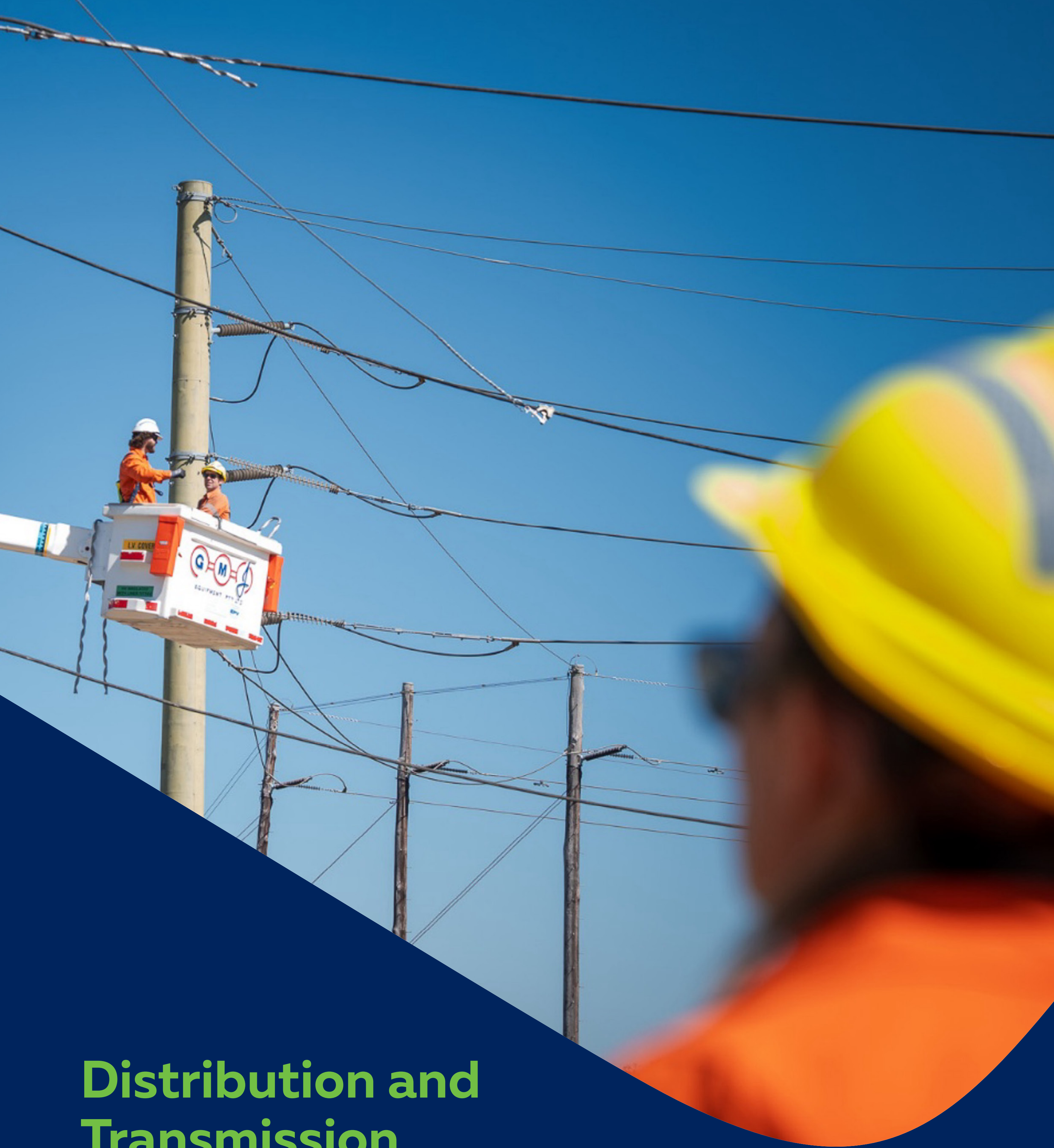

Distribution and Transmission Annual Planning Report

December 2025

Ausgrid

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Message from Junayd Hollis

Ausgrid continues to play a pivotal role in enabling the energy transition across its communities. We have an obligation to protect the long-term interests of our customers and the communities we serve. As adoption of consumer energy resources (**CER**) accelerates, through rooftop solar, battery storage, and electric vehicles, our network is evolving to become smarter, more dynamic, and more customer focused.

Our purpose is to make electricity accessible for all, and our vision is for our communities to have the power in a resilient, affordable and sustainable future. This aligns with our customer's priorities for:

- **Reliable electricity** – confidence that Ausgrid is there to power their needs;
- **Affordable electricity** – empowering customers to manage their energy use and bills; and
- **Renewable electricity** – supporting Australia's decarbonisation goals and protecting our planet.

A Year of Growth, Innovation and Connection

In 2025, Ausgrid has continued to see strong growth in demand across the network, driven by electrification, large loads connecting and population growth. The adoption of CER continues to rise, giving customers greater control over how they generate, store, and use electricity.

This year brought significant progress on the Hunter-Central Coast Renewable Energy Zone (**HCC REZ**). In April 2025, the NSW Consumer Trustee formally confirmed Ausgrid as the preferred network operator for the HCC Project, authorising us to design, build, own, control and operate the network infrastructure required to deliver 1 GW of transfer capacity by 2028. Ausgrid and Transgrid have also jointly developed projects to expand the HCC REZ and are currently working with NSW EnergyCo and market proponents on detailed modelling work to progress these projects.

Investments in **battery energy storage systems** (**BESS**) and **community batteries** are improving reliability and allowing more renewable energy to be shared locally.

Electric vehicle (EV) uptake is accelerating, and we are exploring vehicle-to-grid (**V2G**) technology to support network stability and enable customers to use their energy more flexibly.

Complementary initiatives such as **Stand Alone Power Systems** (**SAPS**) and **microgrids** are delivering more resilient and efficient solutions for customers in remote and **bushfire-prone areas**. This year, the commissioning of the **Merriwa Microgrid** marked a significant milestone in our resilience journey. The system combines solar generation, battery storage, and backup generation to supply local customers during outages, enhancing energy security and demonstrating how innovative, community-based solutions can support regional resilience. There have been two recent significant storms that were in the areas we have identified for investment in network resilience projects, including the Central Coast. This highlights the importance of Climate Resilience Program's place-based approach, including prioritised investment in communities most frequently impacted by extreme weather events.

Building a Smarter, More Dynamic Network

Through our wider **Network Digitisation Program**, we continue to modernise the way we plan, monitor and operate the grid. Advancements in data, analytics and automation are supporting more efficient decision making, with technologies such as **Fault Location, Isolation and Service Restoration** (**FLISR**) improving reliability by restoring supply more quickly to customers during outages.

This year we also launched the inaugural **NSW Distribution System Plan** with Endeavour Energy and Essential Energy, which sets out a single unified view across the three NSW electricity distribution networks on how to fully leverage and optimise the existing distribution network to meet future energy needs. This Plan has shown NSW could unlock up to $4.3 billion in value by using available network capacity and integrating CER like rooftop solar, batteries and EVs.

We are also enhancing the visibility of the network by expanding our mapping portal in early 2026 to incorporate 11kV and low voltage network assets, giving customers, councils and developers clearer insights into network hosting capacity and opportunities for connection.

We are also focussed on deepening our partnerships with local communities. We have proposed a pilot program, the Community Power Network (**CPN**), to enable more communities to benefit from the energy transition by co-ordinating how energy is generated, stored and shared in neighbourhoods. This will help to unlock smarter ways to reduce costs, support more solar energy, and help everyone in the community to benefit – whether they have rooftop panels or not.

Together, these digital and community-centred initiatives lay the foundation for a **smarter, more responsive and more resilient distribution system**, capable of adapting to the rapidly changing needs of our customers and the broader energy network.

Our 2025 Distribution and Transmission Annual Planning Report (DTAPR)

This year's DTAPR highlights our progress, challenges and forward strategies. The report is presented in two parts: a summary of key initiatives and outcomes, and a detailed technical document outlining our assessments and obligations as a Distribution and Transmission Network Service Provider.

Looking ahead, we remain focused on meeting our customer needs by:

- Supporting additional renewables and storage connections,
- Enhancing network resilience and flexibility,
- Expanding digital innovation, and
- Balancing affordability with the investments needed for a clean energy future.

Electrification remains central to our vision — the pathway to a resilient, affordable, and sustainable future. Ausgrid is proud to be enabling that future, together with our customers and communities.

This report provides an overview of our plans and strategies for the forward planning period. If you have enquiries, please reach out to us at assetinvestment@ausgrid.com.au.

Junayd Hollis
Group Executive - Network and Digital

About Ausgrid

Ausgrid is operated under a long-term lease via a partnership between the NSW Government and AustralianSuper, APG Asset Management and IFM Investors where 49.6% of interest and share are held by the NSW Government.

Ausgrid owns and operates the network of substations, powerlines, underground cables and power poles that deliver power to communities across large parts of Greater Sydney, the Central Coast and the Hunter. Ausgrid's network is a shared asset that empowers our customers and their communities and has done so for over a century.

Our core business is to provide distribution network services to our customers. Each day we build, operate and maintain the distribution network with a focus on providing a safe, reliable, affordable and sustainable energy supply. The wide range of services we provide is illustrated on the next page.

We're investing now for a future where renewables play a dominant role in the power mix and households and businesses can generate their own energy and sell it back to the grid. The grid has a pivotal role in supporting customers during this energy transformation. We are committed to working with our customers and stakeholders to realise this lower carbon future sooner and at the lowest possible cost for all customers.

Our Network and Customers

We provide an essential service to over four million customers including urban residents and businesses in Sydney, Australia's largest city, and those in rural areas across the Central Coast and Hunter Valley. Our customers also include local councils, telecommunication providers and developers. We service critical infrastructure within our network footprint, including schools and hospitals.

Ausgrid's Network Area, with Indigenous Place Names

Our Network and Customers

- **4m** Australians
- **20%** of Australia's GDP
- **1.5m** Homes
- **200k** Businesses
- **1,238** Schools
- **105** Hospitals
- **1.8m** Customers
- **22,275km²** Area

Ausgrid network covers 22,275 km² made up of large and small substations connected through high and low voltage powerlines, underground cables, tunnels and power poles, including

Dual function subtransmission system	Subtransmission system	High voltage (HV) distribution system	Low voltage (LV) distribution system
132kV transmission assets operated in parallel to and in support of the main transmission system	33kV, 66kV and 132kV assets	Predominantly 11kV, with some 5kV, 22kV and 33kV and 12.7kV Single Earth Wire Return assets	400V assets (230V single phase)

Operating Environment

Ausgrid is regulated by a range of statutory and legislative requirements, including Work Health and Safety (**WH&S**), environmental, competition, industrial, consumer protection and information laws, National Electricity Law (**NEL**), National Electricity Rules (**NER**) and the NSW Electricity Supply Act 1995 (ESA). We must also comply with the conditions of our NSW DNSP licence (under the ESA), Security of Critical Infrastructure Act 2018 and Electricity Infrastructure Investment Act 2020 (**NSW**).

