66 kV	30	-1	30	34	-1	34	38	0	38	41	0	41	44	1	44	47	1	47	49	2	49	51	2	51	53	2	53	55	2	55
Mullumbimby 11 kV	8	-1	8	8	-1	8	8	-1	8	8	-2	9	8	-2	9	8	-2	9	8	-2	9	9	-3	9	9	-3	9	9	-3	9
Mullumbimby 132 kV	57	5	57	58	6	58	58	6	58	59	6	59	59	7	60	60	7	60	61	7	61	61	8	62	62	8	62	62	8	63
Nambucca 66 kV	8	-1	8	8	-1	8	8	-1	8	8	-1	8	8	-1	8	8	-1	8	8	-1	8	8	-1	8	8	-1	8	8	-1	8
Narrabri 66 kV	55	-8	55	56	-9	57	57	-10	58	70	-6	71	103	3	103	115	6	115	115	5	115	116	5	116	119	5	119	121	4	121
Port Macquarie 33 kV	75	4	75	76	4	76	77	5	77	77	5	77	78	5	78	78	6	79	79	6	79	80	6	80	80	6	80	81	7	81
Raleigh 132 kV	11	1	11	11	1	11	11	1	11	11	1	11	11	1	11	11	1	11	11	1	11	11	1	11	11	1	11	11	1	11
Stroud 132 kV	36	8	37	36	9	37	36	9	37	36	10	37	36	10	37	36	11	37	35	11	37	35	11	37	35	12	37	35	12	37
Tamworth 66 kV	136	23	138	138	24	140	139	24	141	138	23	140	141	24	143	140	23	142	142	24	144	142	23	144	141	23	143	141	23	143
Taree 33 kV	31	4	31	31	4	31	31	4	31	31	4	31	31	4	31	31	4	31	31	4	31	31	4	31	31	4	31	31	4	31
Taree 66 kV	54	4	54	54	3	54	54	3	54	54	3	54	54	3	54	54	3	54	54	3	54	55	3	55	55	2	55	55	2	55
Tenterfield 22 kV	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4
Terranora 110 kV	106	5	107	108	4	108	109	4	109	110	3	110	110	3	110	111	2	111	112	2	112	113	1	113	113	1	113	114	1	114

Table A2.6: Essential Energy (North) bulk supply point winter maximum demand

Location	2026			2027			2028			2029			2030			2031			2032			2033			2034			2035		
	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA
Armidale 66 kV	48	0	48	49	0	49	49	0	49	49	0	49	50	0	50	50	0	50	50	0	50	51	0	51	51	0	51	51	0	51
Boambee South 132 kV	19	-1	19	19	-1	19	19	-2	19	19	-2	19	19	-2	19	19	-2	19	19	-2	19	19	-2	19	19	-2	19	19	-2	19
Casino 132 kV	23	4	23	23	5	24	23	5	24	23	5	24	23	5	24	23	5	24	24	5	24	24	5	24	24	6	25	24	6	25
Coffs Harbour 66 kV	62	-12	63	62	-12	64	63	-13	64	63	-13	64	63	-14	65	63	-14	65	64	-14	65	64	-15	66	64	-15	66	64	-15	66
Dorrigo 132 kV	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2
Dunoon 132 kV	6	0	6	6	0	6	6	0	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6
Glen Innes 66 kV	15	-2	15	15	-2	15	15	-2	16	15	-2	16	16	-2	16	16	-2	16	16	-2	16	16	-2	16	16	-2	16	16	-2	16
Gunnedah 66 kV	26	-2	26	27	-2	27	36	0	36	36	0	36	36	-1	36	36	-1	36	37	-1	37	37	-2	37	37	-2	37	37	-2	37
Hawks Nest 132 kV	8	1	8	8	2	8	8	2	8	8	2	8	7	2	8	7	2	8	7	2	8	7	2	8	7	2	8	7	2	8
Herons Creek 132 kV	11	0	11	11	0	11	11	0	11	11	0	11	11	0	11	11	0	11	12	0	12	12	0	12	12	0	12	12	0	12
Inverell 66 kV	34	-9	35	34	-9	36	35	-9	36	35	-9	36	35	-10	36	35	-10	37	35	-10	37	35	-10	37	36	-10	37	36	-10	37
Kempsey 33 kV	31	1	31	31	1	31	31	1	32	32	1	32	32	1	32	32	1	32	32	1	32	32	1	32	32	1	32	32	1	32
Koolkhan 66 kV	51	-8	52	51	-8	52	51	-8	52	51	-9	52	51	-9	52	51	-9	52	51	-10	52	51	-10	52	51	-10	52	51	-10	52
Lismore 132 kV	96	0	96	96	0	96	97	0	97	98	-1	98	98	-1	98	99	-1	99	99	-2	99	100	-2	100	101	-2	101	101	-2	101
Macksville 132 kV	10	0	10	10	0	10	10	0	10	10	0	10	10	0	10	10	0	10	10	0	10	10	0	10	10	0	10	10	0	10
Moree 66 kV	40	-9	41	43	-9	44	48	-8	48	52	-8	53	56	-8	56	59	-7	60	62	-7	63	65	-7	66	68	-6	68	71	-6	71
Mullumbimby 11 kV	11	0	11	11	0	11	12	0	12	12	0	12	12	0	12	12	0	12	12	0	12	12	0	12	12	0	12	13	0	13
Mullumbimby 132 kV	52	-6	52	52	-7	52	52	-7	52	52	-8	53	52	-8	53	52	-9	53	52	-9	53	53	-9	53	53	-10	54	53	-10	54
Nambucca 66 kV	9	-1	9	9	-1	9	9	-1	9	9	-1	9	9	-1	9	9	-1	9	9	-1	9	9	-2	9	9	-2	9	9	-2	9
Narrabri 66 kV	56	-8	57	58	-10	59	63	-10	64	70	-10	70	95	-3	95	124	4	124	124	3	124	125	2	125	126	1	126	130	2	130
Port Macquarie 33 kV	81	2	81	82	3	82	82	3	82	82	4	83	83	4	83	83	4	83	84	5	84	84	5	84	84	5	84	85	5	85
Raleigh 132 kV	11	0	11	11	0	11	11	1	11	11	1	11	11	1	11	11	1	11	11	1	11	11	1	11	11	1	11	11	1	11
Stroud 132 kV	33	4	34	34	4	34	34	5	34	34	5	35	35	6	35	35	6	36	35	7	36	35	7	36	36	8	37	36	8	37
Tamworth 66 kV	111	9	112	121	12	122	123	13	123	125	13	126	127	14	128	128	14	129	131	15	132	132	15	133	134	16	135	135	16	136
Taree 33 kV	26	1	26	26	1	26	26	1	26	26	1	26	26	1	26	26	0	26	26	0	26	26	0	26	26	0	26	26	0	27
Taree 66 kV	55	2	55	55	2	55	55	1	55	55	1	55	55	1	55	55	1	55	56	1	56	56	1	56	56	1	56	56	1	56
Tenterfield 22 kV	6	0	6	6	0	6	6	0	6	6	0	6	6	0	6	6	0	6	6	0	6	6	0	6	7	0	7	7	0	7
Terranora 110 kV	87	-3	87	87	-4	87	88	-4	88	88	-4	88	88	-5	88	88	-5	89	89	-5	89	89	-5	89	90	-6	90	90	-6	90

Table A2.7: Essential Energy (Central) bulk supply point summer maximum demand

Location	2026/27			2027/28			2028/29			2029/30			2030/31			2031/32			2032/33			2033/34			2034/35			2035/36		
	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA
Beryl 66 kV	77	20	79	77	20	79	77	20	80	78	21	81	78	21	81	79	22	81	79	22	82	79	22	82	80	23	83	80	23	83
Cowra 66 kV	37	2	37	37	2	38	38	2	38	38	3	38	38	3	39	39	3	39	39	3	39	39	3	39	40	3	40	40	3	40
Forbes 66 kV	32	2	32	32	2	32	32	2	32	32	2	32	32	2	32	32	2	32	32	2	32	31	2	31	31	2	31	31	2	31
Manildra 132 kV	12	5	13	12	5	13	12	5	13	13	5	14	13	5	14	13	5	14	13	5	14	13	5	14	13	6	14	13	6	14
Molong 66 kV	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5
Mudgee 132 kV	29	0	29	29	-1	29	30	-1	30	30	-1	30	31	-1	31	31	-1	31	32	-2	32	32	-2	32	33	-2	33	33	-2	33
Orange 66 kV	46	-9	47	46	-8	46	45	-8	46	45	-8	46	45	-8	46	45	-8	46	45	-8	45	45	-7	45	44	-8	45	44	-8	45
Orange 132 kV	178	12	179	181	12	181	183	12	184	186	12	186	188	12	188	190	12	190	191	12	192	194	12	194	195	12	196	197	12	197
Panorama 66 kV	70	8	70	70	8	70	70	8	70	70	8	70	70	8	70	70	7	70	70	7	70	70	7	70	70	7	70	70	7	70
Parkes 66 kV	33	4	34	34	4	34	34	4	34	34	5	35	35	5	35	35	5	35	35	5	36	35	5	36	36	5	36	36	6	36
Parkes 132 kV	41	8	42	49	9	50	57	10	58	60	9	61	64	10	65	67	9	68	70	9	71	73	9	73	75	9	76	77	9	78
Wallerawang 66 kV	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	3	0	4
Wallerawang 132 kV	33	18	37	34	19	39	34	20	40	35	20	40	35	21	41	36	22	42	37	22	43	37	23	44	38	24	44	38	24	45
Wellington 132 kV incl Town	199	-5	199	199	-6	199	199	-7	199	199	-8	199	199	-9	199	199	-10	199	199	-11	199	199	-12	199	199	-13	199	199	-13	199

Table A2.8: Essential Energy (Central) bulk supply point winter maximum demand

Location	2026			2027			2028			2029			2030			2031			2032			2033			2034			2035		
	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA	MW	MVA _r	MVA
Beryl 66 kV	79	15	80	79	15	80	79	15	80	79	15	80	79	15	80	79	15	80	79	15	80	79	15	80	79	15	80	79	14	80
Cowra 66 kV	27	-3	27	27	-3	27	27	-4	27	27	-4	27	27	-4	27	27	-4	27	27	-4	27	27	-4	27	27	-5	27	27	-5	27
Forbes 66 kV	26	-1	26	26	-1	26	26	0	26	26	0	26	26	0	26	26	0	26	26	1	26	26	1	26	27	1	27	27	1	27
Manildra 132 kV	13	4	13	13	4	13	13	4	13	13	4	13	13	4	13	13	4	13	13	4	13	13	4	13	13	4	13	13	4	13
Molong 66 kV	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5	5	-1	5
Mudgee 132 kV	25	-2	25	25	-2	25	25	-3	25	25	-3	25	25	-3	25	25	-3	26	25	-3	26	26	-3	26	26	-3	26	26	-3	26
Orange 66 kV	67	4	67	68	5	68	69	5	69	69	5	70	70	5	70	71	6	71	71	6	71	72	6	72	72	6	72	72	6	73
Orange 132 kV	175	19	176	177	19	178	178	19	179	180	19	181	181	19	182	183	19	184	184	18	185	185	18	186	186	18	187	188	18	189
Panorama 66 kV	78	7	78	78	7	78	78	7	79	79	7	79	79	7	79	79	7	79	79	6	80	80	7	80	80	6	80	80	6	80
Parkes 66 kV	30	5	31	31	6	31	31	6	32	31	7	32	32	7	32	32	8	33	32	8	33	32	9	33	33	9	34	33	9	34
Parkes 132 kV	34	3	34	42	1	42	50	0	50	58	-1	58	61	-3	61	65	-4	66	69	-6	69	72	-7	72	74	-8	75	77	-10	78
Wallerawang 66 kV	6	0	6	6	-1	6	6	-1	6	6	-1	6	6	-1	6	6	-1	6	6	-1	6	6	-1	6	6	-1	6	6	-1	6
Wallerawang 132 kV	32	35	47	32	37	50	33	40	52	34	42	54	34	44	56	35	46	58	35	48	59	35	50	61	36	51	62	36	53	64
Wellington 132 kV incl Town	168	-8	168	169	-8	169	169	-8	170	170	-7	170	171	-8	171	171	-7	171	172	-7	172	172	-7	172	173	-7	173	173	-7	173

Table A2.9: Essential Energy (South) and Evoenergy bulk supply point summer maximum demand

Location	2026/27			2027/28			2028/29			2029/30			2030/31			2031/32			2032/33			2033/34			2034/35			2035/36		
	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA
Albury & Finley 132 kV	108	5	108	108	5	108	109	5	109	109	5	109	110	5	110	110	5	111	111	5	111	112	5	112	112	5	112	113	5	113
Balranald 22 kV	4	0	4	4	0	4	4	0	4	4	-1	4	4	-1	4	4	-1	4	4	-1	4	4	-1	4	4	-1	4	4	-1	4
Broken Hill 22 kV	38	3	38	38	3	38	38	2	38	39	2	39	39	2	39	39	2	39	39	1	39	39	1	39	39	1	39	40	1	40
Canberra 132 kV Evoenergy	335	68	342	359	73	366	378	77	386	394	80	402	410	83	418	426	86	434	441	90	450	458	93	467	475	96	484	491	100	501
Coleambally 132 kV	14	4	15	15	4	15	15	4	15	15	4	16	15	4	16	15	4	16	16	4	16	16	4	16	16	4	16	16	4	16
Cooma 66 kV	13	-1	13	13	-1	13	13	-1	13	13	-1	13	13	-1	13	13	-1	13	13	-2	13	13	-2	13	13	-2	14	13	-2	14
Cooma 132 kV	31	-12	33	31	-12	33	31	-12	33	30	-11	33	31	-11	33	31	-11	33	31	-11	33	31	-11	32	31	-10	32	31	-10	32
Darlington Point 132 kV	24	13	27	25	14	28	25	15	29	25	16	30	25	17	30	25	18	31	26	19	32	26	19	32	26	20	33	26	21	33
Deniliquin 66 kV	51	2	51	51	3	51	52	3	52	53	3	53	53	4	53	54	4	54	54	4	55	55	4	55	56	5	56	56	5	56
Finley 66 kV	16	1	16	16	1	16	16	1	16	16	1	16	16	1	16	16	0	16	16	0	16	16	0	16	16	0	16	16	0	16
Griffith 33 kV	94	2	94	94	2	94	95	2	95	95	1	95	95	1	95	96	1	96	96	1	96	96	1	96	96	0	96	97	0	97
Marulan 132 kV	51	3	51	52	3	52	53	4	53	54	4	54	55	4	55	56	4	56	57	5	57	58	5	58	59	5	59	60	5	60
Morven 132 kV	8	0	8	8	0	8	8	0	8	8	0	8	8	0	8	8	0	8	8	0	8	8	-1	8	9	-1	9	9	-1	9
Munyang 33 kV	3	-1	3	3	-1	3	3	-1	3	3	-2	3	3	-2	3	3	-2	3	3	-2	3	3	-2	3	3	-2	3	3	-2	4
Murrumbateman 132 kV	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	6	6	1	7	7	1	7
Murrumburrah 66 kV	41	1	41	41	1	41	41	0	41	42	0	42	42	-1	42	42	-1	42	42	-1	42	42	-1	42	42	-2	42	42	-2	42
Queanbeyan 66 kV Essential Energy	49	1	49	49	1	49	49	1	49	49	0	49	49	0	49	50	0	50	50	0	50	50	-1	50	50	-1	50	50	-1	50
Queanbeyan 66 kV Evoenergy	33	7	34	34	7	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Queanbeyan 132 kV	23	-1	23	28	0	28	34	1	34	39	2	39	45	3	45	50	5	50	56	6	56	64	7	64	66	8	66	68	8	68
Snowy Adit 132 kV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stockdill 132 kV Evoenergy	160	32	163	181	37	185	200	41	204	210	43	215	220	45	225	227	46	231	233	47	238	241	49	246	250	51	255	258	52	263
Tumut 66 kV	28	1	28	28	1	28	29	0	29	29	-1	29	29	-1	29	29	-2	29	29	-2	29	29	-2	29	29	-3	29	29	-3	30
Upper Tumut (Cabramurra) 11 kV	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
Wagga 66 kV	88	8	89	89	7	89	89	6	89	89	6	89	89	5	89	90	4	90	90	4	90	90	3	90	90	3	90	90	2	90
Wagga North 132 kV	83	-9	83	84	-9	85	86	-9	86	87	-9	87	88	-9	88	89	-9	89	90	-9	90	91	-9	91	92	-9	92	93	-9	93
Wagga North 66 kV	32	5	32	34	5	35	36	6	37	38	6	39	41	7	41	50	9	51	53	10	54	54	10	55	54	10	55	54	10	55
Williamsdale 132 kV Evoenergy	214	43	218	225	46	229	235	48	239	242	49	247	249	51	254	256	52	261	262	53	268	270	55	275	277	56	283	284	58	290
Yanco 33 kV	43	13	45	43	14	45	43	14	45	43	15	45	43	15	45	43	15	45	43	16	45	43	16	46	43	16	46	43	17	46
Yass 66 kV	13	-3	13	13	-3	13	13	-3	13	13	-3	13	13	-3	13	13	-3	13	13	-4	13	13	-4	13	13	-4	13	13	-4	13

Table A2.10: Essential Energy (South) and Evoenergy bulk supply point winter maximum demand