The NEL and NER regulate the National Electricity Market (**NEM**), and the National Energy Customer Framework. Ausgrid operates in the NEM as both a DNSP and TNSP. The National Electricity Objective (**NEO**), was amended in late 2023 to include an emissions reduction component, and as stated in the NEL is 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 Australia's greenhouse gas emissions."

We meet these obligations with investments that address our customers' requirements for safe, affordable, reliable and sustainable network services.

We manage compliance with these laws and regulations through our internal codes and policies and a common control framework. This control framework comprises plans, policies, procedures, delegations, instruction and training, audit and risk management.

Our Purpose

Making electricity accessible for all.

Our Vision

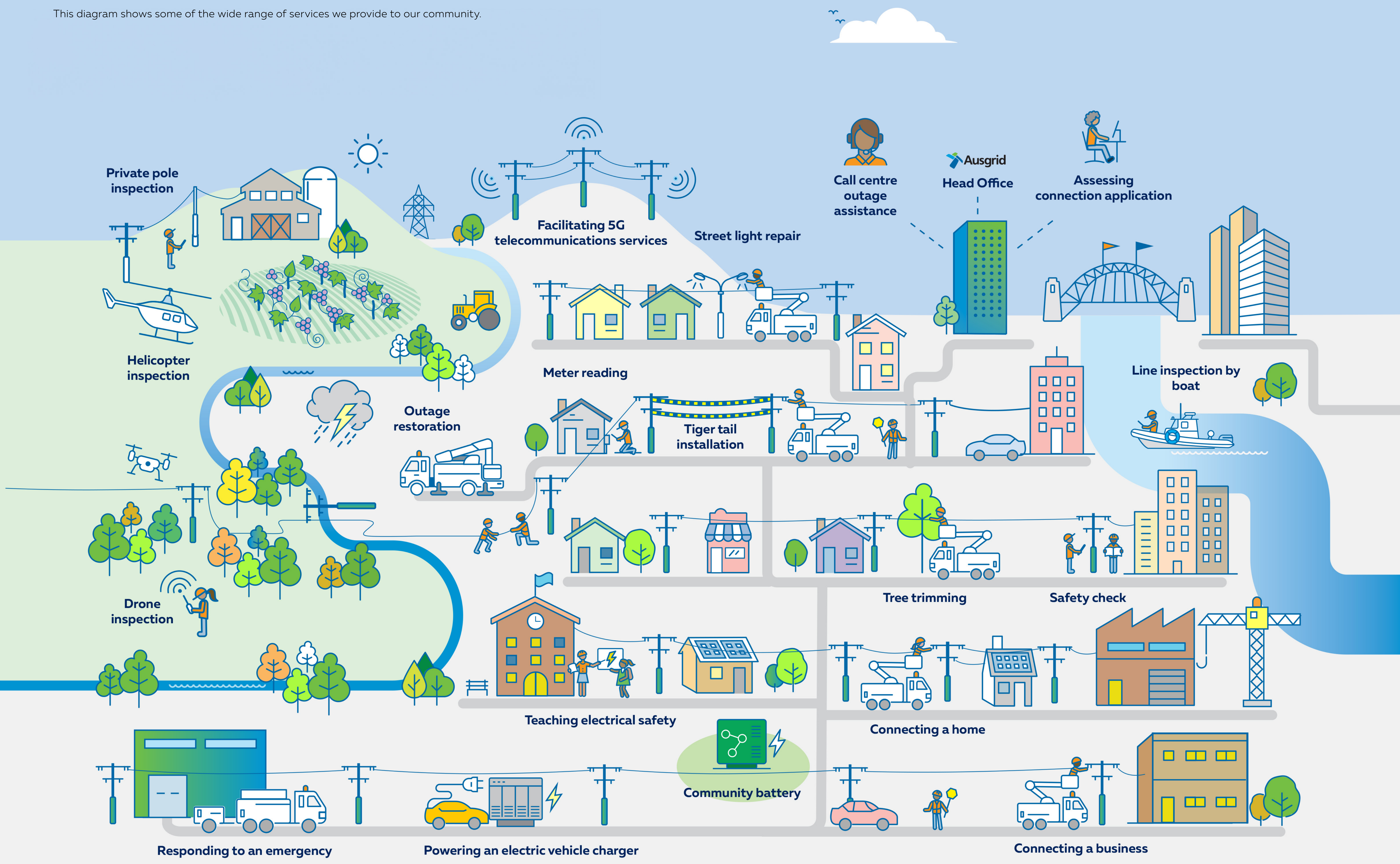
For our communities to have the power in a resilient, affordable and sustainable future.

Our Values

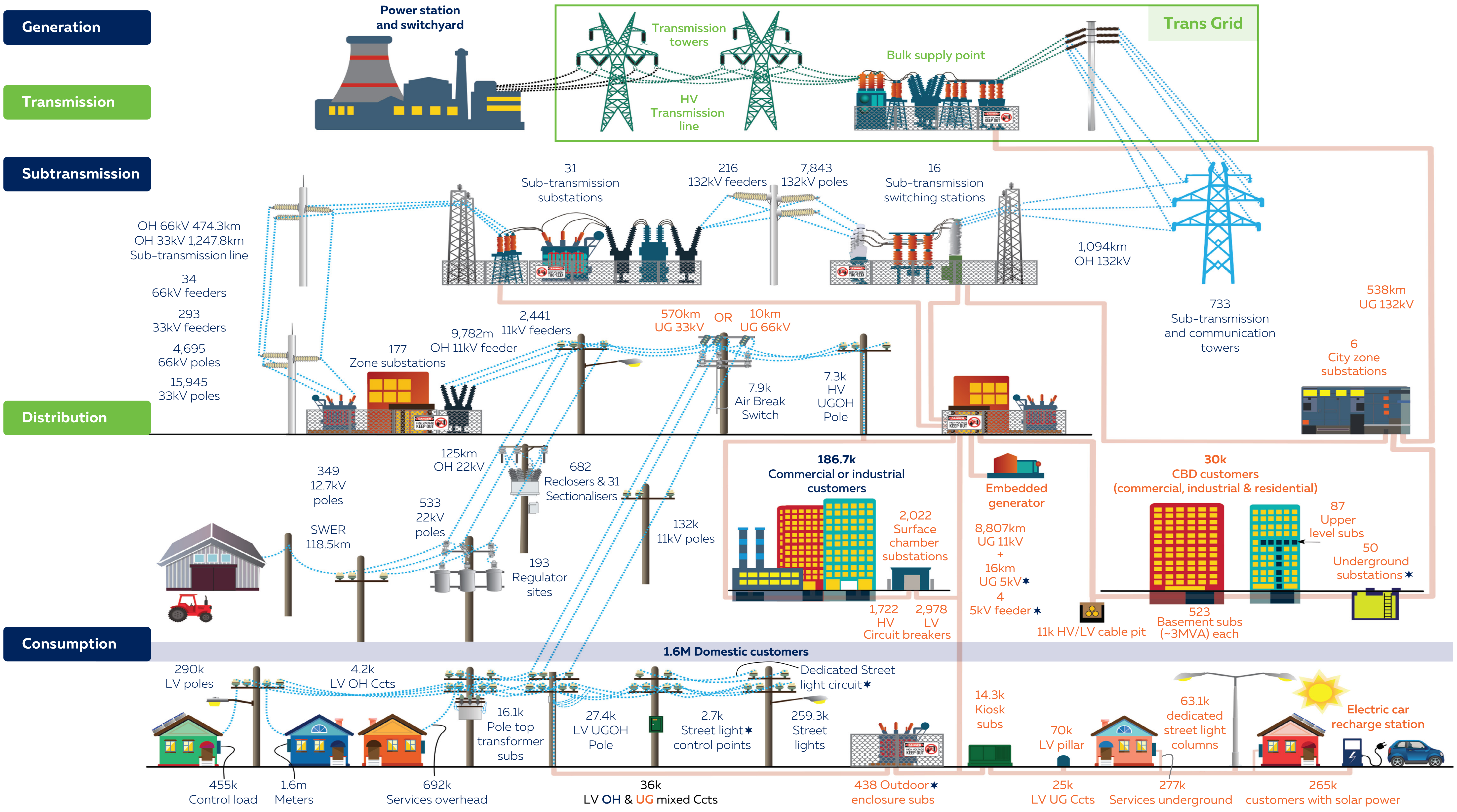
- Work safe, live safe
- Customer-focused
- Commercially minded
- Collaborative
- Honest and accountable
- Respect

Our Role in the Community

This diagram shows some of the wide range of services we provide to our community.



State of the Network



Legend Ausgrid ⋯⋯ Overhead Supply ▬ Underground Supply

Indicative asset counts as recorded in corporate systems. Not validated for external reporting purposes.

Other Network Asset Statistics	2024/25
Dual function (Transmission) System – 132kV (km)	883
Low Voltage Overhead (km)	13,177
Low Voltage Underground (km)	7,304
Streetlighting Overhead (km)	2,205
Streetlighting Underground (km)	1,146

Note: Asset counts and lengths do not include private assets.

Purpose of the Distribution and Transmission Annual Planning Report

This DTAPR complies with National Electricity Rules (**NER**) clause 5.13.2 Distribution Annual Planning Report (**DAPR**) and clause 5.12.2 Transmission Annual Planning Report (**TAPR**), utilising Version 232 of the NER. Ausgrid has prepared this DTAPR with a five-year forward planning horizon, reflecting the outcomes of the annual planning review of Ausgrid's electricity network since the December 2024 DTAPR publication.

The purpose of this document is to inform Registered Participants, stakeholder groups and interested parties of the identified future network needs, the committed and proposed solutions to these needs and the potential opportunities for non-network solutions, particularly for large investments where the Regulatory Investment Test for Distribution (**RIT-D**) applies.