Location	2026			2027			2028			2029			2030			2031			2032			2033			2034			2035		
	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA	MW	MVAr	MVA
Albury & Finley 132 kV	102	3	102	103	3	103	104	3	104	105	3	105	106	3	106	107	3	107	108	3	108	109	3	109	110	3	110	111	3	111
Balranald 22 kV	3	-1	3	3	-1	3	3	-1	3	3	-1	4	3	-1	4	3	-2	4	3	-2	4	3	-2	4	3	-2	4	3	-2	4
Broken Hill 22 kV	34	0	34	35	0	35	35	0	35	35	0	35	35	0	35	35	0	35	35	0	35	35	0	35	35	0	35	35	0	35
Canberra 132 kV Evoenergy	391	79	399	389	79	397	388	79	396	383	78	391	374	76	382	365	74	372	356	72	363	347	70	354	339	69	346	331	67	338
Coleambally 132 kV	9	3	10	9	3	10	9	3	9	9	3	9	9	3	9	9	3	9	9	3	9	9	3	9	8	3	9	8	3	9
Cooma 66 kV	26	-2	26	27	-2	27	27	-2	27	27	-3	27	27	-3	27	27	-3	27	27	-4	27	27	-4	28	27	-4	28	28	-4	28
Cooma 132 kV	40	-17	43	40	-17	43	40	-16	43	40	-15	43	39	-15	42	40	-14	42	40	-14	42	40	-13	42	40	-12	41	40	-12	41
Darlington Point 132 kV	23	5	24	24	7	25	24	8	25	24	9	26	24	10	26	24	12	27	24	13	28	25	14	28	25	15	29	25	16	29
Deniliquin 66 kV	37	-1	37	37	-1	37	37	-1	37	37	-1	37	38	-1	38	38	-1	38	38	0	38	38	0	38	39	0	39	39	0	39
Finley 66 kV	13	-2	13	13	-3	14	13	-3	14	13	-3	14	13	-3	14	14	-3	14	14	-3	14	14	-3	14	14	-3	14	14	-3	14
Griffith 33 kV	62	7	62	62	7	63	63	8	63	63	7	64	64	7	64	64	8	64	64	8	65	65	8	65	65	8	65	65	8	66
Marulan 132 kV	65	13	67	66	14	67	67	14	68	68	14	69	68	15	70	69	15	71	69	15	71	70	15	72	71	16	72	71	16	73
Morven 132 kV	7	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7	0	7	7	1	7	7	1	7	7	1	7
Munyang 33 kV	29	16	33	29	17	34	30	18	35	30	19	35	30	19	36	30	20	36	30	20	37	31	21	37	31	21	37	31	21	38
Murrumbateman 132 kV	7	1	8	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8	8	2	8	8	3	8	8	3	9	8	3	9
Murrumburrah 66 kV	40	2	40	40	3	41	41	3	41	41	3	41	41	3	42	42	3	42	42	3	42	42	3	43	43	3	43	43	3	43
Queanbeyan 66 kV Essential Energy	64	2	64	64	2	64	65	2	65	65	2	65	66	1	66	66	1	66	66	1	66	67	1	67	67	1	67	67	1	67
Queanbeyan 66 kV Evoenergy	31	6	32	32	6	33	32	7	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Queanbeyan 132 kV	18	-2	18	23	-1	23	29	0	29	34	1	34	39	2	40	45	3	45	50	5	51	56	6	56	64	7	64	66	8	66
Snowy Adit 132 kV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stockdill 132 kV Evoenergy	205	42	209	247	50	252	278	56	283	306	62	312	326	66	332	345	70	352	360	73	368	376	76	384	393	80	401	411	83	419
Tumut 66 kV	31	-1	31	31	-1	31	31	-2	31	31	-2	31	31	-2	31	31	-3	31	31	-3	31	31	-4	31	31	-4	31	31	-4	31
Upper Tumut (Cabramurra) 11 kV	2	0	2	2	0	2	2	0	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2
Wagga 66 kV	84	9	84	85	10	85	86	10	87	87	10	87	88	10	88	89	10	89	89	11	90	90	11	91	91	11	92	92	11	92
Wagga North 132 kV	75	-10	76	76	-10	76	76	-9	77	76	-9	77	77	-8	77	77	-8	77	77	-8	78	77	-8	78	78	-7	78	78	-7	78
Wagga North 66 kV	25	9	27	28	10	30	30	12	32	32	13	35	34	15	37	37	16	40	46	19	50	49	21	53	50	22	55	51	22	55
Williamsdale 132 kV Evoenergy	244	49	249	257	52	262	267	54	272	276	56	281	282	57	288	289	59	294	294	60	300	300	61	306	306	62	313	313	64	319
Yanco 33 kV	35	7	36	35	7	36	36	8	36	36	8	37	36	8	37	36	8	37	36	8	37	36	8	37	36	8	37	36	9	37
Yass 66 kV	16	-2	16	16	-2	16	16	-2	16	16	-2	17	17	-2	17	17	-1	17	17	-1	17	17	-1	17	17	-1	17	17	-1	17

Table A2.11: Major industrial customers – Sum of individual summer maximum demand

	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36
	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
Industrial Loads	1135	1263	1453	1677	1840	2007	2177	2333	2468	2572

Table A2.12: Major industrial customers – Sum of individual winter maximum demand

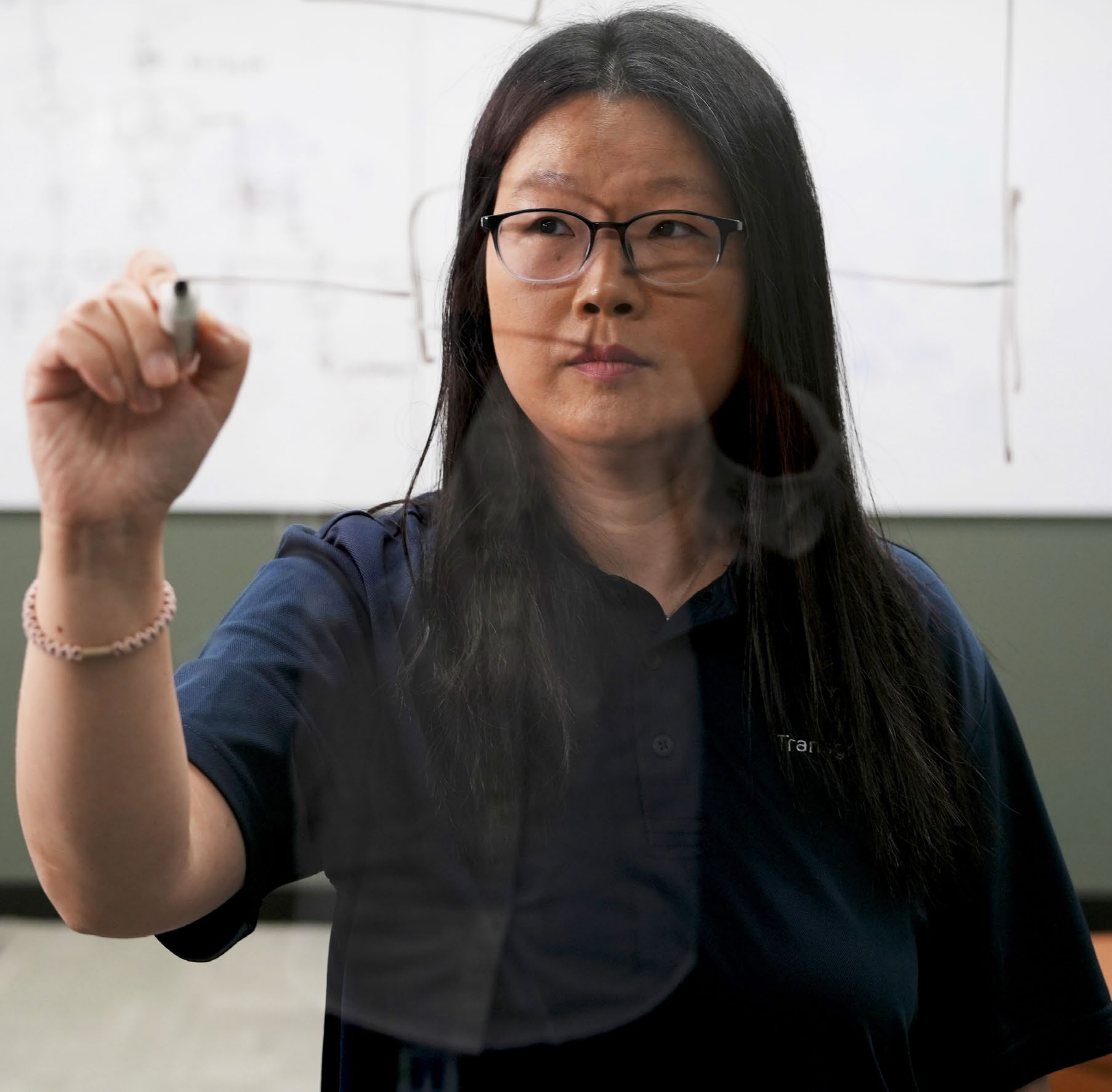
	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
Industrial Loads	1034	1132	1260	1450	1674	1837	2004	2174	2330	2465



Teinaga Nouata -
Pre-apprentice program



How we plan



Wei Wang - Team Leader HV
Design

A3.1 Planning requirements

Our network planning process is designed to ensure the efficient delivery of our capital program, facilitating the transition to a clean energy future.

A3.1.1 NSW Transmission Planning

Our current planning, coordination, operation and service provision roles.

Under the National Electricity Rules (NER), Transgrid has multiple roles. We are the:

- Primary Transmission Network Service Provider (TNSP) for NSW
- Coordinating Transmission Network Service Provider (CTNSP) for NSW
- System Strength Service Provider and Inertia Service Provider for NSW

As a TNSP, we are required to publish this report and connection arrangements when generators, customers or other networks seek to connect to our network.

Transgrid is also a network operator for Renewable Energy Zone (REZ) Network Infrastructure Projects and Priority Network Infrastructure Projects under the Electricity Infrastructure Investment Act 2020 (NSW) (EII Act) and holds a transmission operator licence under the Electricity Supply Act 1995 (NSW).

One system planning

No single organisation can plan the future electricity system on its own. Delivering the lowest-cost, most reliable outcomes for consumers requires generation, storage, transmission and distribution to be planned together.

Transgrid works closely with AEMO, EnergyCo, the Consumer Trustee and DNSPs to coordinate investment across the electricity system. Our planning aligns with AEMO’s Integrated System Plan, which identifies the long-term development pathway for the National Electricity Market, and with EnergyCo’s NSW Network Infrastructure Strategy (NIS), which coordinates the connection of new generation under the NSW Government Electricity Infrastructure Roadmap. The Consumer Trustee, AusEnergy Services, independently considers these options in preparing its Infrastructure Investment Objectives (IIO) Report, which sets a 20-year pathway for generation and energy storage infrastructure in NSW.

We align our planning of the shared transmission network to support the development of REZs, taking into account the NIS and the IIO. This includes planning how a REZ will integrate with the transmission network to avoid compromising system security.

How this may change after the NSW Transmission Planning Review

The [NSW Transmission Planning Review 2025](#) aimed to improve transmission planning coordination.

Its 15 recommendations, aimed at accelerating planning and delivery of upcoming projects, clarifying roles and responsibilities, are now being implemented by the NSW Government. Important changes are also being made to the planning framework. In particular, the role of Jurisdictional Planning Body for NSW (under the NER) will transition to EnergyCo from Transgrid.

Under the reforms, Transgrid will continue to:

- Plan our network
- Undertake joint planning with EnergyCo, AEMO and DNSPs
- Publish our Transmission Annual Planning Report
- Be the System Strength Service Provider and Inertia Service Provider for NSW
- Plan connections to our network
- Plan interconnections with other states
- Be responsible for transmission pricing, including being CTNSP for NSW
- Undertake our current system security, system control and system operation functions
- Plan and deliver NER transmission projects and EII Act projects where we are the TNSP or network operator.

A new NSW System Plan will provide a coordinated 20-year roadmap for the efficient development of network infrastructure in the interest of NSW consumers. It will also identify regulatory and procurement pathways. The plan will be published every two years, with the first edition due in 2027 under transitional arrangements.

Transgrid is working closely with the NSW Government and other stakeholders to implement the NSW Transmission Planning Reforms. Throughout the jurisdictional planning transition, we will maintain our core capabilities in network planning, system strength planning, connections management and network analysis to support timely decision-making, avoid unnecessary delays and keep costs down for consumers.



A3.1.2 Transgrid’s obligations under the National Electricity Rules

The NER sets the processes we must use to plan network development and the minimum performance requirements for networks and their connections. When required, our development proposals must pass the AER’s RIT-T, which requires us to consult with registered participants and interested parties.

We also have to plan according to certain standards. When the system is either in its normal state with all elements in service or following a credible contingency:

- Electrical and thermal ratings of equipment will not be exceeded
- Stable control of the interconnected system will be maintained, with system voltages maintained within acceptable levels
- The power system should remain in synchronism and be stable
- System strength and inertia levels are above the required levels
- A quality of electricity supply, at least to NER requirements, is to be provided
- A standard of connection to individual customers, as specified by Connection Agreements, is to be provided
- As far as possible, the connection of a customer is to have no adverse effect on other connected customers
- Environmental and social objectives are to be satisfied
- Acceptable safety standards are to be maintained.

Another obligation is to develop the NSW electricity system at the lowest cost possible while meeting all these requirements. This includes ensuring the system has sufficient capacity to allow components to be maintained efficiently — and finding cost effective ways to reduce system energy losses.

In fulfilling our obligations, we recognise both the needs of our customers and AEMO’s operational requirements. Where the NER are flexible, we assess options based on the net benefit they deliver to the market and consumers, rather than simply meeting minimum compliance requirements. For example:

- Where DNSPs or directly connected customers agree, limited supply interruptions may be accepted during planned single outages, until the network can be upgraded (for example, the situation with radial supplies).
- Where requested by a DNSP or directly connected customer, inadvertent loss of load will be avoided (other than load which is interruptible or dispatchable) following events more onerous than N-1, such as concurrent outages of 2 network elements.
- The transmission network must have sufficient capacity to accommodate AEMO’s operating practices without inadvertent loss of load (other than load which is interruptible or dispatchable) or uneconomic constraints on the energy market. This includes allowing the system to be returned to a secure operating state within 30 minutes following a credible contingency.

A3.1.3 Service standard

Our planning obligations are interlinked with the reliability obligations placed on DNSPs in NSW. We must ensure that the network is adequately planned to meet these licence requirements, including compliance with the Electricity Transmission Reliability Standards 2017, administered by the Independent Pricing and Regulatory Tribunal.

This standard specifies two reliability criteria for each BSP:

- The required level of network redundancy for each BSP or group of BSPs that function as a cohort
- An allowance of Minutes of Expected Unserved Energy, which is the maximum amount of energy at risk of not being supplied in a given year, expressed as minutes at the average load on the BSP.

This is a planning, rather than a performance standard. It means the network needs to be planned to meet the standards over the lifecycle of the assets, on average, rather than every year.

Network investment may be required to ensure compliance with the standard. However, we have the flexibility to promote the most efficient network or non-network solution to meet the Minutes of Expected Unserved Energy allowance. This may include a combination of changes to the transmission network, the distribution network, network support arrangements (including the use of demand management options), or existing backup supply arrangements. Transgrid’s 2026 annual compliance report found that all existing BSPs are compliant with the standard.

A3.1.4 National planning requirements

AEMO produces an ISP that considers Transmission Network Service Provider documents, such as the Transmission Annual Planning Report. In turn, the TNSPs need to take the ISP into account. Our plans in this Report are consistent with the developments of the ISP 2026.

A3.1.5 The rule change on NCIPAP

The AER revised STPIS (V6) in April 2025, changing the manner by which TNSPs propose NCIPAP projects which will take effect for Transgrid as of the 2028-2033 regulatory control period.



A3.2 Asset management approach

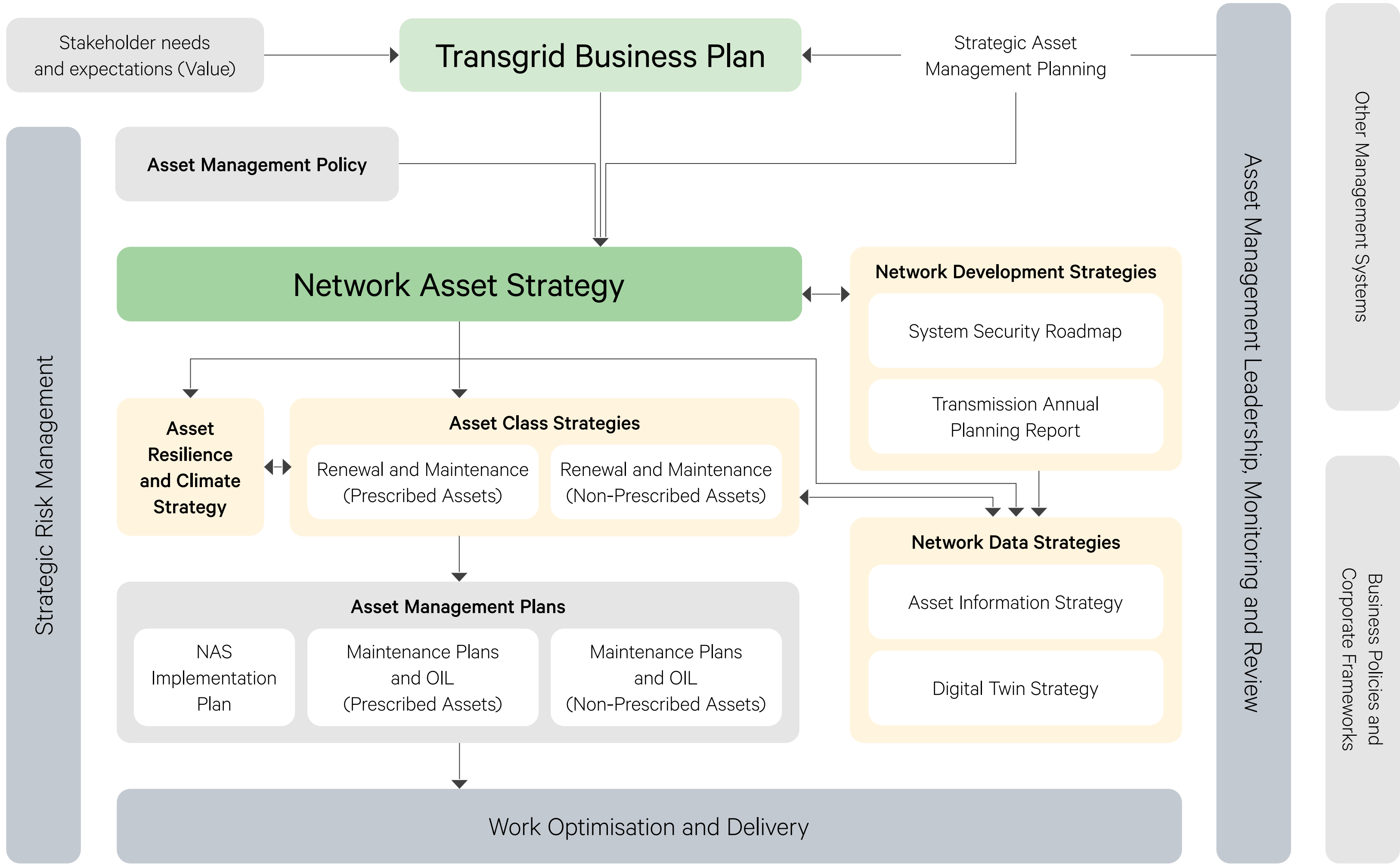
Transgrid must maintain an Asset Management System (AMS) that complies with ISO 55001 to ensure the network is managed at the forefront of good practice asset management, delivering safe, reliable, efficient and affordable network services. Our AMS covers the entire asset lifecycle from planning through, design, construction/acquisition, operation, maintenance, renewal and decommissioning.

Figure A3.1 illustrates our AMS structure under ISO 55001.

Transgrid’s Network Asset Strategy (NAS) demonstrates how we will deliver value to our customers and stakeholders throughout the deep transition phase and beyond. It provides a plan and coordinated initiatives in response to the uncertainty, challenges and complexity of the deep energy transition, which require investment in the network and new technologies, changes to asset management processes and new resources and skills. The NAS identifies initiatives to meet these asset management objectives, including:

- Advanced data and digital capabilities (including digital twins and predictive analytics) to enable real time asset insights, proactive decision making and optimised lifecycle outcomes.
- Risk-based asset lifecycle planning that improves resilience to climate, cyber and system security challenges.
- Coordinated network planning and connection frameworks to efficiently integrate renewables, large load connections and emerging technologies while improving access, outage visibility and customer outcomes.

Figure A3.1: Asset Management System

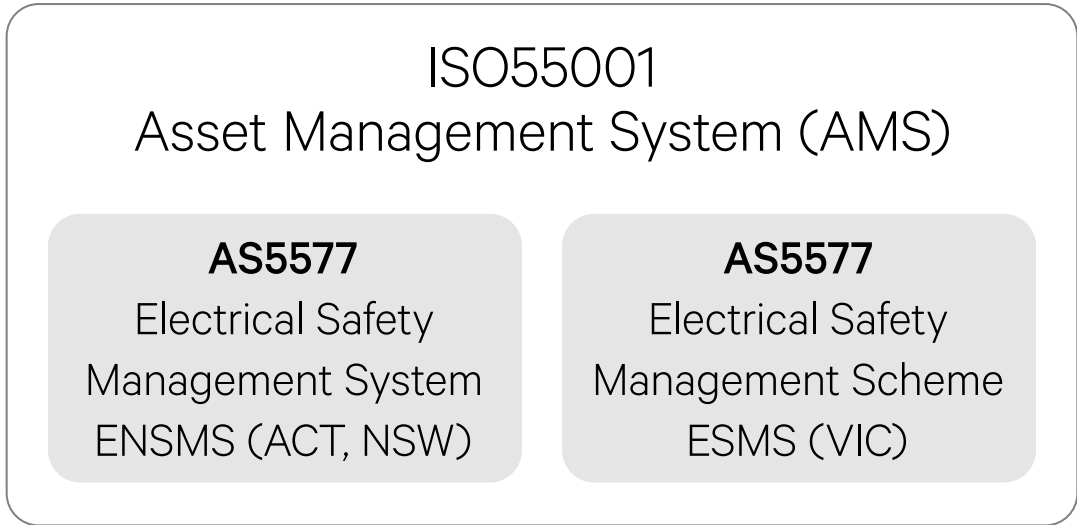


The Transmission Annual Planning Report is a key enabler in achieving our NAS objectives of managing risks posed by network assets and delivering value for our consumers and security holders.

Safety of our customers and community

Transgrid has two network safety systems to manage hazards and risks on our electricity supply networks. One is applied to network assets in NSW and the ACT (the ENSMS), the other is for network assets in VIC (the ESMS), as shown in Figure A3.2.

Figure A3.2: Asset and Safety Management Systems



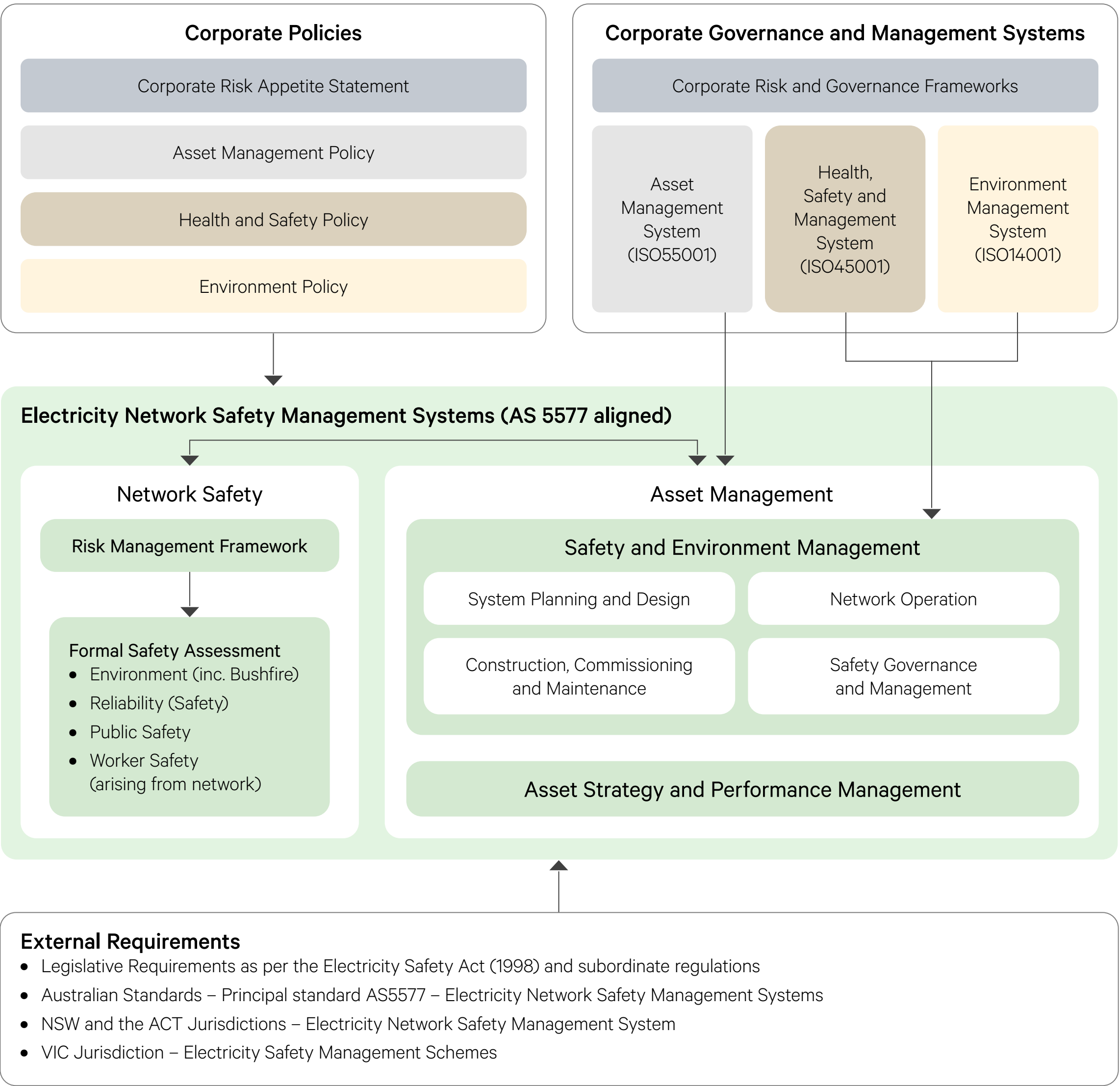
Transgrid takes all reasonably practicable steps to ensure safety and reliability are prioritised in network planning, design, construction, commissioning, operations and decommissioning in NSW and the ACT. Through our AMS, ENSMS and ESMS, Transgrid seeks to:

- Demonstrate our commitment to regulatory compliance requirements
- Formalise and communicate how risk from assets is managed and reduced
- Demonstrate alignment to the requirements of AS5577 in managing the hazards and risks throughout the asset lifecycle
- Educate and gain the commitment of internal and external stakeholders.

The ENSMS and ESMS include System Planning and Design as part of the Asset Management lifecycle to meet the needs of our stakeholders, including meeting our network reliability obligations.

Our asset renewal planning uses a methodology for quantifying risk that combines the failure behaviour of an asset (the likelihood), and its consequences (the consequence). This approach ensures our asset renewal program has the most economic combination of replacement and refurbishment options.

Figure A3.3: Asset Management System



A3.3 Network investment process

- Our network investment process ensures:
- An integrated, whole-of-business approach to capital program management
 - Optimised investments, operating costs and maintenance costs, while meeting augmentation and asset management requirements
 - Early resolution of key risk areas, such as environmental approvals, property acquisition and scope definition in the project delivery process
 - Documented options evaluations and project scoping to enhance transparency.

Stage 1



Identify need or opportunity

Transgrid planning process

- Look at demand forecasts, expected generation patterns, upcoming projects and the condition of existing assets
- Will there be a shortfall in supply if we do nothing?

Stakeholder involvement

- Sense-check forecasts with:
 - Distributors
 - Directly connected customers
 - AEMO
- Seek feedback from end users and their representatives on need assessment.

Stage 2



Review options

Transgrid planning process

- Identify possible network and non-network options to fulfil the need, including:
 - Demand management
 - Local or distributed generation or storage
 - Network infrastructure optimised to meet expected requirements
 - Improved operational and maintenance regimes.

Stakeholder involvement

- Input from large energy users, service providers and experts on potential for non-network options
- Communicate with local community that may be impacted by network infrastructure.

Stage 3



Plan in detail

Transgrid planning process

- Request proposals and undertake investment analysis on the most viable options.

Stakeholder involvement

- Encourage proposals from market participants for non-network options
- Engage impacted communities in network corridor selection, if relevant
- Involve end users and their representatives in final investment decision.

Stage 4



Implement solution

Transgrid planning process

- Optimise the NSW portfolio of investments
- Enter into contracts for network or non-network solutions
- Build or renew network infrastructure, if required.

Stakeholder involvement

- Work with impacted community to support best local outcomes.
- Report progress in meeting identified need to end users and their representatives.



A3.4 Planning approach

As part of our planning process, we identify areas of the network where limitations are expected to emerge and consider both network investment and non-network solutions to address them. To identify the most economic options, we plan jointly with DNSPs, EnergyCo, directly supplied industrial customers, generators and TNSPs.

A3.4.1 The network planning process

Network planning occurs at multiple levels:

Connection planning

Planning to connect new loads and generators involves discussing requirements with customers, reviewing connection capability and conducting System Strength Assessments.

Subsystem planning

Assessing the adequacy of 132 kV and below bulk supply transmission systems requires joint planning in conjunction with DNSPs. This ensures development proposals meet both transmission and distribution requirements, resulting in the lowest possible overall network costs for end customers. This is particularly important where the DNSP’s network operates in parallel with the transmission network.

Main System planning

The 500 kV, 330 kV and 220 kV transmission system (the Main System) is planned to meet forecast demand, connect new generation and support interstate energy transfers. Major developments address emerging constraints, enable Renewable Energy Zones and support delivery of the NSW Electricity Infrastructure Roadmap.

Transgrid works closely with EnergyCo, AEMO and other stakeholders to coordinate network planning and delivery.

As a System Strength Service Provider and Inertia Service Provider, we also plan the system to ensure sufficient system strength and inertia to meet forecast requirements under the NER.

Inter-regional planning

Inter-regional planning focuses on coordinating interconnectivity with network operators in other states, in accordance with Clause 5.14.3 of the NER. This includes developing both interconnectors between regions and augmentations within regions that have a material effect on inter-regional power transfer capability.

Energy transition

Transgrid’s Energy Vision found that the role of the transmission network will be critical under every plausible scenario for the energy transition over the next 30 years. Getting the transmission network equation right and ensuring the network is secure and reliable is critical to Australia’s successful transition to net zero. We are continuously looking into ways the network can facilitate a rapid and stable energy transition.

A3.4.2 Planning horizons and reporting

Transgrid is currently preparing for the 2028 to 2033 regulatory control period. The planning and network investment process supports connection planning and commitments to network developments in the context of the likely impact of emerging technologies on the electricity system. Long-term planning considers options for future major developments and provides a framework for the orderly, cost-effective development of the transmission network and the strategic acquisition of critical line and substation sites.

As this report looks at a 10-year horizon, the constraints that appear over long-term time frames are indicative. The timing and capital cost of possible network options to relieve them may change as system conditions evolve.

A3.4.3 Identifying network constraints and assessing possible solutions

We identify emerging constraints in the relevant horizon during various planning activities, including joint planning with AEMO, EnergyCo and DNSPs. Our planning takes into account the impact of:

- Network developments undertaken by other DNSPs and TNSPs
- Network constraints raised by AEMO
- Prospective generation developments
- Constraints affecting generation dispatch in the NEM
- Changing load forecasts
- Asset renewals
- Relevant regulatory and legislative obligations.

During the initial planning phase, we develop options for addressing the constraint or need. In accordance with NER requirements, we consult with Interested Parties to determine a range of network and non-network options and/or to refine existing network development options.

We conduct a cost-benefit analysis comparing the economic costs and benefits of each option, in accordance with Transgrid’s processes and, if applicable, RIT-T requirements. Cost and benefit factors may include:

- Safety and health, environmental, and financial risk costs
- Avoiding unserved energy caused by either a generation shortfall, inadequate transmission capability or reliability
- Changes in Australia’s greenhouse gas emissions
- Changes in ancillary services costs
- Changes in network losses

- Competition benefits
- Alleviating constraints affecting generation dispatch
- Avoiding the need for generation developments
- Introducing more efficient generation and fuel type alternatives
- Improving marginal loss factors
- Reducing future asset risk costs
- Deferring related transmission works
- Reducing operation and maintenance costs.

Where options have similar net benefits, Transgrid also considers operational, environmental and customer outcomes, such as improved reliability or greater operational flexibility.

When preferred options are identified for replacement and augmentation needs, a review considers the scope of interactions across repex and augex to (a) resolve direct scope overlaps or (b) re-evaluate options to address a combined repex and augex need as relevant. The portfolio is then reviewed and phased for deliverability.

If RIT-T inputs materially change, Transgrid will be required to conduct a Material Change in Circumstances (MCC) assessment to determine whether the preferred option remains the preferred option.

A3.4.4 Considering non-network alternatives

Where economic, we consider non-network alternatives to address emerging constraints, which may defer or eliminate the need for some network augmentations. These opportunities are assessed on a case-by-case basis.

A3.4.5 Applying power system controls and technology

Where economic, we take advantage of the latest proven technologies in network control systems and electrical plants. For example, static VAR compensators have had a considerable impact on the power transfer capabilities of parts of the main grid, deferring or eliminating the need for higher-cost transmission line development.

Remedial action schemes have also been applied in several areas of the NSW system to reduce the impact of network limitations on the NEM and to facilitate the removal of circuits for maintenance.

The following sections outline our broad approach to planning these technologies, together with related issues of protection facilities, transmission line design, substation switching arrangements and power system control and communication. This approach aligns with international practice, delivering a safe, reliable, secure and cost-effective supply system while managing environmental and community impacts.



Matthew McCorry - Construction Manager



A3.5 Planning criteria

Our planning obligations specify the minimum and general technical requirements in a range of areas, including:

- Minimum levels of credible contingency events to be considered for a specified allowance of unserved energy in a year
- The power transfer capability during the most critical single-element outage. This can range from zero in the case of a single-element supply to a portion of the normal power transfer capability.
- Frequency variations
- Magnitude of power frequency voltages
- Voltage fluctuations, harmonics, unbalance and stability
- Synchronous stability
- System strength and inertia
- The damping of power system oscillations
- Allowable maximum fault level and fault clearance times
- The need for two independent high-speed protection systems
- The rating of transmission lines and equipment.

In addition to adhering to the NER and regulatory requirements, we also consider the historical performance of NSW system components, the sensitivity of loads to supply interruptions, and state-of-the-art asset maintenance procedures. Planning must also support the system’s orderly development, considering the requirement to meet future load and generation forecasts.

We apply the criteria below as a point of first review, before making a detailed assessment of each case.

A3.5.1 Main System

Power flows on the Main System are subject to overall state load patterns and to the dispatch of generation within the NEM, including interstate power exports and imports. AEMO applies operational constraints on generator dispatch to maintain power flows within the capability of the NSW and other regional networks. These constraints are based on the networks’ ability to sustain credible contingency events, as defined in the NER, which mainly cover forced outages of single generation or transmission elements. However, as per NER 4.2.3A, a non-credible contingency event may be reclassified as a credible contingency event by AEMO if the likelihood of this event impacting the power system has become reasonably possible due to abnormal conditions, such as severe weather conditions, lightning or bushfires. Constraints for credible contingency events are often based on short-duration loadings on network elements, assuming that generation can be re-dispatched to relieve line loading within the required time frame. The rationale for this approach is that, if operated beyond a defined power transfer level, credible contingency disturbances could potentially lead to system-wide loss of load with severe social and economic impacts.

Following any transmission outage (e.g., during maintenance or following a forced line outage for which line reclosure¹⁰⁷ has not been possible), AEMO applies more severe constraints within a short adjustment period, in anticipation of a further contingency event. This may require:

- Re-dispatching generation and dispatchable loads
- Redistributing ancillary services
- Where there is no other alternative, shedding load (power interruption).

Transgrid’s Main System Planning Criteria requires that no load will be pre-emptively shed in anticipation of the second credible contingency. However, load shedding may be needed following a second credible contingency. The impact of a second credible contingency, including non-credible contingencies that AEMO reclassifies as credible, on the Main System can be significant. The extent of post-contingency load shedding can be minimised by installing a Remedial Action Scheme.

AEMO may direct load shedding rather than operating the network for a sustained period in a manner that would put overall security at risk in the event of a further contingency. The risk is accepted for up to 30 minutes. We consider AEMO’s imperative to be operating the network securely.

Our planning for the Main System focuses on the security of supply to load connection points during sustained outages. This is consistent with the overall principle that supply to load connection points must be satisfactory after any single contingency.

The reliability of Main System components and the ability to withstand disturbances to the system are critically important for maintaining a secure supply to NSW customers. The capital cost of this system is balanced by:

- Avoiding the high cost to the community of widespread shortages of supply
- Providing flexibility in the choice of economical generating patterns
- Allowing reduced maintenance costs through easier access to equipment
- Minimising electrical losses also benefits the environment.

As we plan the Main System, Transgrid considers the risk of a credible contingency event coinciding with adverse conditions of load and generation dispatch scenarios. To manage this risk, we plan to augment the Main System in response to changing load forecasts and generation requirements, and the influence of interstate interconnection power transfers. Any developments are negotiated with affected NSW and interstate parties, including AEMO, to maintain power flows within the capability of the NSW and other regional networks.

In general, our planning processes consider two worst-case load scenarios for maximum demand. These are scenarios with loads at or exceeding a one in two-year probability of occurrence (50 per cent POE Maximum Load Scenario) and a one in 10-year probability of occurrence (10 per cent POE Maximum Load Scenario).

For minimum load forecasts, we use scenarios with loads at or exceeding a 10 per cent POE (one-in-10-year probability of occurrence) for reactive power planning purposes. The projected NSW as-generated forecasts are provided in Chapter 4.

Network planning targets

50 per cent POE Maximum Load Scenario

- The system can withstand a single credible contingency across all reasonably probable scenarios.
- Provision is made for the prior outage of a single item of reactive plant.
- The system can be secured by re-dispatching generation without requiring pre-emptive shedding (interruption) to withstand the impact of a second credible contingency.

107 Transgrid lines have automatic systems to return them to service (reclose them) following a fault.



- 10 per cent POE Maximum Load Scenario
- The system will be in a satisfactory operational state under normal network conditions and under a limited set of scenarios can withstand a single credible contingency event.
 - The system will be able to be re-secured by re-dispatching generation or control scheme to withstand the impact of a second credible contingency event, without pre-emptive load shedding.
- 10 per cent POE Minimum Load Scenario
- The system will meet voltage-level requirements under both normal and N-1 network conditions in a limited set of scenarios, assuming one reactive plant is in pre-outage status.
 - Usually, a sensitivity scenario with high renewable generation is tested to identify potential network constraints in a moderately modified load scenario starting from 10 per cent POE Minimum Load Scenario.

We use these forecasts to simulate multiple scenarios based on the historical performance of the NEM and modelling of future generation sources. These scenarios take into account different generation dispatch scenarios, interconnection power flows and REZ generation.

Under all conditions, we need to achieve adequate voltage control. Traditionally, we assumed all online generators could provide reactive power support within their rated capability. However, we now align with other utilities in relying solely on reactive capability as defined by performance standards. Reactive support beyond the performance standards may need to be procured under network support arrangements.

Supply in NSW currently depends on base-load coal-fired generation in the Hunter region and hydro generation

in the southern network. In future, REZs will have a significant role in the network. These generation areas are interconnected with the load centres via numerous single and double-circuit lines. Planning the NSW system requires consideration of AEMO’s operational approach, including the risks and impacts of overlapping circuit outages under probable load and generation patterns.

Our analysis of network adequacy must take into account probable load patterns, typical generator and load dispatch, the availability characteristics of generators (as influenced by maintenance and forced outages), energy limitations, and other factors relevant to each case.

When we consider options to address an emerging inability to meet all connection-point loads, we allow for the lead time required for a network augmentation solution.