Ausgrid's DTAPR aligns with the NER Schedule S5.8 DAPR to:

- Provide transparency to Ausgrid's decision making processes and assist non-network providers, other Network Service Providers and connection applicants to make efficient investment decisions;
- Promote efficient investment decisions in the electricity market;
- Include information on the planning process encompassing forecasting, identification of network limitations, and the development of potential credible options to address these limitations;
- Present the results of Ausgrid's annual planning review, including joint planning with other Network Service Providers, covering a minimum five year forward planning period for distribution assets;
- Offer third parties the opportunity to offer alternative proposals to the identified network needs, including non-network solutions such as demand management or embedded generation;
- Provide network capacity, load forecasts and hosting capacity for embedded generation for sub-transmission lines, zone substations and transmission-distribution connection points, and any 11kV primary distribution feeders which are constrained or are forecast to be constrained within the next two years; and
- Provide information on Ausgrid's demand management activities and actions taken to promote non-network initiatives each year, including plans for demand management and embedded generation over the forward planning period.

Distribution and Transmission Annual Planning Review and Reporting

Ausgrid owns, develops, operates and maintains transmission dual function assets in NSW that are operated in parallel with Transgrid's network, and perform a transmission function by supporting the main NSW transmission network. Ausgrid is therefore also registered as a TNSP and is required to publish a TAPR covering our dual function assets. The NER permit Ausgrid to publish its TAPR as part of the DAPR to align the publication of both reports each year.

Reporting of both planning reviews have been merged into one document. The information that the NER requires Ausgrid to report for both distribution and transmission is covered throughout the various sections of the DTAPR.

Significant Changes from Previous DTAPR

This year's DTAPR document structure remains unchanged from last year. Like last year, the DTAPR consists of a DTAPR summary, which focuses on Ausgrid's strategies, accomplishments throughout the year, and opportunities as a distribution network service provider. The summary document contains the first chapter "Network Growth and Opportunities" amongst the "Message from Junayd" and "About Ausgrid".

The online portal will still be available for displaying Ausgrid's network interactively. An addition to the portal is the incorporation of 11kV and low voltage feeders, as well as availability of hosting capacity at 11kV and low voltage.

There have been some changes in the Forecasting methodology in Appendix B, as well as the wording in section 2.6 "Primary distribution feeder limitations" to reflect on current planning and forecasting approaches. Part of Chapter 3 – "Network Performance" has also been modified to reflect the changes in the Licence Conditions from IPART, which no longer require Ausgrid to specify feeder category limits and individual feeder limits based on feeder category.

System Limitations Template – Online Data

Since 2017 Ausgrid has published online data in the format prescribed by the Australian Energy Regulator (AER) in a Distribution System Limitation Template.

Following the release of the TAPR guidelines in December 2018, we have populated a Transmission System Limitation Template, and this is included again this year.

Online data associated with the 2025 DTAPR, as well as the document itself, is accessible via Ausgrid's website at www.ausgrid.com.au/DTAPR.

Disclaimer

Ausgrid, registered as both a Distribution and Transmission Network Service Provider, provides this DTAPR 2025 under NER (clause 5.13.2 and 5.12.2) for the sole purpose of informing Registered Participants and Interested Parties about the annual planning review results for distribution and transmission networks.

This document does not purport to contain all of the information that a prospective investor or participant or potential participant in the National Electricity Market, or any other person or interested parties may require. In preparing this document it is not possible nor is it intended for Ausgrid to have regard to the investment objectives, financial situation and particular needs of each person who reads or uses this document. In all cases, anyone proposing to rely on or use the information in this document should independently verify and check the accuracy, completeness, reliability and suitability of that information for their own purposes.

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Guide To This Document

We are the custodians of a network that connects communities and empowers the lives of our 1.8 million customers, and have done so for over a century. Ausgrid operates as both a transmission and a distribution network service provider. Our network is made up of approximately 30,000 substations connected through high and low voltage power lines, underground cables, tunnels and power poles. Our operations include infrastructure construction, maintenance and operation, customer connections, street lighting and telecommunications. We are increasingly involved in supporting the transition to a net zero economy through the connection of renewable energy to the grid, by the electrification of loads such as transport via electric vehicles and by supporting the NSW Government's Electricity Infrastructure Roadmap through the development of renewable energy zones.

The DAPR section of this document covers a five year forward planning period, while the TAPR section covers a ten year forward planning period, from December 2025. Our 2025 DTAPR document is accessible via Ausgrid's website www.ausgrid.com.au/DTAPR, with the supporting data at our new online portal located at https://dtapr.ausgrid.com.au.

This data has been structured to enable you to easily target the key locations and come to us with solutions that more readily meet the needs of our customers and grid.

Chapter 1: Network Growth and Opportunities

We continue to explore opportunities in:

- Enabling Connections
- Leveraging impact of renewable energy and storage
- Reducing cost of living pressures
- Enhancing network resilience
- Advancement through innovation.

Chapter 2: Network Demand and Limitations

This section details the location of identified system limitations and the dual function assets in the network. It also displays the system total maximum demand forecast, discusses frequency control load, load shedding, stability and primary distribution feeder limitations.

Chapter 3: Network Performance

A review of the network from a reliability and quality of supply perspective is reported here. The results are compared against specific targets set in the Licence Conditions given to Ausgrid. This comparison also includes the Service Target Performance Incentive Scheme (STPIS), which is set by the Australian Energy Regulator (AER) as part of its regulatory determination for Ausgrid.

A forecast of the network reliability performance is also provided in this chapter.

Chapter 4: Asset Management

Ausgrid's approach to manage its network assets is described here, including a description of the risk management strategies applied to the asset categories that require the most significant investments in the forward planning period. This section also discusses distribution network losses.

Chapter 5: Non-network Opportunities

Ausgrid welcomes and encourages feedback from market participants and alternative proposals to address identified network limitations by means of demand management options.

This section also provides information about demand management and embedded generation activities in progress and for the forward planning period.

Chapter 6: Network Investments

In consideration of network limitations identified during the planning process, credible network options have been identified to:

- Address the deteriorating condition of network assets.
- Connect customers, including customer driven network augmentations.
- Implement reliability correction actions.
- Deliver improvements in automation/control systems.

Network investments that will be the subject of a RIT-D in the forward planning period will be reported here.

Chapter 7: Information and Communications Technology Systems Investment

A description of the key Information Technology and Communication Systems supporting Ausgrid's business is provided in this chapter, including details of the strategies and investments in progress as well as those proposed for the forward planning period.

Chapter 8: Planning Coordination

Joint Planning is carried out with peer Network Service providers including Transgrid, Endeavour Energy and Essential Energy. Activities conducted with all these entities are reported, providing an overview of the decisions/actions in each case.

Appendix

Ausgrid's approach to network planning and forecasting methodology are described here. This section describes the approach taken, the assumptions considered in the forecast, and the factors having a material impact on the network. Consideration is also given to emerging trends, such as growth in solar installations, future battery installations and electric vehicle uptake. A Glossary is also included.

1. Network Growth and Opportunities

1.1 Enabling Connections: Increasing Opportunities to Connect

1.1.1 Load Growth

The demand for load is changing as customers look to electrify. A key contributor to this change is the adoption of electric vehicles, replacing traditional fossil fuels with increased demand for electricity. The adoption of EVs and the roll-out of EV charging infrastructure must be met with available network capacity.

Additionally, the data centre market is experiencing significant growth, driven by the rise of hyperscale cloud services and the rapid development of artificial intelligence technologies. Ausgrid, is uniquely positioned to support this growth and is working closely with data centre developers to understand their emerging needs.

Ausgrid currently supports 52 dedicated data centres across its network area. These facilities range in scale from 5MVA to nearly 200MVA, providing essential infrastructure to meet the rising demand for data storage and processing capabilities. As the digital economy grows, the need for reliable and scalable data centre facilities has become increasingly critical.

In 2025, Ausgrid has seen a surge in interest from new data centre operators. With over 70 enquiries and applications, the prospective capacity from these developments totals more than 10 GW. However, not all of these applications will be realised as multiple enquiries are bidding for the same end customer loads. Ausgrid forecasts to have over 2GW of data centre load on our network by 2040, reflecting the strong demand for data centre infrastructure, driven by the expansion of digital services and the growing importance of cloud computing. With this growth will come the need to augment and upgrade our network at a rapid pace, challenging existing timelines.

As these emerging loads increase, the reliance on Ausgrid's 132kV network continues to grow and is critical to ensuring customers are served in the locations and volumes required. The 132kV network provides the backbone for supplying major loads including ports, industrial precincts, high-density residential areas and the expanding data centre sector. To enable the forecast growth, particularly in areas where large loads are anticipated, strengthening and reinforcing the 132kV network will be essential. Strategic investment in this network tier will support timely connections, maintain reliability and ensure the system remains resilient.

Ausgrid is meeting this rapid market growth through a range of strategic initiatives aimed at ensuring an efficient integration of new customer capacity:

The Connections Excellence Program: This program is designed to deliver a faster, more efficient, and better value connections experience for data centre customers

Proactive Customer Engagement: Engaging directly with customers and industry stakeholders allows Ausgrid to understand market needs and tailor its services to build strong relationships and facilitate smoother project development

Strategic Network Planning: Ausgrid employs strategic, innovative, and holistic network planning practices to enhance the integration of new data centres into the current network, ensuring that the network remains robust and adaptable to future demands

Promoting Areas with Available Capacity: To support sustainable growth, Ausgrid promotes investment in areas where distribution network capacity is readily available, or where there is potential for grid scale renewable energy developments

Investment in Infrastructure: To accommodate the increased load and ensure reliability, Ausgrid is investing in new distribution network assets and major substation developments

Efficient Pricing Framewroks: Implementing pricing approaches that limit cross subsidies and encourage efficient network utilisation from connecting parties.

1.1.2 Hosting Capacity

The electricity industry is undergoing a significant transformation as renewable energy resources become more prominent. Solar generation, energy storage, and other distribution energy resource technologies are integrating into Ausgrid's network at a rapid pace, while new customer loads such as electric vehicles and data centres are driving significant growth in electricity demand.

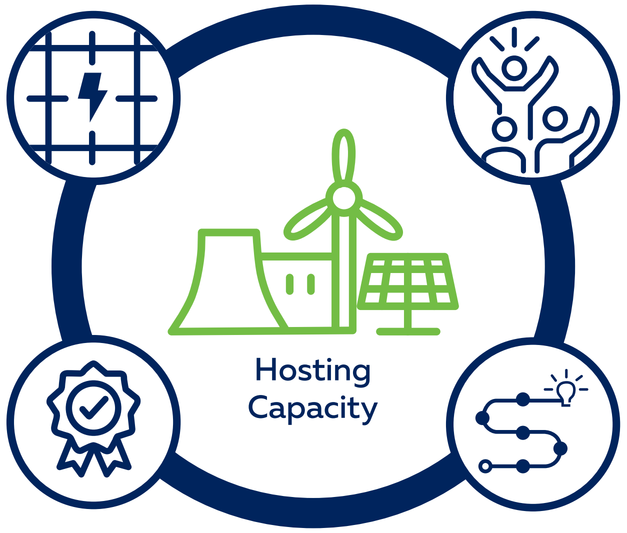
One critical aspect for the energy transition is whether the network can accommodate new loads and generation without requiring major infrastructure investment, collectively referred to here as 'hosting capacity'.

To understand this capability, Ausgrid conducts detailed hosting capacity analysis to determine the additional load and generation that can be connected without compromising reliability, efficiency, or safety. These studies identify where capacity is available, where constraints may arise, and where targeted investment or non-network solutions can unlock further capability.

Hosting capacity insights support new connections, inform planning decisions, and guide future network development. Ausgrid publishes this information to provide transparency and enable customers, developers, and stakeholders to make informed decisions aligned with the network's capabilities. Customers are encouraged to engage early to discuss potential future capacity and connection opportunities.

Network Transistion
- Rapid growth in renewables, EVs, storage and data centres driving demand
- Focus on connecting new loads and generation efficiently

Key Benefits
- Transparency
- Eefficiency
- Flexibility
- Planning insight



Our Approach
- Hosting capacity analysis identifies available network capability
- Feeder and sustation studies reveal where capacity exists and constraints may emerge

Dynamic and Evolving
- Updated annually to reflect network growth and new connections

The hosting capacity information is a snapshot in time reflecting the network status at present based on the maximum load on the network. Ausgrid has recently began offering dynamic connections for customers that are flexible with their network usage and therefore could take advantage low load periods.

If you believe your needs are suitable for a dynamic connection, we encourage you to reach out to us at ausgrid.com.au. 'Getting Connected', as a good place to start for further information on how to get connected to the network.

For Application Form FAQs and supporting resources visit Connection application support or contact the Contestable Connections Team

Email: connections.technical.enquiries@ausgrid.com.au

Phone: 02 4399 8099

Hosting Capacity Data and Analysis

key levels to provide a detailed view of network performance and connection potential:

- **Feeder-level analysis:** Power flow and contingency simulations at the sub-transmission feeder level determine the additional capacity each feeder can support.
- **Substation-level analysis:** Assessments at primary and secondary voltage levels identify available capacity at substations where major load or generation connections are expected.
- **11kV-level analysis (new for 2026):** Hosting capacity at the 11kV distribution network level is being incorporated into Ausgrid's mapping portal. This provides customers and developers with improved visibility of available capacity at a more granular level, supporting efficient and better-informed connection planning.

Hosting capacity data is published on Ausgrid's website, improving transparency and supporting efficient connection processes by helping stakeholders identify suitable connection points and streamline applications.

Optimising the Network for Growth and Sustainability

Hosting capacity analysis enables Ausgrid to plan for growth while enhancing network resilience and sustainability by:

- **Optimising existing infrastructure:** Maximising the use of current assets to defer costly upgrades.
- **Supporting dynamic and flexible connections:** Allowing connections where capacity may vary over time or under specific conditions.
- **Develop long-term planning:** Forecasting future hosting capacity to inform investment decisions.
- **Deliver strategic investment:** Identifying emerging constraints early to prioritise actions that unlock additional capacity.
- **Enhancing transparency:** Providing greater network visibility through the inclusion of 11kV hosting capacity data in Ausgrid's mapping portal (future).

Dynamic Nature

Hosting capacity is dynamic and changes with new connection applications, load growth, and network developments. Assessments are based on the best available data and models as of October each year and should be viewed as indicative snapshots. Ongoing hosting capacity analysis ensures Ausgrid can continue to integrate new loads and generation efficiently, supporting a more flexible, sustainable, and future-ready electricity network.

Through ongoing innovation in hosting capacity analysis, Ausgrid is building a more flexible, transparent, and future-ready network to meet the evolving needs of customers and communities.

1.1.3 Electric Vehicles Uptake

Electric Vehicle Forecasts in Ausgrid's Network Area

EVs within Ausgrid network are projected to increase from 63,000 vehicles in 2025 to nearly 400,000 vehicles by 2030 (based on AEMO's Step Change scenario). All scenarios assume cost parity (i.e., the full cost of owning and operating a vehicle, without subsidies) between EVs and Internal Combustion Engine Vehicles should happen before 2030.

Increasing EV Charging Infrastructure Uptake in Ausgrid's Network

Ausgrid is leading the industry by providing 'facilities access' agreements to enable charge point operators to lease out space on our assets to deploy their chargers on our kiosks and poles.

With support from the NSW Government, Ausgrid will be connecting 100s more EV chargers in our network. However, this will fall far short of the NSW Government's projected need for 26,000 to 30,000 public AC charging points in NSW.

This is why Ausgrid has been advocating to be able to build, own and maintain (but not sell energy through) 11,000 pole mounted AC chargers on our network. We want to support approximately 30% of NSW residents who do not have access to powered off-street parking.

Ausgrid proposes to maintain these chargers to the same high reliability standards as the rest of our network assets, while providing all charging providers open access to these chargers via a standard electricity tariff. This will expand existing charging providers' networks. This way customers will be able to access AC kerbside charging for similar costs to those able to charge at home.

Enabling Vehicle-to-grid Charging

Ausgrid is exploring ways to accelerate vehicle-to-grid (**V2G**) charging with use of its Artarmon test facility, and options for public V2G.

V2G technology enables grid-interactive, bi-directional chargers to utilise EV batteries as distributed energy resources, supplying electricity to homes and supporting the grid during peak demand. The initiative will enable customers to use their EV batteries to power their homes and earn income, regardless of whether they have rooftop solar.

Looking ahead, in FY26 Ausgrid will continue to look for new ways to empower customers to participate in the energy transition.

1.1.4 Dynamic Connections

The Dynamic Connection Agreement is a new way for large customers to connect to our high voltage network, faster and at lower cost.

Instead of locking in a traditional fixed capacity connection that may require costly network upgrades, a Dynamic Connection Agreement provides:

- A fixed capacity you can always rely on; and
- A variable capacity that is in addition to the fixed capacity and adjusts in real time based on network conditions

This flexibility enables more efficient use of the existing network and helps avoid expensive and time-consuming network augmentation.

A Dynamic Connection Agreement is ideal for large sites that can receive and respond to real-time signals from Ausgrid by adjusting their energy use in real time. These agreements are best suited for customers connected with real-time energy monitoring capability such as customers with batteries, EV chargers, or flexible loads or generation.

If you are interested in a Dynamic Connection Agreement, please submit a preliminary enquiry on our website and we'll let you know if the site is suitable and a full application can be submitted via our website.

1.2 Leveraging Impact of Renewables and Storage

1.2.1 Renewable Generation

In December 2024, EnergyCo announced that they will be working with Ausgrid to deliver the proposed network solution for the HCC REZ. This involves upgrading the existing electricity network to allow new renewable generation to connect to the grid. These enhancements are vital to meeting both our current and future energy needs.

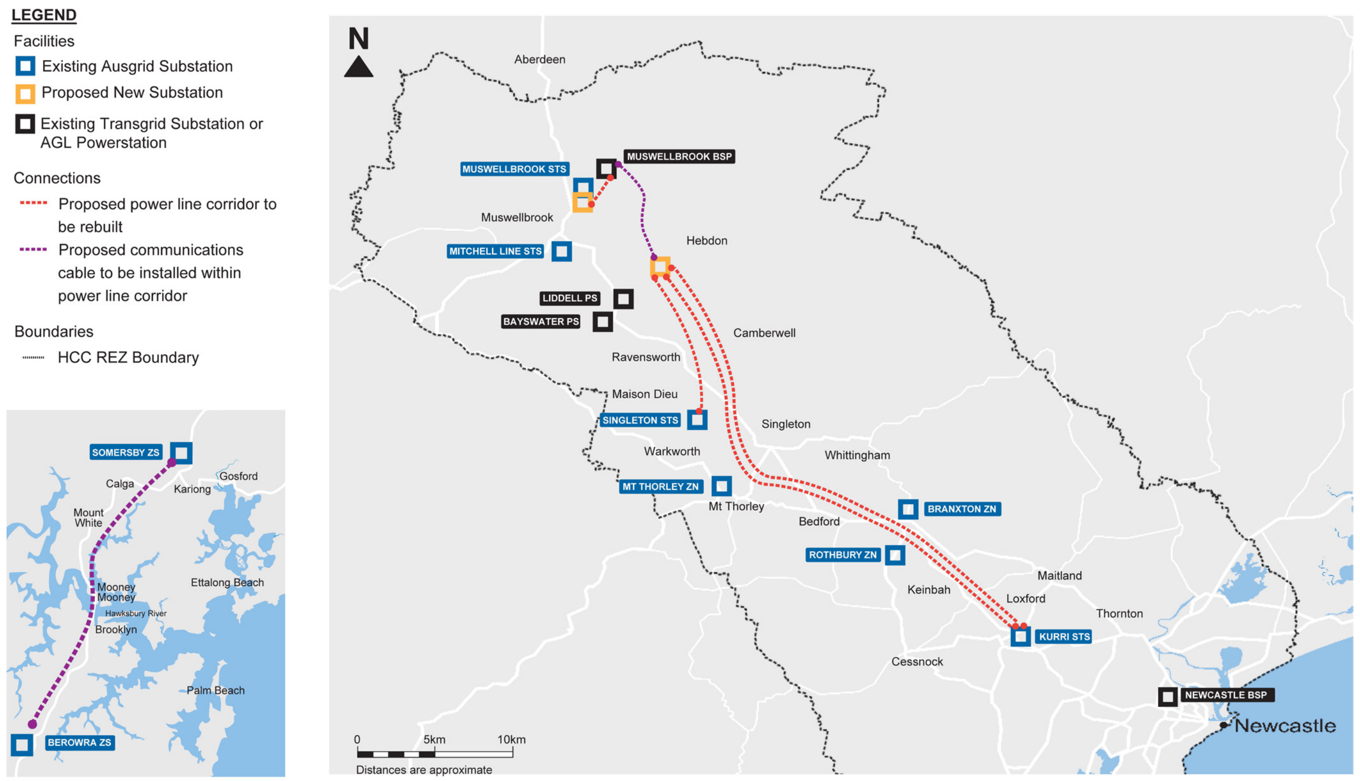
The proposed solution will primarily involve upgrades to existing network infrastructure, and re-use of existing corridors. This minimises impacts on surrounding communities and the environment, while delivering the capacity to transfer at least 1 gigawatt of renewable energy.