Before this, we consider the costs of re-dispatching energy and ancillary services markets to manage credible contingencies. If these costs exceed those of augmentation, discussions with network load customers may lead to network or non-network solutions developed through a consultation process.

A3.5.2 Networks supplied from the Main System

Some parts of the network are primarily concerned with supplying local loads and are not significantly affected by generation dispatch (although they may contain embedded generators). In determining network constraints, AEMO now has to consider the loss of a transmission element within these networks. Although ancillary services may be needed to cover load rejection in the event of a single contingency.

A3.5.3 Supply to major load areas and sensitive loads

The NSW system comprises six major load areas: Northern NSW, Newcastle and Central Coast, Greater Sydney, Central West, Southern NSW, and South Western NSW.

Some of these load areas, including individual smelters, are supplied by limited circuits that may share double-circuit line sections. Significant individual loads and load areas must not be exposed to supply loss if multiple circuit failures occur over extended periods. Therefore, we assess the impact of contingency levels exceeding the specified redundancy and the expected unserved energy for each network node.

We also consider network element outages for planned maintenance. Generally, this requires 75 per cent of the maximum load to be supplied during the outage. While every effort is made to secure supplies in the event of a further outage, this may not always be possible. In this case, our focus is on minimising the duration of the plant outage.

A3.5.4 Urban and suburban areas

Generally, urban and suburban networks are characterised by a high load density served by high-capacity underground cables and relatively short transmission lines. The connection points to the network are usually the low-voltage (132 kV) busbars of 330 kV substations. There may be multiple connection points and significant DNSP capability to transfer load between them, either permanently or to relieve short-term load on network elements after a contingency.

The focus of joint planning with DNSPs is the capability of the meshed 330/132 kV system and the existing connection points to meet expected maximum loadings. Joint planning addresses the need to augment the meshed 330/132 kV system and the connection-point capacity, or to provide a new connection point when this is the most economic overall solution.

Consistent with good international practices, we give special consideration to supply to high-density urban and central business districts. For example, the inner Sydney metropolitan network supplies a large, critical portion of the state’s load. This supply is primarily via 330 kV and 132 kV underground cables. The 330 kV cables are part of our network, while Ausgrid owns the 132 kV cables.

The criterion applied to the Inner Sydney area is consistent with that applied to electricity supply in major cities worldwide. Most countries use an N-2 criterion. Others apply an N-1 criterion with selected N-2 contingencies, commonly involving 2 cables sharing a single trench or a double-circuit line.

This is similar to the previous approach in NSW, which used the probabilistic approach specified in the NSW Electricity Transmission Reliability and Performance Standard 2017. Under this standard, supply to the Inner Sydney load is required to be designed for a Category 3 level of redundancy and a maximum unserved energy allowance corresponding to 0.6 minutes per year at average demand levels.¹⁰⁸

The reliability criteria (redundancy level and unserved energy allowance per year) at bulk supply points outside the Inner Sydney area are less onerous than for those inside.

A3.5.5 Non-urban areas

Generally, these areas are characterised by lower load densities and have lower reliability requirements than urban systems. The areas are sometimes supplied by relatively long, often radial, transmission systems. Connection points are either on 132 kV lines or on the low-voltage busbars of 132 kV substations. While multiple connection points to a DNSP may exist, they are often widely spaced with limited transfer capacity between them. Frequently, supply limitations may apply to the combined capacity of several supply points together.

- The focus of joint planning with DNSPs usually relates to:
- Augmenting connection point capacity
 - Duplicating radial supplies
 - Extending the 132 kV system to reinforce or replace existing lower voltage systems and to reduce losses
 - Developing a higher voltage system to support major augmentations and reduce network losses.

Supply to one or more connection points may need to be augmented when the transmission network does not provide the specified redundancy level, or when the probability of unserved energy (i.e., the function of network failure rate, restoration duration, and average load) at the end of the planning horizon exceeds the specified reliability criteria.

Based on the criteria, some radial parts of the 330 kV and 220 kV networks are unable to withstand the forced outage of a single-circuit line at the time of maximum load. In these cases, provision is made for under-voltage load shedding.

We also need to provide for network maintenance. Additional redundancy is required where maintenance cannot be scheduled without causing load restrictions or an unacceptable level of risk to the security of supply.

¹⁰⁹Transformer nominal ratings are based on them carrying a constant load. However, loads are often cyclic (they vary throughout the day). In these cases transformers may be able to carry more than their nominal rating for a short period around the time of the maximum load as they are loaded less heavily before and after that period. A cyclic loading takes this into account.

¹¹⁰ Alternating current power systems generally have three phases. Faults on those systems can involve one, two or all three of those phases. Faults involving three phases are generally the most onerous.

A3.5.6 Relationship with inter-regional planning

We monitor the occurrence of transmission system constraints that affect generator dispatch. Our planning, therefore, considers the scope for network augmentation to reduce constraints.

The capacity of interconnectors used in market dispatch is the short-term capacity, determined by their ability to maintain secure system operation in the normal state in anticipation of a single contingency. Interconnector operation at this capacity must be supported by appropriate ancillary services. AEMO does not operate on the basis that the contingency may be sustained, but considers the impact of a prolonged plant outage.

For parts of the network critical to load supply, we may initiate augmentation to meet reliability requirements. Transgrid’s major network development projects aim to increase transfer capabilities between NSW and QLD/ VIC/SA. The planning of interconnections is undertaken in consultation with the Transmission Network Service Providers of the other states.

Under the NER, a Region may be created where constraints to generator dispatch are predicted to occur with reasonable frequency when the network is operated in the “system normal” (all significant elements in service) condition. However, Region creation does not consider the impact of contingencies on load connection points.

A3.5.7 Transformer augmentation

In considering transformer augmentation, we allow for the transformer cyclic rating¹⁰⁹ and the practicality of load transfers between connection points. Allowance is made for the outage of a single transformer (or single-phase unit) or a transmission line that supports the load carried by the transformer.

We also provide for transformer maintenance. This has become a critical issue at a number of sites in NSW where multiple transformers are in service. To enable maintenance, additional transformer capacity may be required, or the load may need to be transferred to other supply points via the lower-voltage network.

A3.5.8 Consideration of low probability events

Although the probability of supply interruptions due to system disturbances is low, no power system can be guaranteed to deliver firm capability 100 per cent of the time, particularly when subjected to severe or widespread disturbances. Extreme loads beyond planning allowances can also occur, typically during extreme weather events.

The NSW network contains numerous lines with double-circuit construction. While the probability of overlapping outages on both circuits of a line is very low, the consequences could be widespread supply disturbances.

Thus, we assess the potential for low probability events to cause localised or widespread disruption to the power system. These events can include:

- Loss of several transmission lines within a single corridor, as may occur during extreme weather events
- Loss of a number of cables sharing a common trench
- Loss of more than one section of busbar within a substation, possibly following a major plant failure
- Loss of a number of generating units
- Occurrence of 3-phase faults,¹¹⁰ or faults with delayed clearing.

In our network, appropriate facilities and mechanisms are in place to minimise the likelihood of such events and lessen their impact. Our decision-making process considers the underlying economics of facilities or corrective actions, accounting for the low probability of extreme events.

We take measures, where practicable, to minimise the impact of disturbances to the power system by implementing power system control systems at minimal cost in accordance with the NER.

A3.6 Joint planning

Transgrid regularly undertakes joint planning with AEMO and Primary Transmission Network Service Providers from across the NEM. Our joint working and reference groups include:

- Executive Joint Planning Committee (EJPC)
- Joint Planning Committee
- Forecasting Reference Group
- Regulatory Working Group
- Power system modelling reference group
- System Strength Working Group.

Executive Joint Planning Committee (EJPC)

The Executive Joint Planning Committee coordinates effective collaboration and consultation on electricity transmission network planning issues to:

- Develop a framework for the ISP
- Continuously improve current network planning practices
- Coordinate on energy security across the NEM
- Help provide efficient services to the NEM while jointly considering planning, operations, and other activities.

The EJPC directs and coordinates the activities of the Forecasting Reference Group and the Regulatory Working Group as outlined below. These activities ensure effective consultation and coordination among Transmission Network Service Providers, transmission system operators, and AEMO on a broad spectrum of perspectives on network planning, forecasting, market modelling, and market regulatory matters to address the challenges of a rapidly changing energy industry.

Joint Planning Committee

The Joint Planning Committee supports the EJPC in achieving effective collaboration, consultation, and coordination among jurisdictional planning bodies, transmission system operators, and AEMO on electricity transmission network planning issues.

The matters to be considered by the committees include:

- Load forecasting
- Reliability and quality of supply issues
- Major plant refurbishment and retirement
- Reviewing and updating the Connection Agreement Data Book and Licence to Occupy schedules
- New and augmented major load, generator and Battery Energy Storage Systems (BESS) connections
- Data centres, Special Activation Precincts and Renewable Energy Zones
- Demand management and embedded generation opportunities
- Network augmentation options
- Reactive plant and voltage control requirements
- System fault levels and system strength requirements
- Earthing coordination
- Network operational control coordination
- Overview of protection, metering, control and communication issues.

Forecasting Reference Group

The Forecasting Reference Group is a monthly forum with AEMO and industry forecasting specialists. The forum seeks to facilitate constructive discussion on matters relating to gas and electricity forecasting and market modelling. It is an opportunity to share expertise and explore new approaches to addressing the challenges of forecasting in a rapidly changing energy industry.

Regulatory Working Group

The Regulatory Working Group supports the EJPC in achieving effective collaboration, consultation, and coordination among Transmission Network Service Providers, transmission system operators, and AEMO on key areas related to the application of the regulatory transmission framework and on suggestions for improvement.

Power system modelling reference group

This technical expert reference group focuses on power system modelling and analysis techniques to ensure an accurate power system model is maintained for network planning and operational analysis, and to establish procedures and methodologies for power system analysis, plant commissioning, and model validation.

System Security Working Groups

AEMO's System Strength Service Provider working group's objective is to support collaboration, consultation, and coordination among system strength service providers in implementing the System Strength Framework.

AEMO's Improved Security Frameworks working group's mission is to enable consistent, effective, and efficient consultation between AEMO and TNSPs to support the timely implementation of the Improving Security Framework Rule Change in the NEM.

Regular joint planning meetings

Transgrid ensures effective network planning by joint planning with:

- AEMO National Planning
- EnergyCo
- VicGrid
- ElectraNet
- Powerlink
- Ausgrid
- Endeavour Energy
- Essential Energy
- Evoenergy
- ACERES.



Joint Planning Projects

Transgrid has coordinated with other Transmission Network Service Providers, Distribution Network providers and infrastructure planners on the following projects:

- Hunter Transmission Project – joint planning with EnergyCo
- Hunter Transmission Project 2 – joint planning with EnergyCo
- Central-West Orana REZ – joint planning with EnergyCo and ACERES
- QNI Connect – joint planning with Powerlink
- Sydney Ring South – joint planning with AEMO
- EnergyConnect – joint planning with ElectraNet and AEMO VIC Planning
- VNI West – joint planning with VicGrid
- South West REZ – joint planning with EnergyCo
- Switching Station Near Wondalga – joint planning with AEMO
- Hunter-Central Coast REZ – joint planning with EnergyCo and Ausgrid
- New England REZ – joint planning with EnergyCo
- Illawarra REZ – joint planning with EnergyCo and Endeavour Energy
- Orana Distribution Project – joint planning with EnergyCo and Essential Energy
- Sydney Plan options to reinforce the Sydney area – Joint Planning with Endeavour Energy and Ausgrid
- Yass Strategic Plan – joint planning with Essential Energy



A3.7 Alignment with Electricity Statement of Opportunities and Integrated System Plan

As detailed in Chapter 5, unless sufficient additional firm generation capacity is developed in time, there will be a risk of Lack of Reserve conditions as per AEMO's ESOO 2026, and such insufficiency could be worse when large-scale coal-fired units retire. Any outage of the remaining large generating units will further increase the generation adequacy gap and could result in unserved energy.

The plans in this Report align with the Integrated System Plan 2026. However, we have considered our own scenarios and forecasts as outlined in this document.

A3.8 Protection requirements

The NER requires that protection systems be installed so that any fault can be detected by at least two fully independent protection systems. Backup protection is provided against circuit breaker failure. Provision is also made for detecting high-resistance earth faults on 330 kV and above circuits.

Required protection clearance times are specified by the NER and determined by stability considerations and the characteristics of modern power system equipment. Where planning includes special protection facilities or speed of fault clearance, they are justified on either NER compliance or a cost-benefit basis.

All modern distance protection systems on the main network include the power swing blocking (PSB) feature, which mitigates the impact of disturbances that can cause synchronous instability. At the moment, PSB is not enabled, except at locations where demonstrated advantages apply. This feature is becoming increasingly critical as the interconnected system expands and becomes more complex.

A3.9 Transient stability

In accordance with the NER, transient stability is assessed by analysing angular swings following a solid fault on one circuit at the most critical location, with the faster of the 2 protections clearing it (assuming intertrip schemes are in service, where applicable). We determine the transient stability capability of the Main System using software calibrated against commercially available system dynamic analysis tools.

To assess transient stability at the Main System level, we apply a two-phase-to-ground fault. On 132 kV systems that are to be augmented, a three-phase fault is applied. At the Main System level, we institute maintenance and operating precautions to minimise the risk of a 3-phase fault.

Where transient stability is a limiting factor in the Main System, we prioritise implementing advanced system controls or high-speed protection systems before considering high-capital plant solutions.

A3.10 Steady state stability

The NER outlines requirements for controlling steady-state stability. For planning purposes, we consider steady state stability (or system damping) adequate under any given operating condition if, after the most critical credible contingency, simulations indicate that the halving time of the least damped electromechanical mode of oscillation is not more than 5 seconds.

We determine steady-state stability performance using software calibrated against commercially available software and data derived from monitoring system behaviour.

In planning the network, we make maximum use of existing plant, through the optimum adjustment of plant control system settings before consideration is given to installing high capital cost plant.

Under Clause S5.1.8 of the NER, Transgrid also considers non-credible contingency events, such as bubsar faults, and double-circuit contingencies. In situations where severe disruption is likely, Transgrid considers measures, such as Remedial Action Schemes and design measures, to help mitigate the impact of such events on the network. Such measures would typically be assessed as part of AEMO's General Power System Risk Review using economic assessment.

A3.11 Power quality

The NER specifies system standards for maintaining power quality in the network. For planning purposes, we consider the associated system standards of NER Schedule 5.1a, including voltage fluctuations, voltage waveform distortion (harmonics), and voltage unbalance requirements, to ensure the quality of the electricity supply to customers. The following measures are considered in planning to manage power quality:

Voltage fluctuations

- Including conditions in connection agreements in relation to the permissible variation with time of the power generated or load taken by Network Users.
- Appropriately sizing the reactive plant based on the location in the network, particularly considering fault levels.
- Introducing management measures, such as Point-on-Wave (POW) and Pre-Insertion Resistors (PIR), when energising transformers and reactive plant.

Voltage waveform distortion

- Including conditions in connection agreements in relation to the permissible voltage distortion by Network Users.
- Introducing management measures, such as filters and detuning capacitor banks, where required.

Voltage unbalance

- Including conditions in connection agreements in relation to the permissible negative sequence voltage levels by Network Users.
- Introducing management measures, such as line transpositions, to balance the effective impedance of the phases.



Jamie Brown - Construction Manager



A3.12 Reactive support and voltage stability

If a single element fails at times of maximum system loading, we need to keep voltages within acceptable levels. A single element could be a generator, a single transmission circuit, a cable or a single item of reactive support plant.

To cover fluctuations in system operating conditions, uncertainties in load levels, measurement errors, and errors in setting control operating points, we need to maintain a margin from any operating point that could result in a loss of voltage control. A reactive power margin is maintained above the point of voltage instability, or alternatively, a margin is maintained with respect to the power transfer relative to the maximum feasible power transfer.

The system voltage profile is set to standard levels during generator dispatch to minimise the need for post-contingency reactive power support.

Reactive power generally has a lower cost than major transmission lines, and the incremental cost of providing additional reactive support can be relatively low. Also, reactive power can have a very high cost-benefit ratio. Consequently, the timing of reactive power installation is typically less sensitive to load changes than for other network augmentations. Even so, the aim is to make maximum use of existing reactive sources before new installations are considered.

We have traditionally assumed that all online generators can provide reactive power support within their rated capability. However, we now align with other utilities in relying solely on the generator's reactive capability as defined by agreed performance standards. Reactive support beyond the performance standards may need to be procured under network support agreements.

We install reactive power to support planned power flows up to the capability defined by limit equations. This is often the critical factor determining network capability. On the Main System, we allow for a single major source of reactive power support to be unavailable in the critical area affected at times of high load, but not at the maximum load level.

To maintain control of the voltage supply to the connected loads under minimum load conditions, we determine the need for reactive plant installations based on the economic and safety imperatives to:

- Limit the voltage deviation between the pre- and post-contingency operating conditions
- Ensure the post contingency operating voltage at the major 330 kV busbars remains above a lower limit
- Maintain the reactive margin from the point of voltage collapse above a minimum acceptable level
- Maintain a margin between the power transmitted and the maximum feasible power transmission
- Maintain voltages during low-load conditions within equipment voltage limits.

Following forced outages, relatively large voltage changes are accepted at some locations on the main network and are agreed with customers, provided that voltage stability is not compromised. These voltage changes can approach, and in certain cases, exceed 10 per cent at maximum load.

In some network sections, the possibility of load loss due to depressed voltages following a contingency is also accepted. However, we prefer to implement load shedding initiated by under-voltage so that disconnections occur in a controlled manner.

When determining the allowable rating of switched reactive plant, we observe the requirements of the NER.

A3.13 Transmission line voltage and conductor sizes determined by economic considerations

Transgrid selects line design voltages within the standard nominal ranges, taking due account of transformation costs. Minimum conductor sizes are governed by losses, radio interference and field strength considerations.

We select line conductor sizes based on cost efficiency. For a line whose design is governed by economic loading limits, we determine the conductor size by assessing capital versus loss costs. This includes considering the impact of the development on generator and load marginal loss factors in the market. For other lines, the rating requirements determine the conductor requirements.

Double-circuit lines are built in place of two single-circuit lines where this is both economic and provides adequate reliability. We consider the impact of a double-circuit line failure, both over relatively short-term and extended duration periods. This means that supplying a relatively large load may require single rather than double-circuit transmission line construction, where this is environmentally acceptable.

In areas prone to bushfire, any parallel single-circuit lines are preferably routed well apart to avoid the risk of simultaneous outage during a bushfire event.

Where feasible, we may consider replacing existing conductors with high-temperature, low-sag conductors of higher ratings to minimise impacts on the surrounding environment and communities.

A3.14 Line and equipment thermal ratings

Line thermal ratings have often traditionally been based on a fixed continuous rating and fixed short-time ratings. Transgrid’s line ratings, which depend on weather conditions and line design parameters, are:

- Normal rating
- Contingency rating
- Short-time emergency rating – typically based on a load duration of 15 minutes, although the duration can be adjusted to suit the particular load pattern to which the line is expected to be exposed.

Five-minute ratings will be used under certain conditions to maintain a reliable supply once coal generators retire. The duration and level of loading take into account any requirements for re-dispatch of generation or load control.

Ambient condition monitors have been installed on several transmission lines to allow real-time line conductor ratings to be applied in the generation dispatch systems. Transgrid is implementing dynamic line ratings on additional transmission lines.