This will bring significant economic benefits to the region including more jobs, opportunities for local businesses and potential new industries.

The map below shows the areas where Ausgrid's proposed upgrades will occur, with a proposed completion date of mid-2028.

Ausgrid is committed to working alongside EnergyCo and engaging with local councils, landowners, communities, and businesses to ensure the project delivers benefits for all stakeholders.

Proposals for three additional expansion options have also been submitted to EnergyCo to participate in the 2025 IIOR (Infrastructure Investment Objectives Report) report. These expansion options have also been included in AEMO's 2025 electricity network options report (**ENOR**).



Ausgrid is continuing work with the NSW government, to identify further opportunities to support large renewable generation in our network. This ongoing work is vital to securing the long-term interest of our customers by providing sustainable and secure sources of generation.

Key Dates

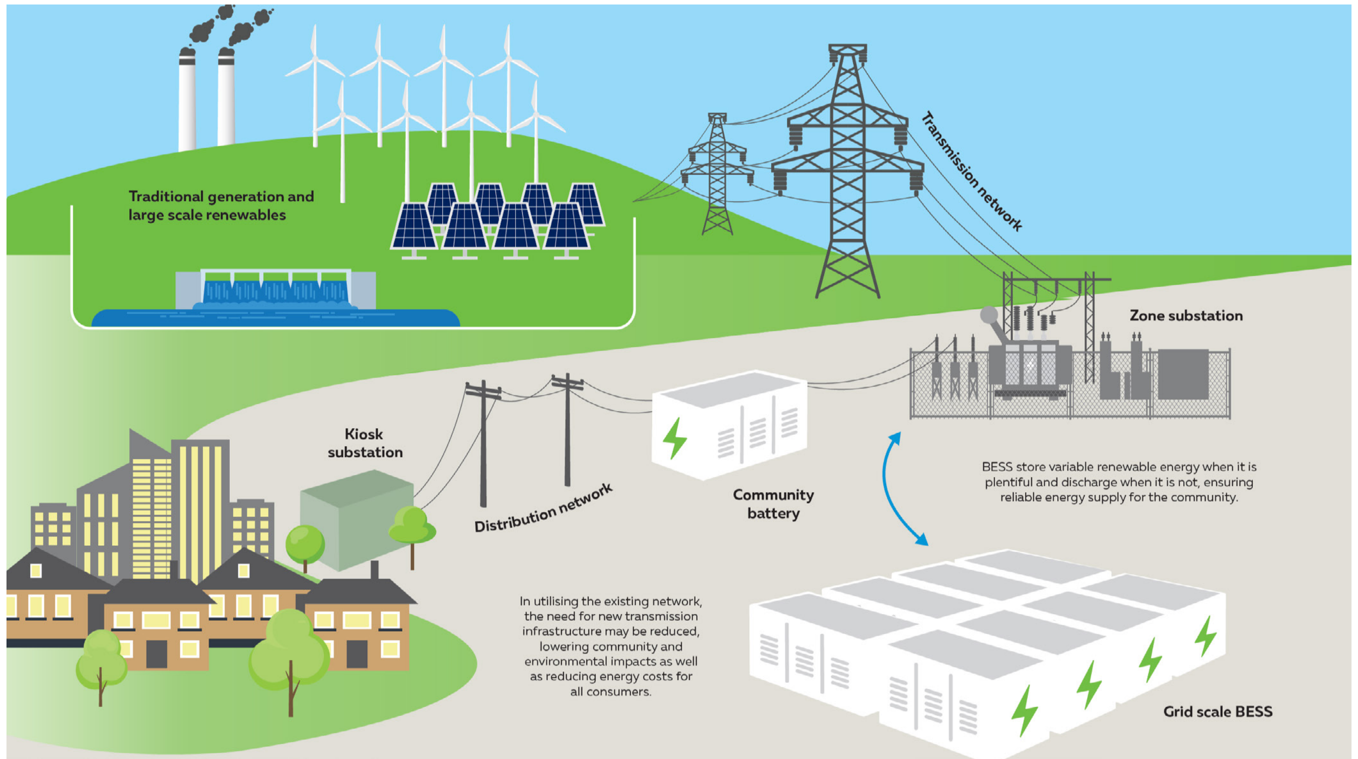
Early 2025 -mid 2025	Mid 2025	Mid-late 2025	Early 2026	Mid 2028
Refine design. Ongoing site investigations.	Review of Environmental Factors (REF) on public display.	Detailed design and early works.	Start of sub-transmission line and substation construction works.	Commission and move into operation and maintenance phase.

1.2.2 Battery Energy Storage Systems

Ausgrid Group is building a resilient and sustainable energy system by expanding energy storage on the distribution network, increasing the integration of renewable energy and ultimately paving the way for a more sustainable future.

Ausgrid's ambition is to facilitate the connection of energy storage on the distribution network to improve network resilience. This approach ensures the best outcomes for our customers, the network and our shareholders, and helps deliver a faster, more affordable, and less disruptive transition.

As one of the first DNSPs to connect grid-scale storage to the distribution network, Ausgrid is leading the way in fostering a resilient and equitable energy transition. This initiative challenges the status quo and supports the ongoing integration and adoption of renewable energy, contributing to a sustainable energy future for all.



1.2.3 Community Batteries

Ausgrid is continuing to deliver its community battery program, with 22 community batteries now operational in the network.

In August, Ausgrid launched its largest ever community battery at Cooranbong. The battery was co-funded by the Australian Renewable Energy Agency (**ARENA**) as part of a $12.6M grant awarded to Ausgrid in 2024. It is the first of several 5MW batteries being launched as part the Federal Government's Community Batteries for Household Solar program.

Key Updates for 2025

- A total of 22 community batteries is now operational, totalling approximately 7MW / 14MWh. This includes our 5MW battery, 10 smaller ground mount batteries, and 11 pole mounted batteries.
- One 5MW community battery is now operational under Ausgrid's ARENA funded Community Battery Program
- Energy-Storage-as-a-Service offering is continuing to grow, with many Ausgrid customers now saving ~$200 in their yearly electricity bills.

Sized at 5MW, this battery will enable benefits for the thousands of residents in the Central Coast and Lake Macquarie regions, including:

- Providing residents with savings of ~$200 per year through Ausgrid's Energy Storage as a Service offering;
- Facilitating effective management of the local network;
- Allowing more rooftop solar and devices such as EV chargers to be connected; and
- Reducing reliance on traditional poles and wires investment and helping to lower network costs

Our community batteries enable Energy Storage as a Service, which is designed to provide ongoing bill savings to residents near a community battery. This includes customers with or without solar, renters, and those that live in apartments. ESaaS is currently offered to customers through leading retailers Origin Energy and Energy Australia.

Ausgrid will soon be launching more 5MW batteries at Peats Ridge and Bankstown, with additional batteries expected in 2026.

1.2.4 SAPS and Microgrids

Ausgrid is investing in SAPS and microgrids to reduce outage impacts for certain customers in remote locations, as well as reducing risk of fires in bushfire prone areas. SAPS are off grid electricity systems, generally comprised of solar photovoltaic arrays, energy storage and backup diesel generators.

SAPS and microgrids reduce bushfire risk as electricity infrastructure, that could potentially spark igniting a bushfire, is either no longer energised or removed. It is expected that the average cost to supply customers will fall if DNSPs provide SAPS on a permanent basis, leading to a reduction in network charges for the entire customer base. They can also be used by electricity networks as practical solutions to make communities more resilient to extreme weather events and natural disasters as they enable a customer or community to isolate and remain energised in an emergency. This is particularly important for keeping telecommunication towers and fire-fighting equipment (water pumps) operational.

As distribution network's experience more natural disasters such as bushfires, storm events and floods, SAPS can also be utilised in an emergency to replace assets, allowing utilities to effectively provide the updated power solutions for our customers rather than replacing assets like for like.

- SAPS range in sizes but typically comprise a 13kW PV system, paired with a 7.5kW BESS & 9kVA backup generator connected to a single customer point of connection.
- 10 x SAPS have been commissioned to date in the suburbs of Ellerston and Mirannie located in the Upper Hunter region of Ausgrid.
- A microgrid may be completely disconnected from the electricity network or it can be connected to the main electricity network with the ability to deenergise the main line for network maintenance or an impending extreme weather event.
- Ausgrid announced the construction of a LV Microgrid in Merriwa in late 2022. Ausgrid's depot in Merriwa was the ideal spot to locate the microgrid given its location on the main street and connected to the same low voltage network as many key small businesses.
- The Merriwa microgrid will supply 28 customers incl. the petrol station, supermarket, chemist, bakery, CWA hall, IGA supermarket and RSL amongst other small businesses that will be able to continue to service the township during planned and unplanned outages on the local electricity grid.
- Ausgrid has recently completed major construction activities with the installation of a new 500kVA diesel generator, 500kW/1000kWhr BESS and 110kW solar installation along with microgrid control system.
- Final Testing & Commissioning of the Microgrid was completed in June 2025.
- The Microgrid Community Launch was hosted by Ausgrid CEO Marc England in November 2025.
- Further information on the project is available: https://www.ausgrid.com.au/About-Us/Future-Grid/Merriwa-Microgrid

1.2.5 Community Power Network

What is it?

An accelerated program of rooftop solar and strategically placed community storage, managed by Ausgrid (involving both Ausgrid and commercially owned assets) for community benefit.

Objective

To provide the lowest cost of electricity for all customers by pooling surplus solar, storing it locally, and redistributing it in the evening peak—ensuring benefits extend beyond those with their own solar or storage assets.

Pilot Locations

- Mascot-Botany (Sydney) - 65MWh of additional storage and 50MW of addition solar
- Charmhaven (Central Coast)) - 65MWh of additional storage and 20MW of addition solar

Benefits at a glance

- Reduce electricity prices and higher feed-in tariffs
- Support a faster transition to renewables
- Provide equitable acess to benefits for all

Estimated Financial Benefit

~$22.9M in benefits over five years for 32,000 customers, equating to ~$150–200 annual savings per household, plus higher yields from solar systems for locals

Value Streams

- Leveragege cheap solar - maximise use of rooftop generation (lowest-cost energy)
- Reduce network charges - by lessening upstram asset needs
- Lower asst costs - through collective procurement and scale efficiencies
- Shift orchestration value - share benefits between wholesale makets and customers

1.2.6 CER Uptake

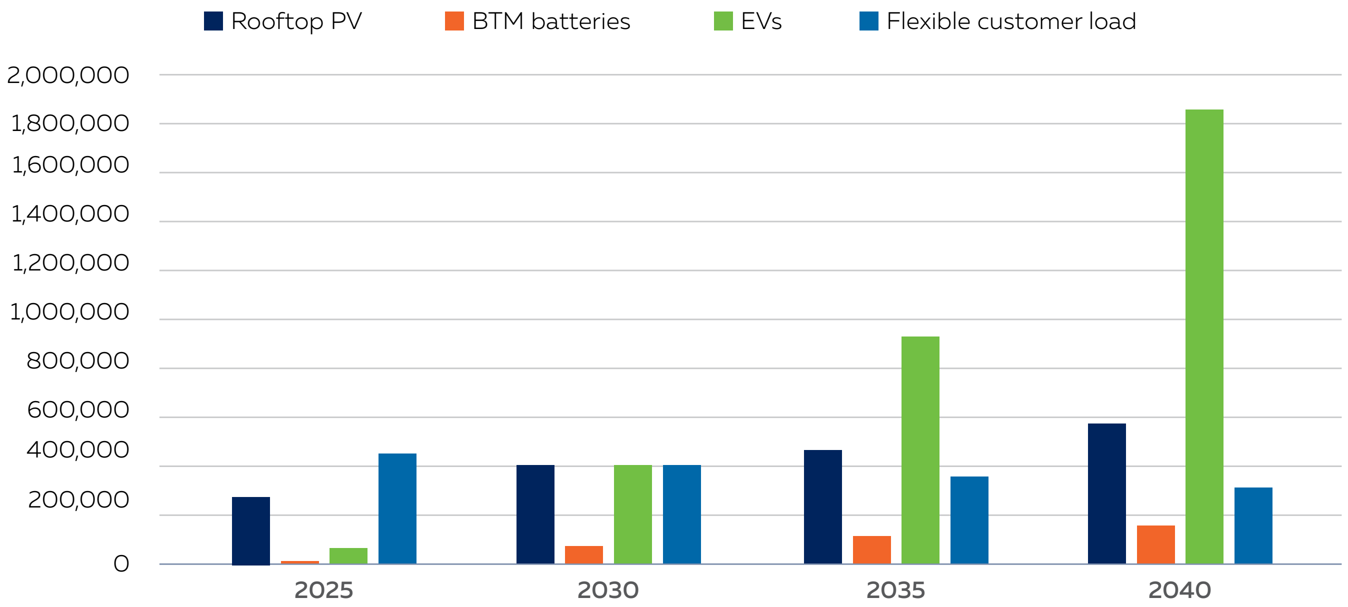
Ausgrid is adapting to a rapidly changing energy landscape including an acceleration of CER, which include behind-the-meter (BTM) renewable energy generation, storage, and EVs. The uptake of rooftop solar on our network has consistently exceeded forecasts, with this trend expected to continue.

BTM storage is typically paired with rooftop solar, where rooftop solar is forecast to grow from 278,000 systems in 2025 to 377,000 in 2029 and BTM storage is forecast to grow from 23,000 systems to 78,000 in over the same timeframe. EV adoption on our network is also accelerating, with numbers expected to rise from 63,000 in 2025 to 298,000 by 2029.

Updated Forecasts

Ausgrid has updated its forecasts since the 2024 DTAPR for rooftop solar and BTM storage based on the latest inputs and assumptions from the AEMO[1]. Additionally, for BTM storage, the forecasts include an adjustment for the significant increase in battery uptake following the inception of the federal government's Cheaper Home Batteries Program.

The forecast for EVs has been revised downwards since the 2024 DTAPR, reflecting EV forecast changes from AEMO that include latest data on adoption trends especially in hybrids outpacing EV sales, new vehicle emissions policies and correction of previously over-estimated fleet EV forecasts.



What this means for Ausgrid and our Customers

Under certain conditions, high levels of CER can push the network beyond its design limits, leading to supply interruptions and curtailment. Successful integration of CER into the network is essential for maximising the value of customers' investments in CER and distributing these benefits across all connected customers.

Due to increasing two-way power flows, Ausgrid must support the integration of CER through efficient investment. Rooftop solar exports can cause network voltages to rise, leading to curtailment where inverters limit their output or trip off. This affects both in-home consumption and exports, with 11% of rooftop solar customers expected to experience some level of curtailment by 2029[2].

EVs can increase maximum demand, particularly during times of peak household energy usage, which can drive the need for network upgrades to manage capacity constraints and avoid equipment failures. Smart charging and other initiatives such as price signals to promote EV charging outside of network peak demand times will become increasingly important to mitigate peak demand growth due to EVs.

Managing Network Challenges and Maximising CER Integration

Ausgrid's approach to CER integration includes a range of initiatives to effectively integrate CER, manage the risks and opportunities of the accelerated adoption of CER. Our business strategy prioritises incentives to reduce the need for network augmentation and offers a wide range of network solutions to manage voltage non-compliance and capacity constraints due to increasing CER.

1. AEMO, 2023 - 24 inputs, assumptions and scenarios report, 2023, https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp/current-inputs-assumptions-and-scenarios
2. Ausgrid, 2023, Att. 5.7: CER Integration Program, https://www.aer.gov.au/system/files/Ausgrid%20-%20Att.%205.7%20-%20CER%20integration%20program%20-%2031%20Jan%202023%20-%20Public.pdf

Key initiatives include:

- **Innovative Pricing Options**
  Simplify tariffs and offer cost-reflective pricing to manage peak demand and reduce costs
- **Coordination and Collaboration**
  Enhance planning data transparency and improve network visibility through increased measurement and data sources
- **Improved Network Visibility and Voltage Management**
  Invest in dynamic voltage management tools and processes to maintain network stability.
- **Transition from Load Control to Flexibility**
  Develop incentives for flexible load and generation, adapting to smart meter adoption
- **Investment in Grid Enhancement**
  Address voltage and thermal constraints to support increasing rooftop solar and EV adoption.

The AER assessed Ausgrid's 2024-29 period regulatory proposal and determined that the requested funding for dealing with EV constraints was not required. Despite this, Ausgrid will continue to assess the needs of our customers and seek efficient methods to maintain reliable power supply, including monitoring and adjustment of our plans as CER uptake and usage patterns evolve.

To address grid destabilisation on the grid, caused by voltage issues, reverse flows, minimum system load, the NSW Government has implemented a broader NSW Consumer Energy Strategy. One of the tools adopted under this strategy is the Emergency Backstop Mechanism (**EBM**). In rare emergency conditions, the EBM gives the market operator (Australian Energy Market Operator, AEMO) the ability to direct distribution networks to temporarily curtail (reduce), or even pause, rooftop solar exports (or generation) from connected systems. It is a last resort measure and used only when other mechanisms have failed to keep the grid stable.

Ausgrid will be able to act under EBM when directed by AEMO. When in effect, EBM allows Ausgrid to curtail or pause export/generation from impacted rooftop solar installations while the grid event persists, with supply from the grid to customers remaining unaffected.

EBM will apply to new or upgraded rooftop-solar / CER systems (up to 200 kW) installed from the implementation date (Spring 2025). Existing solar systems (that are neither upgraded nor replaced) are not subject to EBM requirements.

In regard to the new electricity plan by the Australian Government to give household a block of daily "free power", known as the Solar Sharer Offer (**SSO**), Ausgrid shares the Government's objectives to drive the uptake of CER and enable all consumers having access to the benefits of the energy transition. There are however some unintended risks this policy may have on the network and some customer cohorts. These impacts may include:

- Unrecovered costs of transporting electricity during the solar soak period; and
- Managing network peak demand under a static time window without taking into account dynamic grid conditions or unique characteristics of specific geographic or demographic areas of the network.

Further steps to increase electrification have been implemented. The City of Sydney has decided to apply restrictions on the installation of gas appliances. From 01 January 2026, new homes will need to use electric cooktops and heaters. This has also been implemented in other council areas but not across the entire Ausgrid network.

1.3 Reducing Cost of Living Pressures

1.3.1 Addressing Affordability Challenges in the Energy Transition

Affordability continues to be a challenge during the energy transition, largely due to factors beyond our control, such as:

- Global supply chain pressures and rising unit rate costs for network infrastructure inputs.
- The potential impact of additional investments in transmission and generation costs on energy bills.
- The need to balance achieving net-zero targets with maintaining affordable electricity for all customers.
- The impact on customers that do not have access to rooftop solar, home batteries and EV charging at home.

To maintain downward pressure on electricity prices, Ausgrid will focus on:

- Expanding access to EV adoption for more customers, through the availability of EV public charging. Our kerbside charging solution could save residential customers $18 per year by 2030 even with higher demand and greater consumptions on our network.
- Continuing to make the benefits of CER available to other customers, through expanding community batteries and offering energy storage as a service.
- Offering dynamic connections, tariffs and coordinated management of CER, to improve the utilisation of existing infrastructure and reduce the need for network investments.
- Providing greater transparency of available capacity to encourage customers that have the option of where to connect, to locations where capacity is available, reducing the need for greater network investment.

The total revenue approved by the AER in its final decision is expected to result in an average increase of $14 per annum ($ nominal) to the average electricity bill for Ausgrid residential customers over the 2024–29 period. For small business customers, the impact would be an increase on average of $38 per annum ($ nominal).

Ausgrid placing downward pressure on electricity prices while ensuring the transition benefits all customers.

Amplify Value
- Investing in new grid capacity where it provides the highest net benefit for customers.
- Dynamically managing our grid to unlock the most value out of what has already been build.

Powering Progress
- Improve asset management and resilience strategies.
- Drive technology advancements and operational efficiency.

Stakeholder Synergy
- Foster stakeholder engagement so we understand their priorities and focus on high-value, aligned opportunities.