Transformers are rated according to their specification. Provision is also made for the use of the short-time capability of the transformers during the outage of a parallel transformer or transmission line.

The 330 kV cables are rated in accordance with the manufacturer’s recommendations and have been checked against an appropriate thermal model of the cable. The rating of line terminal equipment is based on the manufacturer’s advice.

A3.15 Autoreclosure

As most line faults are transient, our overhead transmission lines are equipped with autoreclose facilities. For most overhead circuits, this is slow-speed 3-pole reclosure. On the remaining overhead circuits, under special circumstances, high-speed single-pole autoreclosing may be applied.

For public safety reasons, reclosure is not applied to underground cables.

Autoreclose is inhibited following the operation of breaker fail protection.

A3.16 Short-circuit rating requirements

Substation high-voltage equipment is designed to withstand the maximum expected short-circuit duty in accordance with the applicable Australian standard.

Operating constraints are enforced to ensure equipment is not exposed to fault duties beyond the plant ratings.

In general, the short-circuit capability of all plants is designed to match or exceed the maximum short-circuit duty at the relevant busbar. To achieve cost efficiencies when augmenting an existing substation, the maximum possible short-circuit duty of individual substation components is calculated and applied to assess the adequacy of the equipment.

Short-circuit duty calculations are based on the following assumptions:

- All main network generators that are capable of operating, as set out in connection agreements, are assumed to be in service
- All generating units that are embedded in distribution networks are assumed to be in service
- The maximum fault contribution from interstate interconnections is assumed
- The worst-case pre-fault power flow conditions are assumed
- Normally open connections are treated as open
- Networks are modelled in full
- Motor load contributions are not modelled at load substations
- Generators are modelled as constant-voltage sources behind sub-transient reactance.

In power station switchyards, we account for the motor component of loads. We analyse the impact of the motor component of loads to assess whether to include such contributions when assessing the adequacy of the rating of load substation equipment.

A3.17 Substation configurations

Transgrid adopts substation configurations (single busbar, double busbar, multiple element mesh or breaker-and-a-half) that provide acceptable reliability at minimum cost. In determining a switching arrangement, we also consider the:

- Site constraints
- Reliability expectations with respect to connected loads and generators
- Physical location of “incoming” and “outgoing” circuits
- Maintenance requirements
- Operating requirements
- Transformer arrangements.

In general, at main system locations, an up to four circuit-breaker mesh or breaker-and-a-half arrangement is the preferred minimum-requirement standard configuration. Where necessary, the expected reliability performance of potential substation configurations can be compared using equipment reliability parameters derived from local and international data.

The forced outage of a single busbar zone is generally provided for. Under this condition, the main network is planned to have adequate capability, although loss of load may eventuate. In general, the forced outage of a single busbar zone should not cause any base-load generating unit to go out of service. Where appropriate, a 330 kV bus section breaker would ordinarily be provided to segregate “incoming” lines when a second “incoming” 330 kV line is connected to the substation.

A 132 kV bus section circuit breaker would generally be considered necessary when the maximum load supplied via that busbar exceeds 120 MW. A bus section breaker is generally provided on the low-voltage busbar of 132 kV substations when more than two low-voltage feeders supply a particular location or area.

A3.18 Power system control and communication

In designing the network and its operation to specified power transfer levels, we use the following control facilities:

- Automatic excitation control on generators
- Power system stabilisers on generators and SVCs
- Load drop compensation on generators and transformers
- Supervisory control over the main network circuit breakers
- Under-frequency load shedding
- Under-voltage load shedding
- Under and over-voltage initiation of reactive plant switching
- High-speed transformer tap changing
- Network connection control
- Check and voltage block synchronisation
- Control of reactive output from SVCs
- Remedial Action Schemes.

We also use the following communication, monitoring and indication facilities where appropriate:

- Network-wide SCADA and Energy Management System
- Telecommunications and data links
- Mobile radio
- Fault locators and disturbance monitors
- Protection signalling
- Load monitors
- Power Quality monitors.

We use protection signalling and communication over a range of media, including pilot wire, power line carrier, microwave links and, increasingly, optical fibres in overhead earthwires.



A3.19 Scenario planning

Scenario planning assesses network capacity across a range of NEM load and generation scenarios, taking into account AEMO’s outlook as stated in its latest ESOO and the scenarios considered in the ISP.

The planning scenarios we develop also incorporate:

- Identifying possible future load growth scenarios. These are developed based on Transgrid’s NSW Region forecasts, DNSPs’ bulk supply point load forecasts and directly connected customer demand outlook. We consider key data for each scenario to prepare load forecasts for the NSW Transmission Annual Planning Report. The forecast can also incorporate possible local developments, such as new loads or the expansion or closure of existing industrial loads.
- Developing a number of generation scenarios for each load growth scenario. These generation scenarios relate to new generators and the utilisation of existing generators, and consider expected or possible future retirements.

- Modelling the NEM for load and generation scenarios to quantify factors affecting network performance, including generation from individual power stations and interconnector flows.
 - Modelling network performance for the load and generation scenarios using the data from market modelling.
- We then assess the set of scenarios over the planning horizon to establish the adequacy of the system and to evaluate network and non-network augmentation options.



David Lilley - Construction Electrician
Drew Angel - Substations Technician Grade 1



A3.20 System Strength

Transgrid’s system strength modelling methodologies, assumptions and results are referred to in Chapter 5.

The following methodologies and assumptions have been followed when producing Transgrid’s system strength Project Assessment Conclusion Report (PACR), published in July 2025:

- Methodologies for assessing system strength follows AEMO’s published System Strength Requirements Methodology v2.0 and System Strength Impact Assessment Guidelines (SSIAG) v2.1
- Inverter-based renewable projections, informing Transgrid’s efficient level requirements, are based on an IBR forecast developed by Baringa Partners. Baringa used the same modelling methodology as AEMO in its ISP and System Strength Reports, however the updated delivery timing of New England REZ was included to reflect best available information at the commencement of PACR modelling. This results in a deviation in future IBR timing and distribution of future IBR compared to AEMO’s 2024 ISP.
- Transgrid has used the Available Fault Level (AFL) methodology to approximate efficient level of system strength requirements. In preparation for the PACR, Transgrid undertook an assessment of stable-voltage waveform remediation required using the AFL proxy method versus detailed PSCAD studies and concluded that AFL method represented a useful long-term planning proxy but should be validated with PSCAD studies.
- For future inverter based renewable plant where the withstand Short Circuit Ratio (SCR) is not known, an assumed value of 3.0 has been used.
- An alpha factor of 1.2 has been used.

- Network solutions for system strength focussed on synchronous condensers and grid-forming batteries. The PADR modelling showed that Grid-forming Static Synchronous Compensators (STATCOMs) coupled with a supercapacitor STATCOMs were not selected as part of the portfolio optimisation approach. As such, Transgrid did not consider STATCOMs as potential solution for the PACR assessment. Synchronous condensers with a short circuit capacity of 1,050 MVA at their point of connection have been assumed.
- Attributes of non-network options have been taken from proponent Expressions of Interest proposals, the 2023 IASR workbook, GHD’s costs and technical parameter review and an independent assessment conducted by GHD.
- In line with discussions between AEMO and System Strength Service Providers, our analysis assumes that fault current contributions from minimum generating unit combinations in other states flow through to NSW until synchronous condensers can be delivered, then one unit less than the minimum combination in each state.
- Transmission dates have been informed by AEMO’s 2024 Integrated System Plan Optimal Development Pathway with updated delivery dates for the New England REZ Network Infrastructure Project.
- The proposed remediation of system strength within the Central-West Orana REZ by the REZ Network Operator is documented within the NSW Government’s Network Infrastructure Strategy. Transgrid have included the ACERREZ synchronous condensers intended to remediate the Central-West Orana REZ in the PACR modelling with updated delivery timing provided by EnergyCo in April 2025.

- In collaboration with Baringa Partners, Transgrid conducted market modelling in PLEXOS to assess the economic feasibility of all solutions considered as part of the system strength PACR.
- To account for the disadvantage that grid-forming BESS face when stable voltage waveform support is ‘valued’ using its fault current provision, Transgrid has introduced a ‘boost factor’ concept. Transgrid has used detailed PSCAD analysis to determine a ratio between the fault current contribution from a synchronous condenser to the MVA size of BESS that can support the level of stable voltage waveform, thus determining the ‘boost’ factor. This was performed on various inverter-supplier models and calculated with a range between 2.6 to 4.1.
- Market modelling assumed a Value of Emissions Reduction (VER) published by the AER in May 2024 consistent with the statement published by the Ministerial Council of Energy (MCE) on the interim value of greenhouse gas emissions reduction. Transgrid also ran sensitivities applying higher and lower assumed VER.

In July (draft) and August 2026 (final), Transgrid published its Material Change in Circumstance (MCC) Report. This Report identified if the PACR preferred option should be changed in light of increasing synchronous condenser costs. The MCC assessment also considered the effect of delayed coal retirements under the 2026 ISP Step Change scenario and a revised synchronous condenser delivery timing based on latest information.

The following assumptions and methodology have been followed when producing Transgrid’s MCC Report:

- AEMO’s ISP Step Change retirement timing of NSW coal generators was updated within the 2026 ISP, compared to the 2024 ISP which underpinned the PACR.
- Transgrid has included the ACERREZ synchronous condensers intended to remediate the Central-West Orana REZ as well as all other existing and committed sources of system strength.
- Transmission dates have been informed by AEMO’s 2026 ISP Optimal Development Pathway.
- Non-network costs for gas, hydro and BESS solutions are sourced from AEMO’s Draft 2026 ISP inputs and assumptions workbook.
- New England REZ solutions, expected as part of the New England REZ Infrastructure Project from January 2034, were excluded from the assessment until EnergyCo’s approach to system strength remediation is confirmed.¹¹¹
- Grid-forming BESS are not currently credible as a source of protection quality fault current, which is required to contribute towards minimum level system strength requirements. Transgrid has included grid-forming BESS for the minimum level as an available solution from FY33, given the high likelihood that grid-forming BESS would form part of the preferred portfolio option if credibility can be confirmed. However, Transgrid will only rely on grid-forming BESS to the extent that there are sufficient alternative fall back solutions to meet the need if grid-forming BESS do not demonstrate credibility.
- Value of customer reliability is based off the AER 2025 Values of Customer Reliability 2025 annual adjustment.

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Methodology

- The MCC assessment applied a streamlined methodology focussing on Transgrid's minimum level system strength requirements, commensurate with the need and the urgency of delivering system strength solutions. This approach was approved by the AER in its determination of Transgrid's MCC notification.
- Transgrid manually constructed five portfolio options to test the value of each of the five PACR identified Phase 2 synchronous condensers.
- For each portfolio option, power system studies were undertaken to assess the gap in system strength against Transgrid's minimum level system strength requirement. The power system studies used coal duration curves derived from PACR market modelling to estimate the proportion of the year each number of coal units were online and then identified the residual system strength gap as a result.
- Hydro and then gas units were then progressively added, in addition to the synchronous condenser(s) included in each portfolio option, until the system strength requirements were met.
- Portfolio options which showed a modelled risk of system strength gaps without the minimum level contribution from grid-forming BESS, were not considered credible. This ensured credible portfolio options have sufficient fall-back solutions if the grid forming BESS for the minimum level does not perform on time or as modelled.

- Transgrid identified a modelled risk of system strength gaps where additional dispatch of gas exceeded model constraints, reflecting practical pipeline and supply limits. These limits were consulted on with AEMO and were informed by independent technical advice provided by GHD for the PACR and by AEMO's 2026 Gas Statement of Opportunities.
- A net present value assessment for each portfolio option was conducted which compared the capital and operating expenditure, avoided involuntary load curtailment, avoided fuel costs, avoided greenhouse gas emissions and changes in costs for non-RIT-T parties for each portfolio option.
- For each credible portfolio option, grid-forming BESS for the minimum level was added incrementally to identify the amount which maximised the net present value.



David Lilley - Construction Electrician
Ryan Dunn - HSE Business Partner

Line utilisation report



A4.1 Line utilisation report

This report sets out our transmission line utilisation for the period from 1 March 2025 to 28 February 2026.

The line loading information from 1 March 2025 to 28 February 2026 was obtained from AEMO Modelling Platform (AMP). This system produces half hourly system operating parameters in NSW and its interconnectors.

For each half hour period, the utilisation (loading) of each line was calculated as a proportion of the relevant rating. The highest values of these proportions are reported here. The utilisation of each line was calculated based on two conditions:

1. With all network elements in service, referred to as the ‘N utilisation’. These utilisation figures are based on normal line ratings; and
2. With the most critical credible contingency (usually an outage of another line in the area), referred to as the ‘N-1 utilisation’. These utilisation figures are based on the line contingency ratings. The N utilisation and N-1 utilisation of the transmission lines in the NSW transmission network are shown in Figures A4.2 to A4.9. For each line, the utilisations are shown in the box placed adjacent to the line. The box shows:
 - A. The transmission line number
 - B. The maximum N utilisation of the transmission line
 - C. The maximum N-1 utilisation of the transmission line
 - D. The identity of the line that creates the critical contingency in the event of an outage.

The box layout is shown in Figure A4.1.

Figure A4.1: Key to interpreting the information shown in Figures A4.2 to A4.9

A. Line number

B. Maximum N Utilisation %

C. Maximum N-1 Utilisation %

D. Line number out for N-1

- In some situations, the N-1 utilisation has been estimated to be more than 100 per cent. These situations could be because of:
- A higher level of line loading being allowed, considering the operational line overloading control schemes, runback schemes available for managing the line loadings, and generation re-dispatch capability by AEMO
 - The predicted dispatch conditions that change over the five-minute dispatch period, causing the line loadings to increase above the predicted values.

Figure A4.2: Transgrid N and N-1 line utilisations – Sydney and Newcastle

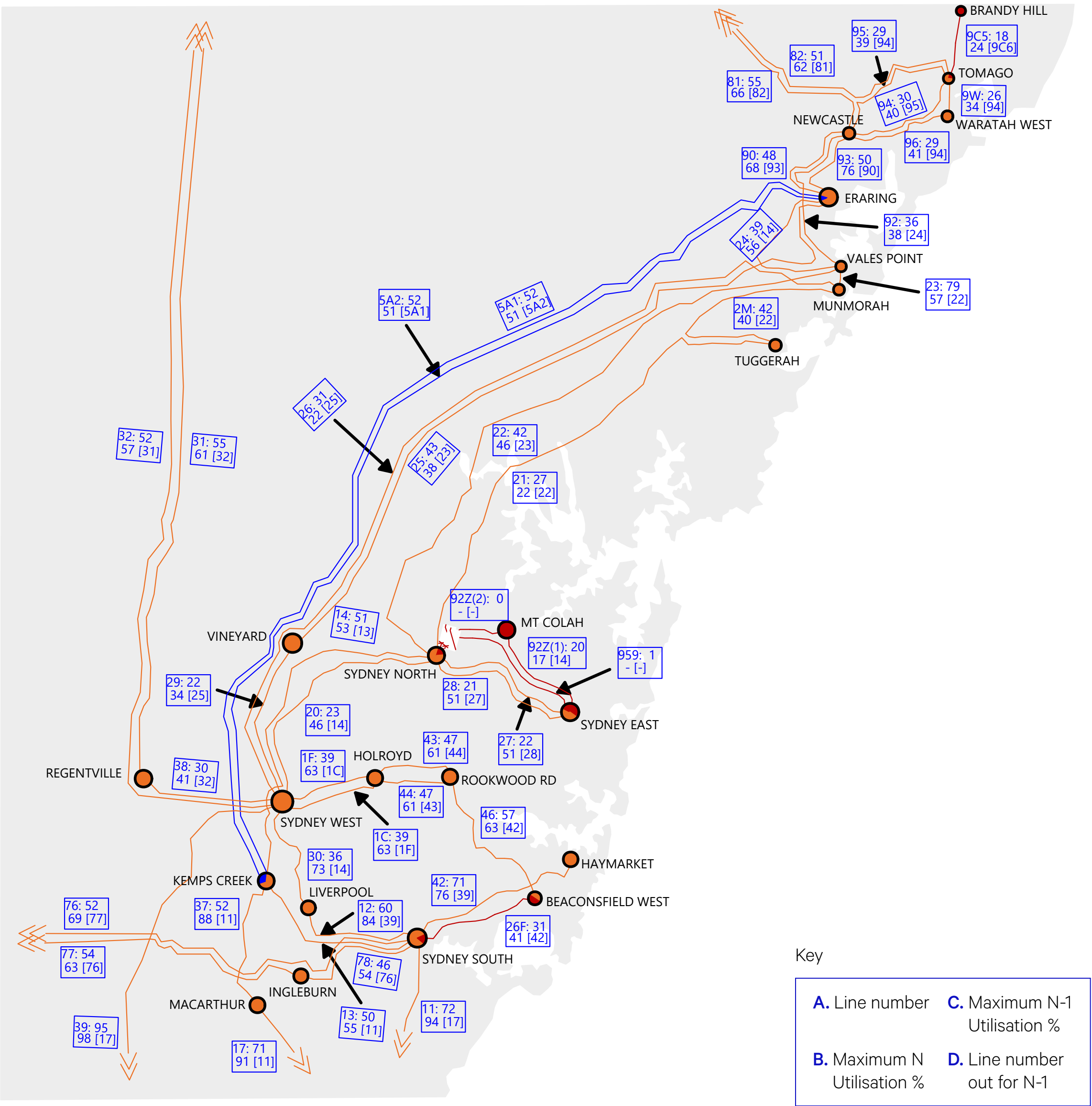


Figure A4.5: Transgrid N and N-1 line utilisations – Far West



Figure A4.6: Transgrid N and N-1 line utilisations – North Coast and North West 132 kV System