1.3.2 Dynamic Networks

As part of preparations for the next regulatory reset and the ongoing development of customer pricing options, we are proposing three sub-threshold trial tariffs for FY27:

- **Residential Dynamic Network Tariff (Project Edith):**
  Provides day ahead, location-aware dynamic import and export prices with guardrails, layered over a low anytime energy charge and a daily network access charge (**NAC**), to mobilise CER in support of local network needs while remaining compatible with wholesale participation.
- **Large-LV Flexible-Load Trial (160–750 MWh):**
  Extends the existing <160MWh LV flexible-load trial tariff (EA964) structure to larger LV sites, include but not limited to large EV charging facilities capable of load shifting and responding to sharper price signals, to test demand response in the larger-business cohort and improve utilisation of existing capacity.
- **HV Dynamic Connection Trial (Firm + Flex Capacity):**
  Aligns price signals with SCADA-enabled dynamic connections at HV, with clear differentiation between firm (guaranteed) and flexible (conditional) access: firm kVA priced at full cost and flex kVA discounted to encourage HV dynamic connection uptake and access to spare capacity in the network.

1.3.3 Participation of Customers in Energy Markets

Project Edith Overview

Project Edith is an Ausgrid-led trial designed to test Dynamic Network Prices (DNP)—real-time network tariffs that change based on local network conditions. Unlike traditional tariffs, DNP aims to reflect the actual cost of network usage at different times and locations, encouraging Consumer Energy Resources (CER) such as solar and batteries to support local network stability and wholesale market participation. The trial has expanded from an initial 200-customer pilot to a large-scale program involving 1,200 residential customers and four key partners: Reposit Power, Origin Energy, Energy Australia, and Shinehub.

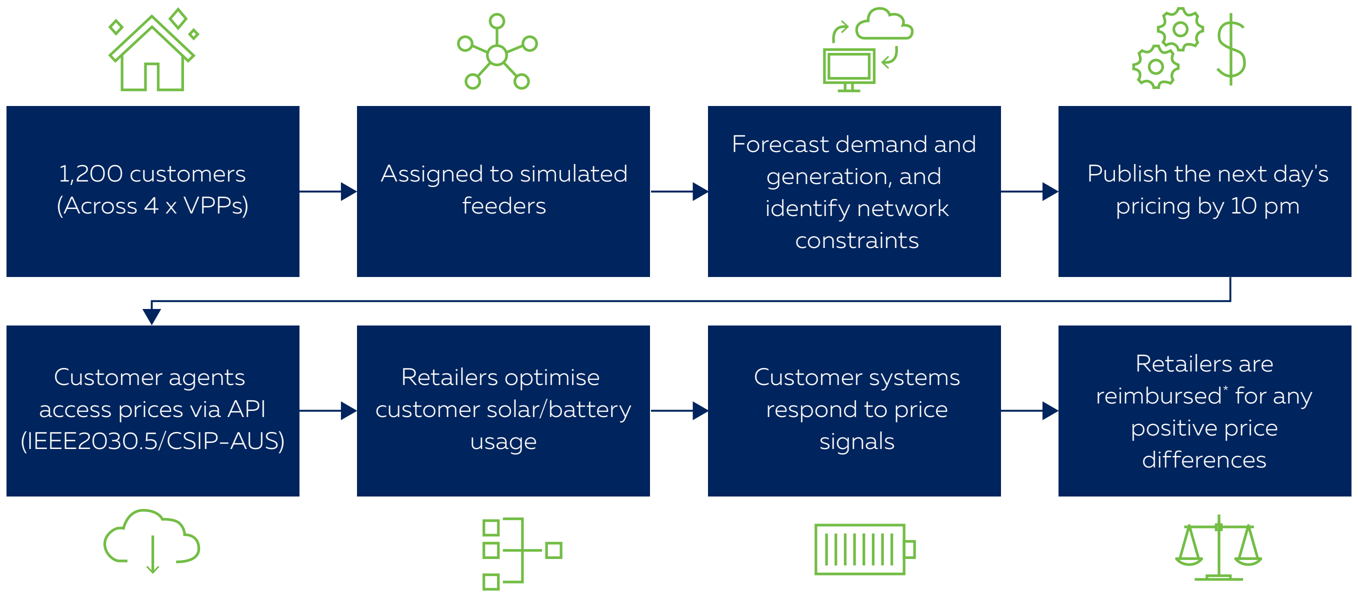
How it Works

The process, as illustrated in the diagram, starts with customers grouped into Virtual Power Plants (VPP**s**) and allocated to simulated feeders. Ausgrid forecasts demand and generation, identifies network constraints, and releases the next day's dynamic prices by 10 pm. These prices are accessible to customer agents via API standards (IEEE2030.5/CSIP-AUS), allowing retailers to optimise solar and battery usage. Customer systems then respond to these price signals, and retailers are reimbursed for positive price differences. This approach aims to shift demand away from peak periods, flatten the "duck curve" and enhance network efficiency.

Learnings so Far and Future Focus

Early findings suggest that dynamic pricing can influence CER behaviour, although responses vary due to household habits, optimisation algorithms, and retail options. Challenges include ensuring fairness across different areas, managing high-cost events, and improving data accuracy for pricing systems. Ausgrid aims to refine tariff structures, establish guardrails for extreme price scenarios, and develop new metrics to evaluate network benefits. Ausgrid plans to launch an on-market residential dynamic tariff in FY27, with ongoing efforts to integrate dynamic pricing into national reforms and ensure it can be scaled.

A Day in the Life of Project Edith



* Current off-market arrangement, on-market bill settlement will use the standard approach.

1.4 Enhancing Network Resilience

1.4.1 Network Resilience

Ausgrid's Climate Resilience Program seeks to build resilience that maintains service levels in the face of the increasing impacts of extreme weather events caused by a changing climate.

Ausgrid's climate change modelling indicates that our risk from climate related events will grow on average by 1 percent each year. Over the last 10 years, 61 percent of all outage minutes were caused by weather related events.

Ausgrid's approach to building resilience includes a spectrum of resilience solutions that range from investments in the network, place-based solutions to educate and prepare vulnerable communities, and improved data sharing between distributors, telcos and councils, to better understand roles and interdependencies, including how we can respond better during outages.

There have been significant storms in identified network resilience areas, which aligns with the current investment strategy. This highlights the importance of the Climate Resilience Program's place-based approach, including prioritised investment in communities most impacted by extreme weather events.

To date, Ausgrid has delivered a range of the FY25-29 planned network and non-network resilience solutions including:

- Establishing the Climate Adaptation and Resilience Expert panel - a forum for Ausgrid, external subject matter experts, and customer advocates, to provide expertise and advice on the delivery of Ausgrid's Resilience Program to support the long-term interests of customers.
- Installing more than 720 fire resistant wraps (pictured) to improve timber pole bushfire resilience in the Hunter region and Central Coast, with the balance of the planned total of 3000 to continue in FY26.
- Appointing a Community Resilience Liaison, deepening engagement with communities that are at a higher risk of outages from extreme weather, to increase awareness and support them to prepare for the impacts of a changing climate with confidence.
- In partnership with the Energy Charter, co-developed and launched the Power Outage Plan, providing online resources to help customers prepare in advance for when an outage occurs.
- Commenced the upgrade of over 120km of bare High Voltage (**HV**) conductors with Covered Conductors to mitigate faults caused by vegetation, and installation of an additional 40 reclosers to prevent outages for customers upstream of a fault.

During FY26-FY29, we will continue this work by:

- Operationalising 3 community resilience hubs, in partnership with local organisations and councils, in readiness to provide reliable back-up power in areas worst impacted by extreme weather.
- Undertaking an updated Ausgrid climate risk assessment using the latest climate science data, and consideration of local geography to model wind impacts at an asset level.
- Working towards lowering the proportion of customers experiencing long interval disruptions in vulnerable LGAs to bring them into line with the rest of the network by 2034.
- Participate in the NSW Reconstruction Authority's Disaster Adaptation Planning, including place based approaches.
- Completing a mid-term program review to assess delivery of our commitments, including an evaluation of our community resilience initiatives against a customer informed baseline.
- Installing small sections of HV undergrounding to mitigate windstorm impacts on poor performing HV power lines.
- Installing 700 Line Fault Indicators across Ausgrid's network, to provide real-time remote data to the teams responsible for restoring power following an outage, helping to speed up restoration times.
- Establishing empirical evidence through a university partnered research project to understand the relationship between urban canopy proximity and customer's energy use during heatwaves.
- Continuing to collaborate with councils, state and federal governments, and other essential service providers to better understand our interdependencies and enable improved data sharing.
- Advocating for continued engagement with the Australian Energy Regulator (**AER**) on development of a longer term Value of Network Resilience (**VNR**) methodology, following Ausgrid's submissions in response to the AER's interim VNR.

The recent final decision by the Australian Energy Market Commission (**AEMC**) to recognise distribution network resilience in the National Electricity Rules provides a formal framework for the proposal and assessment of capital and operating expenditure for resilience. Implementation of the rule change will include the development of resilience expenditure guidelines to be published by the AER by 1 December 2026. Ausgrid will continue to advocate to be engaged in the consultation process for development of the guidelines, leveraging the AEMC's emphasis on vulnerable customer outcomes in its decision, which strongly aligns with Ausgrid's resilience program.

1.4.2 FLISR

In July 2025, Ausgrid enabled the Fault Location, Isolation, and Service Restoration (FLISR) module within the Advanced Distribution Monitoring System (ADMS). FLISR identifies interruptions on the HV network and then attempts to restore supply through automatic operation of motorised HV switches. Over thirty automatic restorations have been successfully performed in the first few months.

Automatic restoration reduces the number of customers experiencing sustained interruptions and improve our reliability and resilience performance. By minimising the impact, risks, and costs of unplanned outages, FLISR supports Ausgrid's mission to provide accessible, reliable, and sustainable electricity to our communities.

Previously, the restoration of supply was heavily dependent on field operators performing patrols – a process that took time, leaving customers without power and Ausgrid facing financial penalties from the regulator.

We're working to expand our network of remotely operable devices to extend the reach of FLISR. This will continue to improve public safety and reduce regulatory penalties from prolonged outages, while also giving our Control Room and field teams a head start by enabling faster diagnostics, targeted patrols, and quicker full restorations.

1.5 Advancement Through Innovation

1.5.1 Network Digitisation

Ausgrid's Network Digitisation Program is advancing as part of its broader digital transformation strategy to enhance **network reliability, operational efficiency, and customer outcomes**. By enhancing **Digital Twin capabilities, integrating drone technology, broadening LiDAR capture program, and developing AI-driven big data platforms**, the program delivers smarter asset management and a safer, more resilient network—particularly against extreme weather and bushfire risks.

Key Components of the Program:

Digital Twin Development

Provides a detailed mechanical model of the overhead network for design, compliance, and scenario testing (e.g., undergrounding or conductor covering). It supports vegetation and clearance analysis with the ability to simulate environmental factors like temperature and wind, whilst using the Digital Twin data to proactively manage risks.