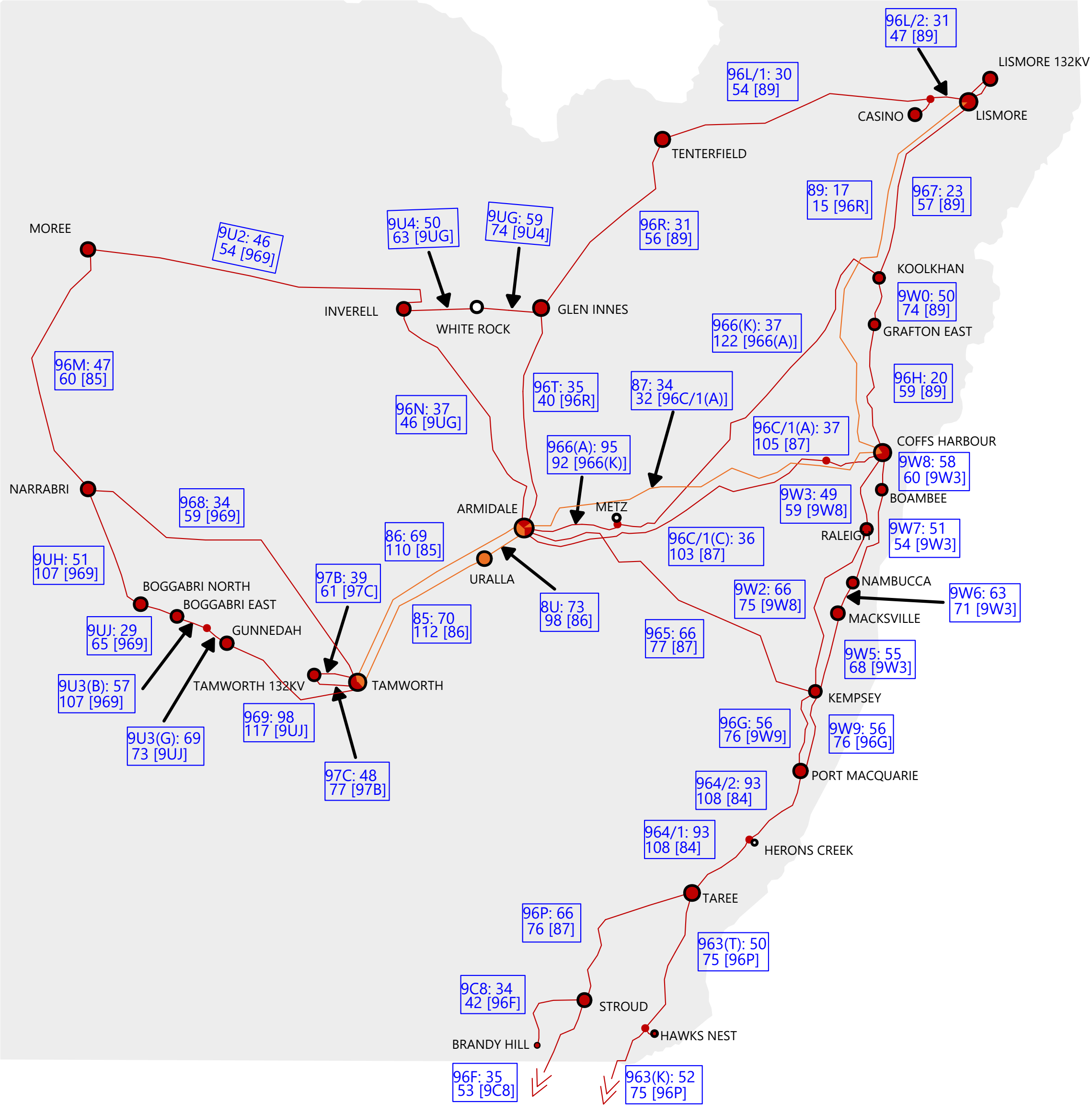


Figure A4.7: Transgrid N and N-1 line utilisations – Central West

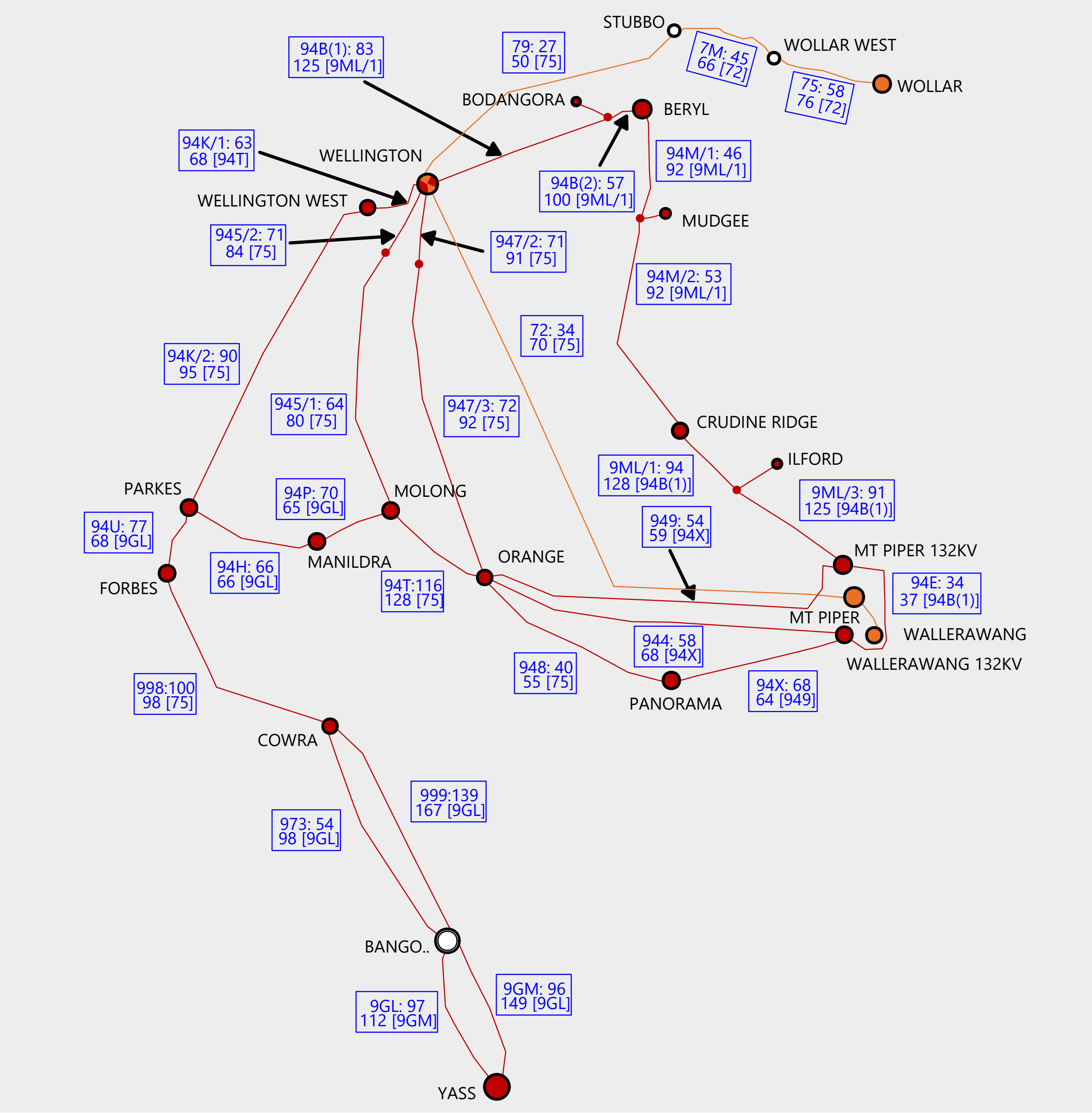


Figure A4.8: Transgrid N and N-1 line utilisations – South East

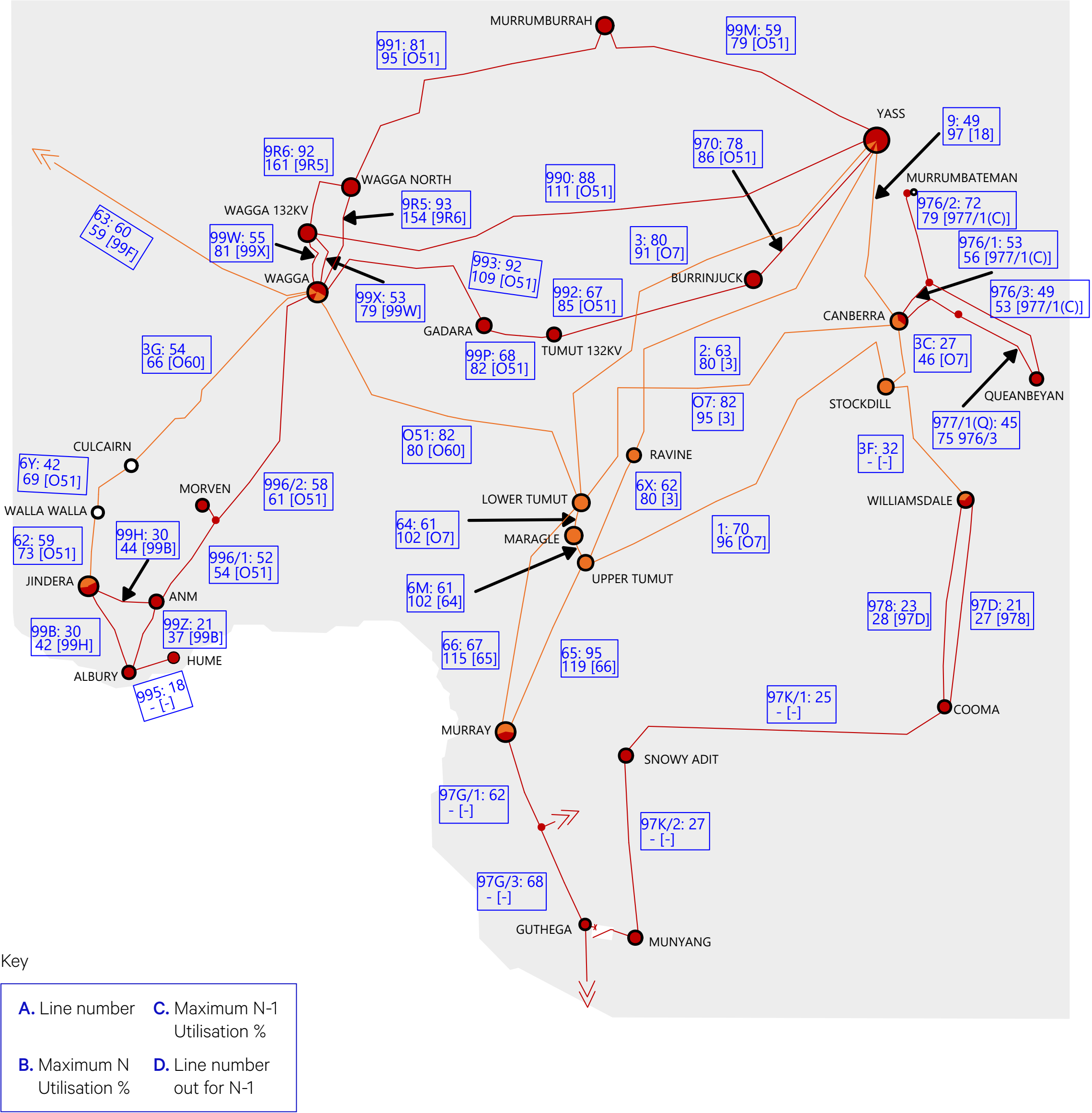
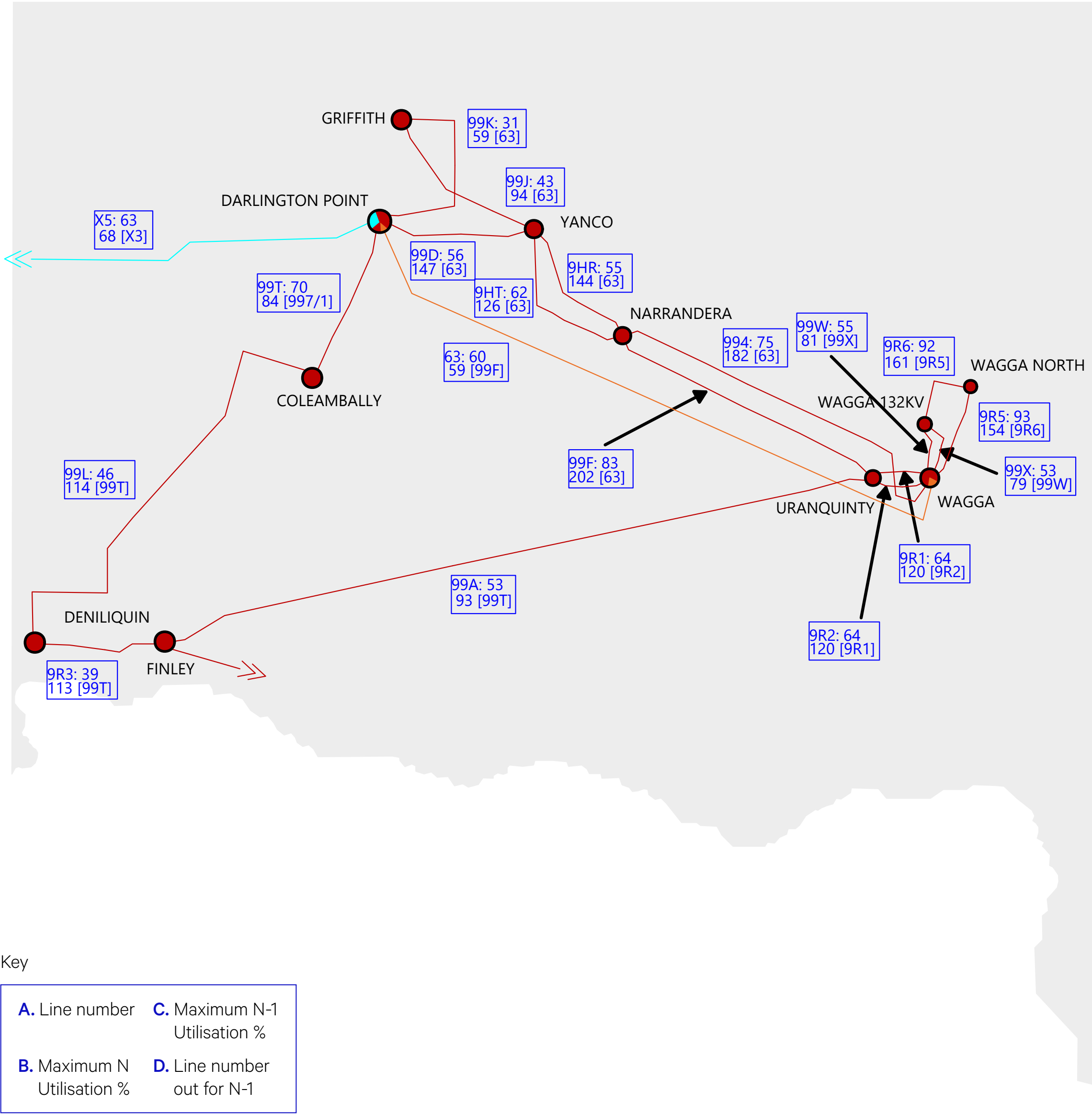


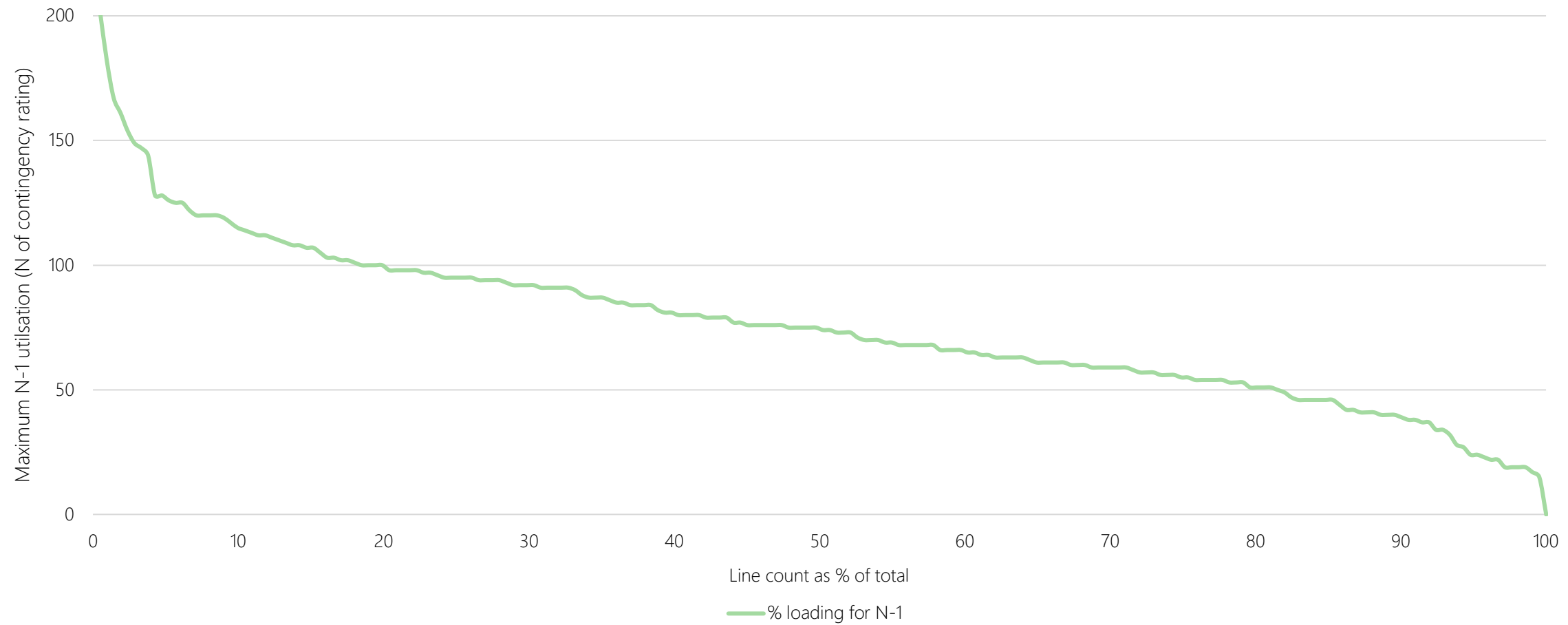
Figure A4.9: Transgrid N and N-1 line utilisations – South West



A4.1.1 Summary of the N-1 utilisation of the transmission lines in the Transgrid network

The distribution of the N-1 utilisation of the transmission lines across our network is shown in Figure A4.10. The distribution shows that approximately 20 per cent of the transmission lines in the network are utilised at more than their installed maximum capacity and over half of the lines are utilised at more than 75 per cent of their installed capacity. The distribution of the N-1 line utilisations reflects at least 40 years of planning history of the transmission network. This is typical of a well-planned network where various parts of the network are well-established, while other parts have had recent step augmentations that will be further utilised in future years.

Figure A4.10: Distribution of Transgrid N-1 utilisations (1 March 2025–28 February 2026)



Transmission constraints



Brodie Grant - 4th Year
Substation Technician
Apprentice

A5.1 Introduction

This appendix shows where the power flows in our network have reached or come close to the network limits, and the assets affected.

- Capacity could be limited due to the power flows reaching:
- The maximum rating of a single transmission element, such as a transmission line or a transformer
 - The combined capacity of a group of transmission elements, such as several parallel transmission lines constituting inter-regional links
 - The limits set by system-wide considerations such as voltage, transient or oscillatory stability.

Transgrid gives this information to AEMO to support power flow management in the transmission network. AEMO automatically adjusts the quantity of generation dispatched to maintain transmission flows under the prevailing operating conditions – and even under credible unplanned outages.

‘Optimal generation dispatch’ is the dispatch that minimises total cost while ensuring the capability limits of the transmission system are not violated. It is determined using the National Electricity Market Dispatch Engine (NEMDE). Capability limits are included within NEMDE as mathematical equations, which are known as the ‘Constraint Equations’. Each constraint equation has a unique identifier, and information including the capability limit and its determining factors, such as power flow in a transmission line or generator power outputs.

The constraints reported here cover the transmission system capability limitation experienced from 1 March 2025 to 28 February 2026.



Caleb Arthur-Wornham - 2nd Year
Transmission Line Apprentice

A5.2 Transmission system performance – Binding duration

Table A5.1 summarises the top 20 constraints where higher cost generation may have been dispatched because some transmission elements or parts of the transmission network have reached their maximum capability. The table shows the constraint identifier, its description, type of limitation addressed by the constraint equation, and length of time the transmission element was operated at its maximum capability from 1 March 2025 to 28 February 2026.

Transgrid reviews the constraints in Table A5.1 to fully understand their nature, and to provide possible solutions to reduce their market impact. The solutions for highly ranked constraints impacting the generators, NSW-QLD and VIC-NSW interconnectors are included in our proposed major developments and in the subsystem developments described in Chapters 2.1 and 2.4 respectively.

Table A5.1: Constraints operating at the capability limit

Rank	Constraint ID	Total duration (dd:hh:mm)	Type	Impact	Reason
1	N>NIL_94T	54:08:30	Thermal	NSW Generation	Avoid overload of Molong to Orange North (94T) line with no trip
2	N>NIL_969	51:05:15	Thermal	NSW Generation	Avoid overload of Gunnedah to Tamworth (969) line with no trip
3	N>>NIL_060_051	40:15:35	Thermal	NSW Generation + Interconnectors	Avoid overload of Jindera to Wodonga (060) line on trip of Wagga to Lower Tumut (051) line
4	N>NIL_901	32:02:20	Thermal	NSW Generation	Avoid overload of West Wyalong to Temora (901) with no trip
5	N>NIL_9R6_991	29:19:35	Thermal	NSW Generation	Avoid overload of Wagga Wagga North to Wagga Wagga 132 (9R6) line on trip of Wagga Wagga North to Murrumburrah (991) line
6	V^^N_NIL_1	22:17:20	Voltage Stability	VIC - NSW Interconnector + Generators	Avoid voltage collapse around Murray on loss of all APD potlines
7	N>Q-NIL_757_758	21:18:00	Thermal	Terranora Interconnector	Avoid overload of Terranora to Mudgeeraba (757 or 758) line on trip of the other
8	N^^N_NIL_WGLT	21:16:05	Voltage Stability	NSW Generation + Interconnectors	Avoid voltage collapse on trip of Wagga to Lower Tumut (051) line
9	N>NIL_94T_75	20:04:15	Thermal	NSW Generation	Avoid overload of Molong to Orange North (94T) line on trip of Wollar West to Wollar (75) line
10	N^^V_NIL_1	16:19:50	Voltage Stability	VIC - NSW Interconnector + Generators	Avoid voltage collapse in southern NSW on trip of largest VIC generator
11	N>NIL_9R6_9R5	16:01:20	Thermal	NSW Generation	Avoid overload of Wagga Wagga North to Wagga Wagga 132 (9R6) line on trip of Wagga Wagga North to Wagga Wagga 330 (9R5) line
12	N>NIL_LSDU	15:02:55	Thermal	Terranora Interconnector	Avoid overload of Lismore to Dunoon (9U6 or 9U7) line on trip of the other
13	N_X_MBTE_3A	14:19:15	Unit Zero	Terranora Interconnector	No flow on Directlink, all 3 cables out of service
14	N>NIL_977_976	14:06:20	Thermal	NSW Generation	Avoid overload of Canberra to Queanbeyan (976 or 977) line on trip of the other
15	N_MBTE1_B	12:20:25	Unit Zero	Terranora Interconnector	Directlink limit with one cable out of service
16	V^SML_BUDP_3	12:10:10	Voltage Stability	VIC Generation + Interconnectors	Avoid voltage collapse on trip of Bendigo to Kerang line, when Buronga to Balranald (X3) or Balranald to Darlington Point (X5) line out of service
17	N>>NIL_964_88_S	11:08:40	Thermal	NSW Generation + Interconnectors	Avoid overload of Port Macquarie to Herons Creek (964/2) line on trip of Tamworth to Muswellbrook (88) line
18	N>NIL_94K_1	10:10:15	Thermal	NSW Generation	Avoid overload of Suntop Tee to Wellington (94K/1) line with no trip
19	V>>N_NIL_65_051	10:02:20	Thermal	VIC Generation + Interconnectors	Avoid overload of Murray to Upper Tumut (65) line on trip of Wagga to Lower Tumut (051) line
20	N>NIL_997/2_99A	9:18:00	Thermal	NSW Generation	Avoid overload of Mulwala to Corowa (996/2) line on trip of Finley to Uranquinty (99A) line

A5.3 Transmission system performance – Market impact

Table A5.2 summarises the top 20 constraints with the highest market impacts, measured by the marginal value. The table shows the constraint identifier, its description, type of limitation addressed by the constraint equation, the sum of the marginal values of the constraint binding and length of time the transmission element was operated at its maximum capability from 1 March 2025 to 28 February 2026.

Table A5.2: Constraints operating at the capability limit

Rank	Constraint ID	Sum of Marginal Values (\$m)	Total duration (dd:hh:mm)	Type	Impact	Reason
1	N>NIL_94T	\$ 26.84	54:08:30	Thermal	NSW Generation	Avoid overload of Molong to Orange North (94T) line with no trip
2	N>NIL_969	\$ 13.77	51:05:15	Thermal	NSW Generation	Avoid overload of Gunnedah to Tamworth (969) line with no trip
3	N>NIL_94T_75	\$ 12.16	20:04:15	Thermal	NSW Generation	Avoid overload of Molong to Orange North (94T) line on trip of Wollar West to Wollar (75) line
4	N>NIL_977_976	\$ 10.15	14:06:20	Thermal	NSW Generation	Avoid overload of Canberra to Queanbeyan (976 or 977) line on trip of the other
5	N>MPWW_94T_71	\$ 10.03	9:07:15	Thermal	NSW Generation	Avoid overload of Molong to Orange (94T) line on trip of Mount Piper to Wallerawang (70 or 71) line with the other Mount Piper to Wallerawang (71 or 70) line out of service
6	N>>NIL_060_051	\$ 9.57	40:15:35	Thermal	NSW Generation + Interconnectors	Avoid overload of Jindera to Wodonga (060) line on trip of Wagga to Lower Tumut (051) line
7	N>NIL_9R6_991	\$ 5.17	29:19:35	Thermal	NSW Generation	Avoid overload of Wagga Wagga North to Wagga 132 (9R6) line on trip of Wagga North to Murrumburrah (991) line
8	N>NIL_901	\$ 4.44	32:02:20	Thermal	NSW Generation	Avoid overload of West Wyalong to Temora (901) with no trip
9	N>NIL_9R5_9R6_N	\$ 4.07	1:02:35	Thermal	NSW Generation	Avoid overload of Wagga Wagga North to Wagga Wagga 132 (9R5) line on trip of Wagga Wagga North to Wagga Wagga 330 (9R6) line
10	N>9ML_94T	\$ 2.46	4:17:05	Thermal	NSW Generation	Avoid overload of Molong to Orange North (94T) line with no trip, when Mount Piper to Crudine Ridge (9ML) line out of service
11	N>NIL_94K_1	\$ 2.26	10:10:15	Thermal	NSW Generation	Avoid overload of Suntop Tee to Wellington (94K/1) line with no trip
12	N>NIL_9R6_9R5	\$ 2.05	16:01:20	Thermal	NSW Generation	Avoid overload of Wagga Wagga North to Wagga Wagga 132 (9R6) line on trip of Wagga Wagga North to Wagga Wagga 330 (9R5) line
13	N>NIL_945_947	\$ 1.75	3:14:15	Thermal	NSW Generation	Avoid overload of Wellington to Wellington Town (945/2) line on trip of Wellington to Orange North (947) line
14	N>NIL_9ML	\$ 1.69	6:05:40	Thermal	NSW Generation	Avoid overload of Crudine Ridge to Ilford (9ML) line with no trip
15	V*SML_BUDP_3	\$ 1.67	12:10:10	Voltage Stability	VIC Generation + Interconnectors	Avoid voltage collapse on trip of Bendigo to Kerang line, when Buronga to Balranald (X3) or Balranald to Darlington Point (X5) line out of service
16	N>NIL_999_9GL	\$ 1.67	6:23:35	Thermal	NSW Generation	Avoid overload of Cowra to Bango (999) line on trip of Bango to Yass (9GL) line
17	N**N_NIL_X5_BESH	\$ 1.23	9:13:30	Voltage Stability	NSW Generation + Interconnectors	Avoid voltage collapse at Balranald on trip of Bendigo to Shepparton line
18	N>>NIL_998_18	\$ 1.20	3:18:25	Thermal	NSW Generation + Interconnectors	Avoid overload of Cowra to Forbes (998) line on trip of Kangaroo Valley to Dapto (18) line
19	N**N_NIL_WGLT	\$ 0.99	21:16:05	Voltage Stability	NSW Generation + Interconnectors	Avoid voltage collapse on trip of Wagga to Lower Tumut (051) line
20	N>94T_947_72	\$ 0.88	2:12:55	Thermal	NSW Generation	Avoid overload of Wellington to Orange North (947) line of trip of Wellington to Mount Piper (72) line, when Molong to Orange North (94T) line out of service

A5.4 Possible future transmission system performance

Table A5.3 summarises the maximum demand event for each of NSW, QLD and VIC that were analysed for the constraints that were binding (or violating) and the 10 constraints that were closest to binding at the time of the maximum demand in the period 1 March 2025 to 28 February 2026. The constraints that were close to binding were assessed to identify possible future transmission system limitations.

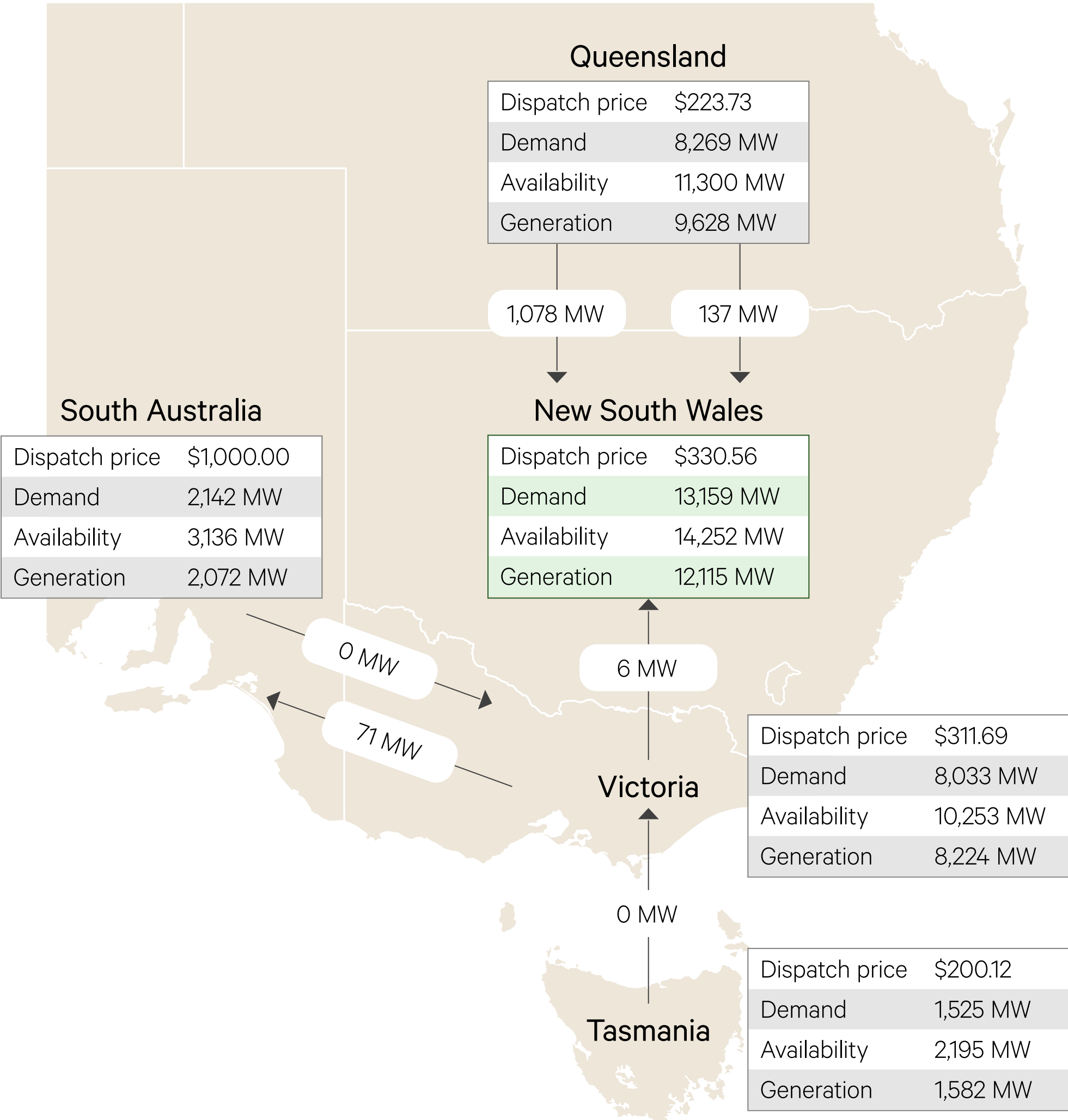
Table A5.3: Maximum demand event in NSW, QLD and VIC

Region	Max demand	Date and time
NSW	13,159 MW	Tuesday 1 July 2025, 17:50
QLD	10,717 MW	Thursday 12 February 2026, 17:00
VIC	10,784 MW	Tuesday 27 January 2026, 18:00

A5.4.1 Maximum demand event in NSW

Figure A5.1 shows a NEM overview map on the maximum demand event day in NSW. It summarises the power flow directions when the maximum demand occurred on Tuesday 1 July 2025 at 17:50.

Figure A5.1: NEM overview map on Tuesday 1 July 2025, 17:50



There were no binding or violating constraints on the maximum demand day of Tuesday 1 July 2025 at 17:50.

Table A5.4 summarises the NSW constraints that were close to binding on the maximum demand day of Tuesday 1 July 2025 at 17:50.

Table A5.4: NSW constraints that were close to binding on Tuesday 1 July 2025, 17:50

Rank	Constraint ID	Headroom (MW) ¹¹²	Type	Impact	Reason
1	N>NIL_977_976	22	Thermal	NSW Generation	Avoid overload of Canberra to Queanbeyan (976 or 977) line on trip of the other
2	N>NIL_COTX_LV	27	Thermal	NSW Generation	Avoid overload of Corowa 132/22 kV transformer with no trip
3	N>NIL_9R5_9R6_N	38	Thermal	NSW Generation	Avoid overload of Wagga Wagga North to Wagga Wagga 132 (9R5) line on trip of Wagga Wagga North to Wagga 330 (9R6) line
4	N>N-NIL_JUTX_LV	38	Thermal	NSW Generation	Avoid overload of Junee 132/66 kV transformer with no trip
5	N>NIL_9R6_9R5_N	39	Thermal	NSW Generation	Avoid overload of Wagga North to Wagga 132 (9R6) line on trip of Wagga North to Wagga 330 (9R5) line
6	N>NIL_94B	47	Thermal	NSW Generation	Avoid overload of Beryl to Wellington (94B/1) line with no trip
7	N>NIL_BHTX_NIL_LV	56	Thermal	NSW Generation	Avoid overload of Broken Hill 220/22 kV transformer with no trip
8	N>NIL_BHTX_NIL_HV	76	Thermal	NSW Generation	Avoid overload of Broken Hill 220/22 kV transformer with no trip
9	N>NIL_BHTX_SF_TTS_HV	76	Thermal	NSW Generation	Avoid overload of Broken Hill 220/22 kV transformer on trip of Broken Hill solar farm
10	N>NIL_94B_94M	83	Thermal	NSW Generation	Avoid overload of Bodangora to Wellington (94B/1) on trip of Beryl to Mudgee Tee (94M) line

112 Constraint equations are directional on energy flow. Hence if flow is in the opposite direction of the constraint equation then headroom can be greater than the element rating.



Teinaga Nouata - Pre-apprentice program
Lilly Flick - 1st Year Transmission Line Apprentice



A5.4.2 Maximum demand event in QLD

Figure A5.2 shows a NEM overview map on the maximum demand event day in QLD. It summarises the power flow directions when the maximum demand occurred on Thursday 12 February 2026 at 17:00.

Figure A5.2: NEM overview map on Thursday 12 February 2026, 17:00

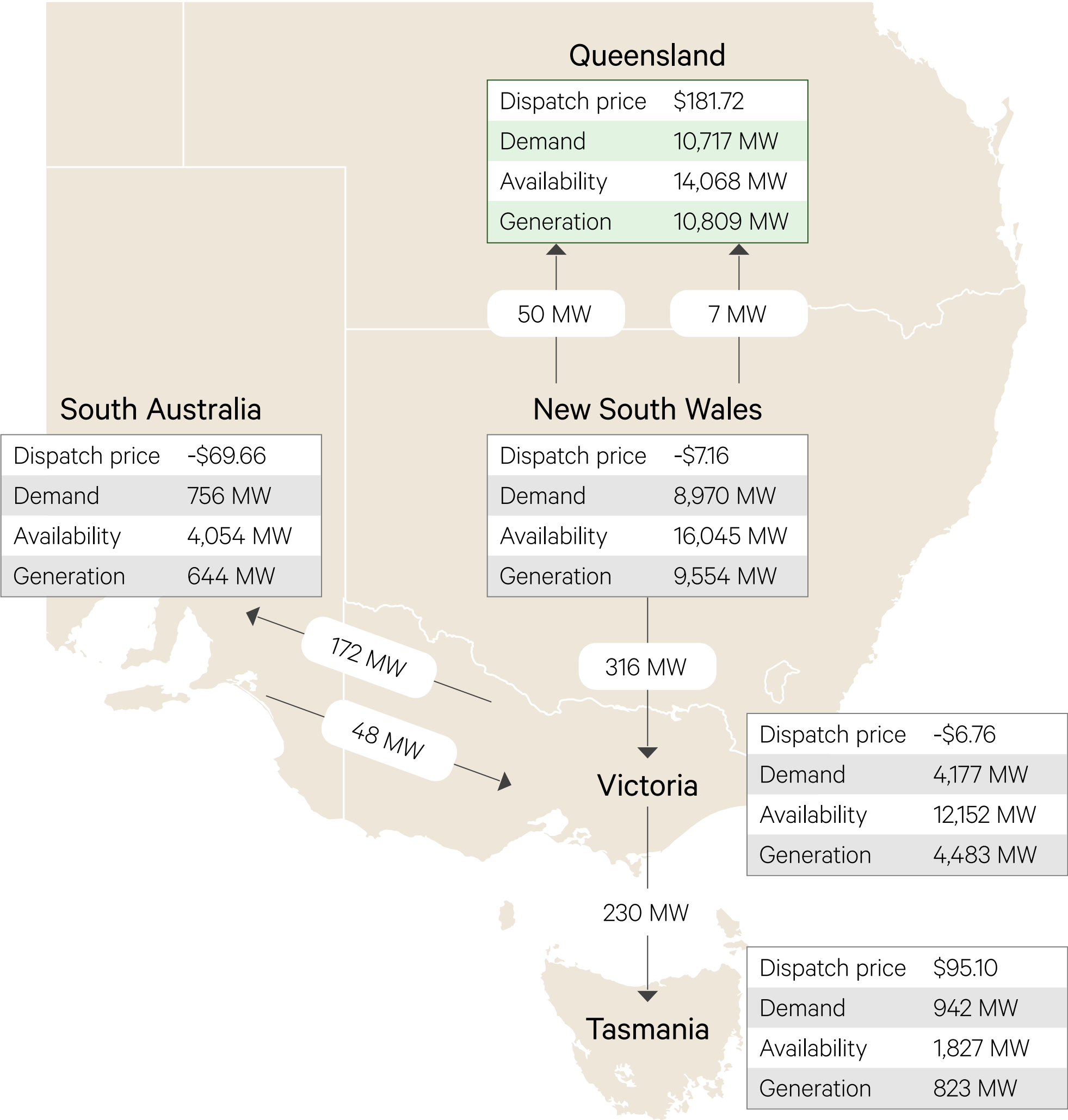


Table A5.5 summarises the NSW binding constraints on the maximum demand day in QLD (Thursday 12 February 2026 at 17:00).

Table A5.5: NSW binding constraints on Thursday 12 February 2026, 17:00

Constraint ID	Type	Impact	Reason
N>>NIL_33_34	Thermal	NSW Generation + Interconnectors	Avoid overload of Bayswater to Liddell (33 or 34) on trip of the other
N>NIL_901	Thermal	NSW Generation	Avoid overload of West Wyalong to Temora (901) with no trip
N>NIL_94T_947	Thermal	NSW Generation	Avoid overload of Molong to Orange North (94T) line on trip of Welling to Orange North (947) line
N>NIL_LSDU	Thermal	Terranora Interconnector	Avoid overload of Lismore to Dunoon (9U6 or 9U7) line on trip of the other
N>>NIL_060_051	Thermal	NSW Generation + Interconnectors	Avoid overload of Jindera to Wodonga (060) line on trip of Wagga to Lower Tumut (051) line

Table A5.6 summarises the NSW constraints that were close to binding on the maximum demand day in QLD (Thursday 12 February 2026 at 17:00).

Table A5.6: NSW constraints that were close to binding on Thursday 12 February 2026, 17:00

Rank	Constraint ID	Headroom (MW) ¹¹³	Type	Impact	Reason
1	N>NIL_94T	2.7	Thermal	NSW Generation	Avoid overload of Molong to Orange North (94T) line with no trip
2	N>NIL_COTX_LV	2.9	Thermal	NSW Generation	Avoid overload of Corowa 132/22 kV transformer with no trip
3	N>N-NIL_JUTX_LV	4.6	Thermal	NSW Generation	Avoid overload of Junee 132/66 kV transformer with no trip
4	N>NIL_PKTX_LV	5.5	Thermal	NSW Generation	Avoid overload of Parkes 132/66 kV transformer with no trip
5	N**N_NIL_X5_BESH	9.9	Voltage Stability	NSW Generation + Interconnectors	Avoid voltage collapse at Balranald on trip of Bendigo to Shepparton line
6	N>NIL_9R6_991	14	Thermal	NSW Generation	Avoid overload of Wagga Wagga North to Wagga Wagga 132 (9R6) line on trip of Wagga Wagga North to Murrumburrah (991) line
7	N**N_NIL_X5_BEKG	30	Voltage Stability	NSW Generation + Interconnectors	Avoid voltage collapse at Balranald on trip of Bendigo to Kerang line
8	N>NIL_99F	31	Thermal	NSW Generation	Avoid overload of Narrandera to Uranquinty (99F) line with no trip
9	N>NIL_94T_75	31	Thermal	NSW Generation	Avoid overload of Molong to Orange North (94T) line on trip of Wollar West to Wollar (75) line
10	N_MBTE1_A	48.2	Unit Zero	Terranora Interconnector	Directlink limit with one cable out of service

113 Constraint equations are directional on energy flow. Hence if flow is in the opposite direction of the constraint equation, then headroom can be greater than the element rating.

A5.4.3 Maximum demand event in VIC

Figure A5.3 shows a NEM overview map on the maximum demand event day in VIC. It summarises the power flow directions when the maximum demand occurred on Tuesday 27 January 2026 at 18:00.

Figure A5.3: NEM overview map on Tuesday 27 January 2026, 18:00

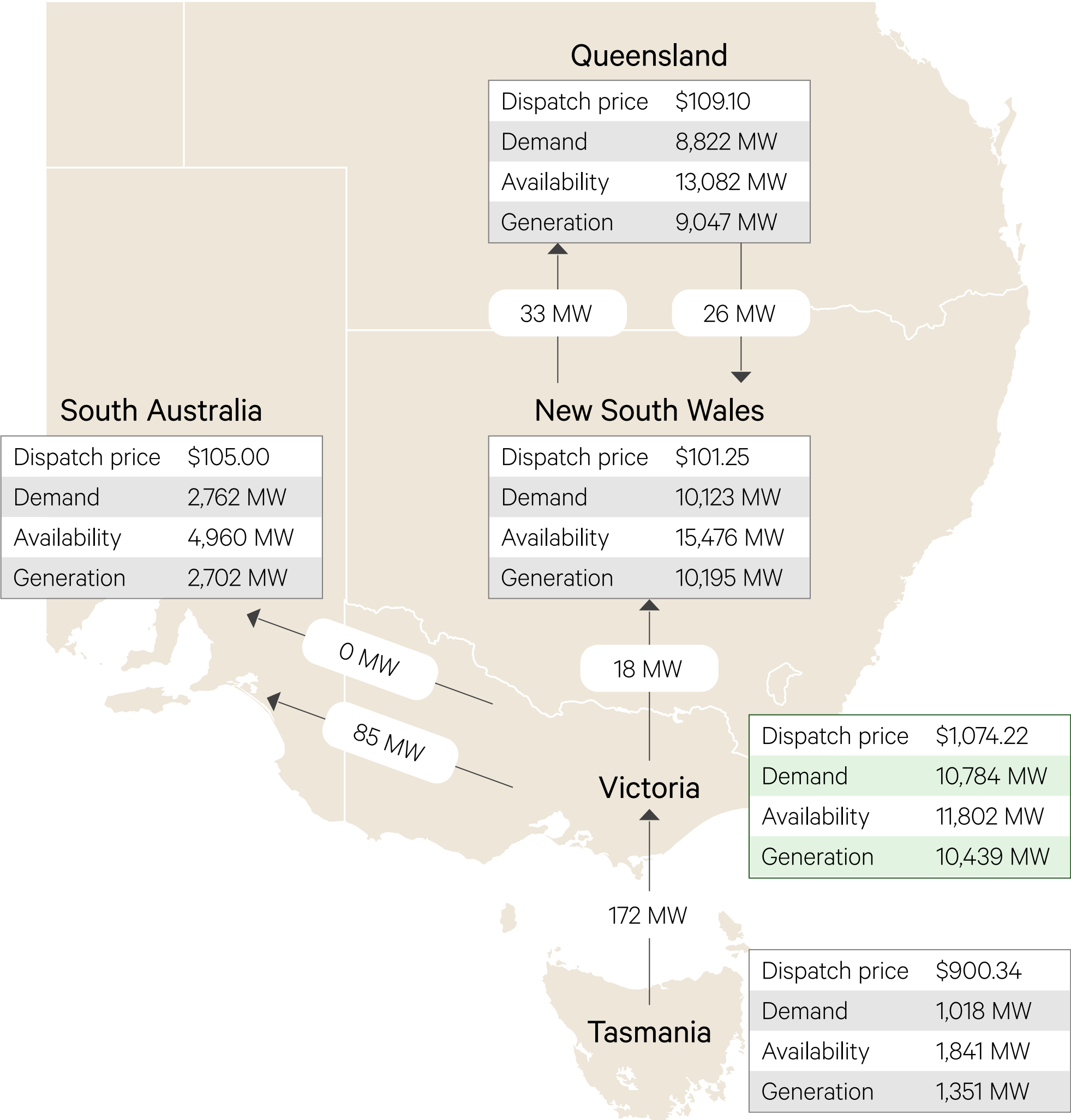


Table A5.7 summarises the NSW binding constraints on the maximum demand day in VIC (Tuesday 27 January 2026 at 18:00).

Table A5.7: NSW binding constraints on Tuesday 27 January 2026, 18:00

Constraint ID	Type	Impact	Reason
N>96L_96R_967_89	Thermal	NSW Generation + Interconnectors	Avoid overload of Koolkhan to Lismore (967) line on trip of Coffs Harbour to Lismore (89) line Lismore to Tenterfield (96L) or Glen Innes to Tenterfield (96R out

Table A5.8: NSW constraints that were close to binding on Tuesday 27 January 2026, 18:00

Rank	Constraint ID	Headroom (MW) ¹¹⁴	Type	Impact	Reason
1	N^V_BADP_1	7.6	Voltage Stability	NSW Generation + Interconnectors	Avoid voltage collapse on trip of largest VIC generator or Basslink, when Balranald to Darlington Point (X5) line out of service
2	N>N-NIL_JUTX_LV	24	Thermal	NSW Generation	Avoid overload of Junee 132/66 kV transformer with no trip
3	N>NIL_COTX_LV	26	Thermal	NSW Generation	Avoid overload of Corowa 132/22 kV transformer with no trip
4	N>NIL_901	31	Thermal	NSW Generation	Avoid overload of West Wyalong to Temora (901) with no trip
5	N>NIL_BHTX_HV	35	Thermal	NSW Generation	Avoid overload of Broken Hill (1 or 2) 220/22 kV transformer on trip of the other
6	N>NIL_977_976	46	Thermal	NSW Generation	Avoid overload of Canberra to Queanbeyan (976 or 977) line on trip of the other
7	N>NIL_94T	49	Thermal	NSW Generation	Avoid overload of Molong to Orange North (94T) line with no trip
8	N>NIL_PKT_X_LV	51	Thermal	NSW Generation	Avoid overload of Parkes 132/66 kV transformer with no trip
9	N>NIL_LSDU	65	Thermal	Terranora Interconnector	Avoid overload of Lismore to Dunoon (9U6 or 9U7) line on trip of the other
10	N>NIL_966/1	84	Thermal	NSW Generation	Avoid overload of Metz Tee to Armidale (966/1) line with no trip

114 Constraint equations are directional on energy flow. Hence if flow is in the opposite direction of the constraint equation, then headroom can be greater than the element rating



Glossary



Term	Explanation/Comments
AEMC	The Australian Energy Market Commission develops the National Electricity Rules by which the markets must operate
AEMO	The Australian Energy Market Operator is responsible for operation of the NEM and has the role of Victorian Jurisdictional Planning Body (JPB)
AER (the regulator)	The Australian Energy Regulator monitors performance and compliance with the rules
As generated	Generation measured at the generator terminals
Assets	Transgrid’s ‘towers and wires’, all the substations and electricity transmission lines that make up the network
Augmentation	Expansion of the existing transmission system or an increase in its capacity to transmit electricity
BESS	Battery Energy Storage System
Bulk supply point (BSP)	A point of supply of electricity from a transmission system to a distribution system
CAGR	Compound annual growth rate
Committed	New generation projects assessed to have a ‘Committed’ status as described in the System Strength Impact Assessment Guidelines. ¹¹⁵ Transgrid further defines committed projects as those where AEMO has been notified as per 5.3.7(g) of the NER
Connection point	The agreed point of supply established between the network service provider and another registered participant or customer
Cooling degree days (Appendix 1)	Cooling degree days are the addition of cooling degrees for all days in a given period. Cooling degrees, or CDs, are temperature deviations above or below the human comfort threshold of 21°C. If, for a given temperature, t, measured on any particular day $t \leq 21^{\circ}\text{C}$, $CD = 0$, or $t > 21^{\circ}\text{C}$, $CD = t - 21$
Constraint (limitation)	An inability of a transmission system or distribution system to supply a required amount of electricity to a required standard
Consumers	Any end user of electricity including large users, such as paper mills, and small users, such as households
Demand	The total amount of electrical power that is drawn from the network by consumers. This is talked about in terms of ‘maximum demand’ (the maximum amount of power drawn throughout a given period) and ‘total energy consumed’ (the total amount of energy drawn across a period)
Demand, Native	Operational demand as above plus small Non-Scheduled generation. Non-inclusion of this generation may significantly distort past electricity usage trends in NSW

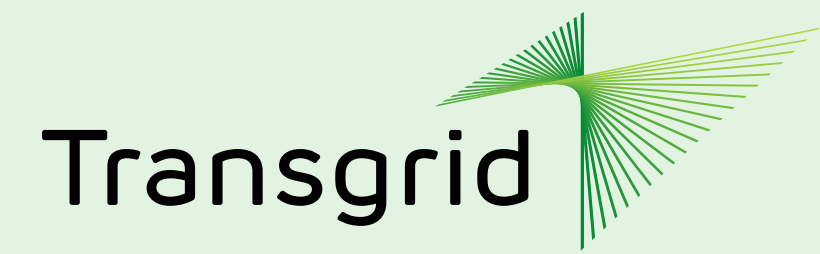
Term	Explanation/Comments
Demand, Operational	A measure of electricity use based on half-hourly measurements of all Scheduled, Semi-Scheduled and significant Non-Scheduled generation within the region, plus net imports into the region. Importantly, operational demand does not include demand met by rooftop solar, which is “behind the meter”
Demand management (DM)	A set of initiatives that are put in place at the point of end-use to reduce the total and/or maximum consumption of electricity
Direct customers	Transgrid’s customers are those directly connected to our network. They are either Distribution Network Service Providers, directly connected generators, large industrial customers, customers connected through interregional connections or potential new customers
Distribution Network Service Provider, DNSP (Distributor)	An organisation that owns, controls or operates a distribution system in the National Electricity Market. Distribution systems operate at a lower voltage than transmission systems and deliver power from the transmission network to households and businesses
Easement	A designated area in which Transgrid has the right to construct, access and maintain our assets, while ownership of the property remains with the original land owner
Elasticity	A unit-less measure of responsiveness of demand to either price or income. For example, an own price elasticity of -0.5 means that a 1 per cent increase in own price reduces demand by 0.5 per cent
Electricity services (Appendix 1)	This concept is used in Transgrid’s energy modelling and refers to an underlying, primary need to use appliances that happen to be powered by electricity. It includes both residential electricity services and non-residential electricity services. Residential electricity services are constructed as the addition of residential grid supplied energy, residential rooftop solar generation and estimated above-trend residential energy efficiency savings. Non-residential electricity services are constructed as the addition of non-residential native energy (minus major industrial loads), non-residential rooftop solar generation, and an estimate of out-of-trend non-residential energy efficiency savings
Electricity Statement of Opportunities (ESOO)	A document produced by AEMO that focuses on electricity supply-demand balance in the NEM
Embedded generation	A generating unit connected to the distribution network, or connected to a distribution network customer (not a transmission connected generator)
Energy	Measures the capacity for work to be done by electricity that is supplied to consumers, expressed in GWh per year
EnergyCo	The Energy Corporation of New South Wales leads the delivery of renewable energy zones (REZ)

Term	Explanation/Comments
Generator	An organisation that produces electricity. Power can be generated from various sources, e.g. coal-fired power plants, gas-fired power plants, solar and wind farms
Heating degree days (Appendix 1)	Heating degree days are the addition of heating degrees for all days in a given period. Heating degrees, or HDs, are temperature deviations above or below the human comfort threshold of 18°C. If, for a given temperature, t, measured on any particular day, $t \leq 18^{\circ}\text{C}$, $\text{CD} = 0$, or $t > 18^{\circ}\text{C}$, $\text{CD} = 18 - t$
Hybrid	A power system that generates electricity from two or more renewable sources, sharing a single network connection point
IBR	Inverter-based resource
Interconnection	The points on an electricity transmission network that cross state boundaries
IPART	Independent Pricing and Regulatory Tribunal
ISP	Integrated System Plan
Jurisdictional Planning Body (JPB)	The organisation nominated by a relevant minister as having transmission system planning responsibility in a jurisdiction of the NEM
Load	The amount of electrical power that is drawn from the network
Load factor	The ratio of average demand to maximum demand. This can relate to maximum demand and energy via the formulation: $\text{Load factor} = 1000 \times \text{GWh energy} / (\text{MW maximum demand} \times 8760)$
Local generation	A generation or co-generation facility that is located on the load side of a transmission constraint
Major industrial load	Electricity usage by a defined group of large electricity customers with whom Transgrid has a direct relationship and who are not significantly responsive to price or temperature
Maximum demand	Measures the highest rate, within a defined period such as summer or winter, at which energy is absorbed by the network, generally expressed in this report by the measure of MW averaged over a half hour
MCC	Material Change in Circumstance
Minimum demand	Measures the lowest rate, within a defined period such as spring or autumn, at which energy is absorbed by the network, generally expressed in this report by the measure of MW averaged over a half hour
‘N – 1’ reliability	The system is planned for no loss of load on the outage of a single element such as a line, cable or transformer
National Electricity Law	Common laws across the states which comprise the NEM and make the NER enforceable

Term	Explanation/Comments
National Electricity Market (NEM)	The National Electricity Market, covering Queensland, New South Wales, Victoria, South Australia and Tasmania
National Electricity Rules (NER or ‘the Rules’)	The rules that govern the NEM. The Rules are administered by the AEMC
Native energy (demand)	Energy (demand) is inclusive of scheduled, semi-scheduled and non-scheduled generation
Non-network options	Alternatives to network augmentation which address a potential shortage in electricity supply in a region, e.g. demand response or local generation
NSCAS	Network Support and Control Ancillary Services are used by AEMO that are essential for managing power system security, facilitating orderly trading, and ensuring electricity supplies are of an acceptable quality
NSW Region	With respect to energy consumption and demand, the term ‘NSW Region’ refers to the combined NSW and the ACT electricity loads
Outage	An outage is when part of the network is switched off. This can be either planned (i.e. when work needs to be done on the line) or unplanned
PACR	Project Assessment Conclusions Report. The PACR is the final deliverable of the RIT-T
PADR	Project Assessment Draft Report. The PADR is a deliverable of the RIT-T
PNIP	Priority Network Infrastructure Project
POE	Probability of Exceedance. This is the probability a forecast would be met or exceeded, e.g. a 50 per cent POE demand implies there is a 50 per cent probability of the forecast being met or exceeded
PSCR	Project Specification Consultation Report. The PSCR is the first deliverable of the RIT-T
PV	Photovoltaic
RAS	Remedial Action Scheme is used to take action on the HV Network during special operating conditions
Reliability	Reliability is a measure of a power system’s capacity to continue to supply sufficient power to satisfy customer demand, allowing for the loss of generation capacity
RET	Renewable Energy Target
REZ	Renewable Energy Zone
RIT-T	Regulatory Investment Test for Transmission
Secondary system	Equipment used to control, automate, protect and monitor the network
Sent-out	Generation measured at the point of connection with the transmission network

Term	Explanation/Comments
Small non-scheduled generation	Non-Scheduled generation that is not included in Operational Demand
Spot load	Spot loads are step (one-shot) increases in load for a BSP due to new commercial/ housing developments or large industrial customer connections. There could be spot load decreases in cases where there are withdrawals of large-load customers from the grid
Substation	A secure area designated for HV switchgear, secondary systems, and other Transgrid assets other than transmission lines
Summer	In this report, all days from 16 November to 15 March
SVC	Static VAr Compensator. An electrical device installed on the high-voltage transmission system to provide fast acting voltage control to regulate and stabilise the system
TAC	Transgrid’s Advisory Council
TBD	To be determined; used where data is unavailable at the time of publication
Transmission Annual Planning Report (TAPR)	This document that sets out issues and provides information to the market that is relevant to transmission planning in NSW
Transmission line	A high-voltage power line running at 500 kV, 330 kV, 220 kV or 132 kV. The high-voltage allows delivery of bulk power over long distances with minimal power loss
Transmission Network Service Provider (TNSP)	A body that owns, controls and operates a transmission system in the NEM
VER	Value of Emissions Reduction
Winter	In this report, all days in a particular year from 16 May to 31 August





Contact details

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For detailed network information see Transgrid Connections Opportunities portal at: tapr.transgrid.com.au

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