Drone Fleet Operations

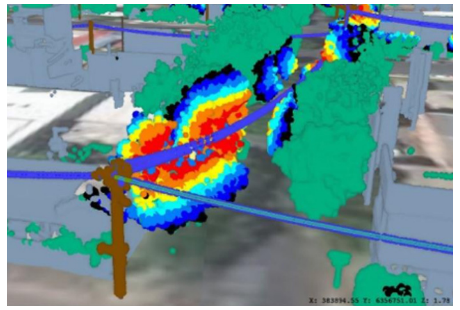
Ausgrid operates a growing fleet of drones that play a critical role in asset inspections, data capture, and operational support. These drones are deployed to prepare for the bushfire season, during storms and other emergency events to assess damage, support rapid restoration, and improve safety outcomes. Their use is particularly valuable in remote and hard-to-access areas, where traditional inspection methods are slower and riskier.

Targeted LiDAR Capture

To further enhance coverage and agility of Ausgrid's comprehensive LiDAR capture program, our drone fleet is being expanded to include LiDAR-equipped units, enabling efficient 3D mapping of overhead assets in hard-to-reach locations.

AI and Big Data Analytics

Developing advanced AI capabilities to process the vast volumes of imagery data collected from drones and other sources. These AI models are being trained to automatically identify and classify network assets and detect defects. This automation will reduce manual processing time, improve defect detection accuracy, and contribute to a more reliable and resilient network.



1.5.2 Innovation

Ausgrid's Network Innovation Program is a suite of research, trials and pilots covering leading edge technologies aimed at better meeting the needs and expectations of our customers in the context of the rapidly evolving electricity sector. The purpose of the program is to test advanced and emerging technologies to efficiently demonstrate the potential of these technologies to deliver significant benefits to our customers and the wider energy market if deployed at scale.

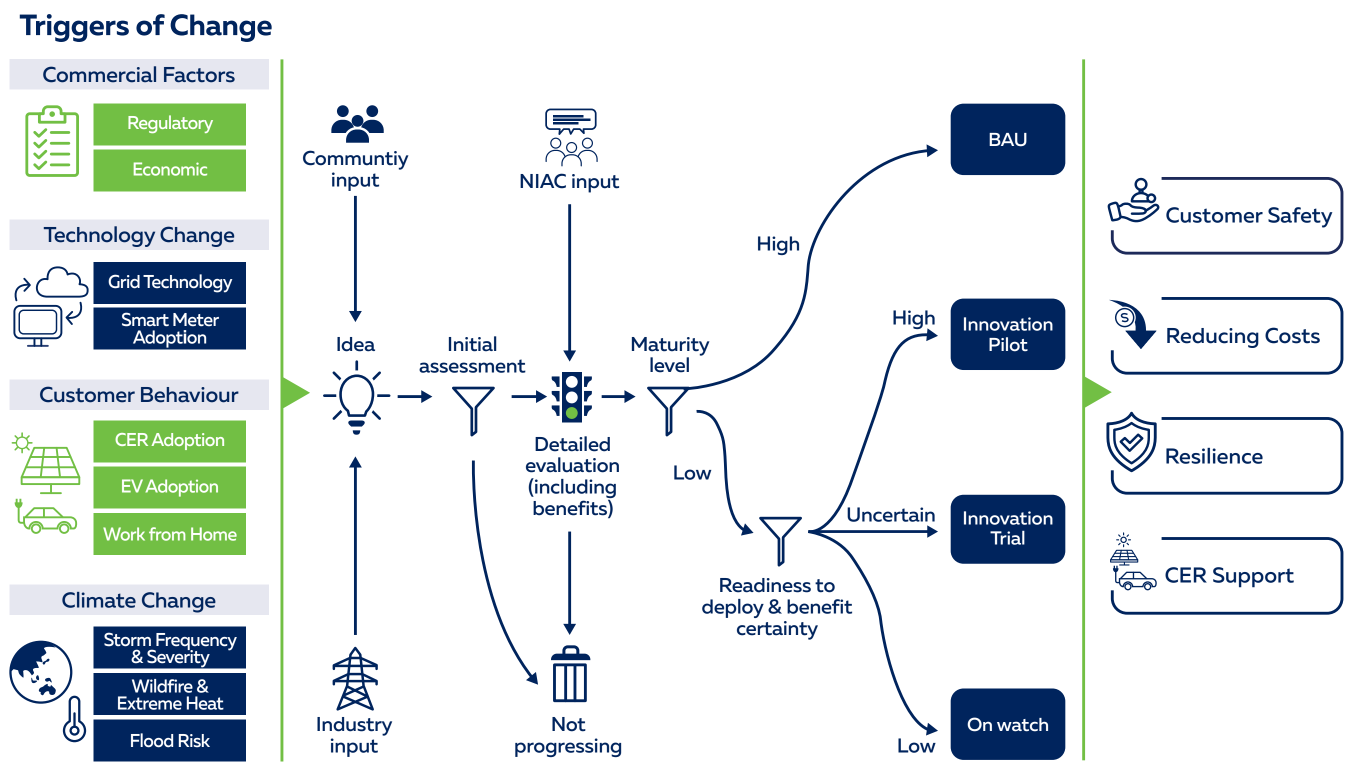
- Projects are grouped into thematic workstreams largely grouped in the following areas e.g. Advanced Voltage Regulation, Network Insights, Fringe of Grid Optimisation, Microgrid Trial, Asset Condition Monitoring, Line Fault Indicators, Dynamic Load Control.

Key Highlights:

- Advanced Voltage Regulation: Completed, with smart meter data analysis underway to verify setpoints.
- Pole Mounted Batteries (**PMB**): Eight projects practically completed; resolving maintenance and hardware issues.
- LV Regulator (Statcom): Twenty projects practically completed; focus on power quality analysis and procurement strategy.
- Fringe of Grid Optimisation (**SAPS**): Ten standalone power system projects completed, with some maintenance and operational challenges.
- Portable SAPS: Construction commenced, with factory testing scheduled for December 2025.
- LV Microgrid Trial: Operational since November 2025; support and maintenance being finalised.
- Early Fault Detection: Ongoing deployment, with delays due to access restrictions.
- Advanced Analytics from Smart Meter Data: Completed; includes loss of neutral detection.
- Line Fault Indicators (**LFI**): Completed; technical evaluation and handover for scaled deployment.
- Advanced Network Visibility: Broken conductor detection cutover to go-live commenced.
- LV Pole Top Monitoring: Practically completed, with some sites experiencing data outages.

Ausgrid is launching five new innovation projects in FY26, each designed to address critical challenges and opportunities in the energy network:

1. Smart Meter Real-Time Verification
2. Broken Wire Detection – Phase 2
3. Distributed Energy Resources (**DER**) – Detection and Updates
4. Smart Meter Network State Estimator
5. Dynamic Voltage Control



2. Network Demand and Limitations

2.1 Identified System Limitations

This section is now part of our web-based portal located at https://dtapr.ausgrid.com.au, and should be viewed in conjunction with the rating and demand forecast data files which are available for download from Ausgrid's website at www.ausgrid.com.au/DTAPR, and as outlined in Appendix B.

DNSPs are required to provide information on anticipated system limitations in this Annual Planning Report (refer NER Schedule 5.8, clause (c)). Under the former licence conditions and planning standards, system limitations could be readily identified as constraints, due to the nature of the deterministic approach. However, with the removal of those standards, Ausgrid has adopted a probabilistic planning methodology, based on the AER suggested approach of assessing risk of expected unserved energy (**EUE**) against the value of customer reliability (**VCR**).

In relation to the timing of anticipated system limitations, for the purpose of this Annual Planning Report, the proposed investment date is reported as determined by the cost / benefit analysis as part of the probabilistic planning methodology. Where appropriate, the date is adjusted to consider resourcing and the timing for delivery.

Consideration of remedial action is required when network limitations are identified due to loading, connection of customers, deteriorating condition/performance or reliability. Identified limitations and indicative solutions are listed in the web-based portal, listing the following information:

- Substation – the name of the location, usually a zone or subtransmission substation;
- Feeder – the name of the feeder, indicating the location of the feeder;
- Timing – the identified need date by which a solution is planned to be implemented; and
- System limitation – an identified network need.

2.2 Dual Function Assets

2.2.1 Changes in Dual Function Asset Status

The list of Ausgrid's dual function assets is reviewed periodically and is used as input for preparing Ausgrid's regulatory reporting, regulatory submission and pricing methodology. For the purpose of the regulatory submission, the list of dual function assets is determined based on the forecast load and system configuration as at the beginning of the regulatory period.

Ausgrid's dual function network is defined as those assets with a voltage 66kV and above that are owned by Ausgrid and operate in parallel with and provide material support to the Transgrid transmission network.

These assets may either operate in parallel with the transmission network during normal system conditions, or can be configured so that they operate in parallel during specific system conditions.

An asset is deemed to provide material support to the Transgrid transmission network if:

- There is otherwise limited or no system redundancy within Transgrid's network, or
- Investment in the transmission system would be required within the regulatory period if that network asset did not exist, or
- The feeder provides operational support to the transmission network (e.g. to facilitate maintenance of transmission assets or improve security of supply) and the asset provides an effective parallel with the transmission network via a relatively low impedance path.

There have been no changes in dual function asset status since the publication of the December 2024 DTAPR.

2.2.2 Dual Function Connection Points

The NER requires a TNSP to set out planning proposals for dual function connection points.

Ausgrid's joint planning with customers, Transgrid and other NSPs may involve the establishment of new connection points. These augmentations are driven by constraints on the distribution network. However, when the augmentation options are considered in the future, the preferred solution may comprise a mix of dual function and distribution network augmentations.

Planning of new or augmented connections involves consultation between Ausgrid and the connecting party, the determination of technical requirements, and the completion of connection agreements. New connections can result from joint planning with Transgrid, other DNSPs, or be initiated by generators or customers through the application to connect process.

Completed New Dual Function Connection Points

Refer to Section 6.5 of this report.

Proposed Augmentation of Existing Dual Function Connection Points

Ausgrid has identified the need to establish a new 132/33kV subtransmission substation (**STS**) in the Macquarie area due to load growth.

The project to install a third 132/33kV transformer at Macquarie 132/33kV STS due to load growth became committed in 2024.

Committed New Dual Function Connection Points

There are no committed projects for new dual function connection points since the publication of the December 2024 DTAPR.

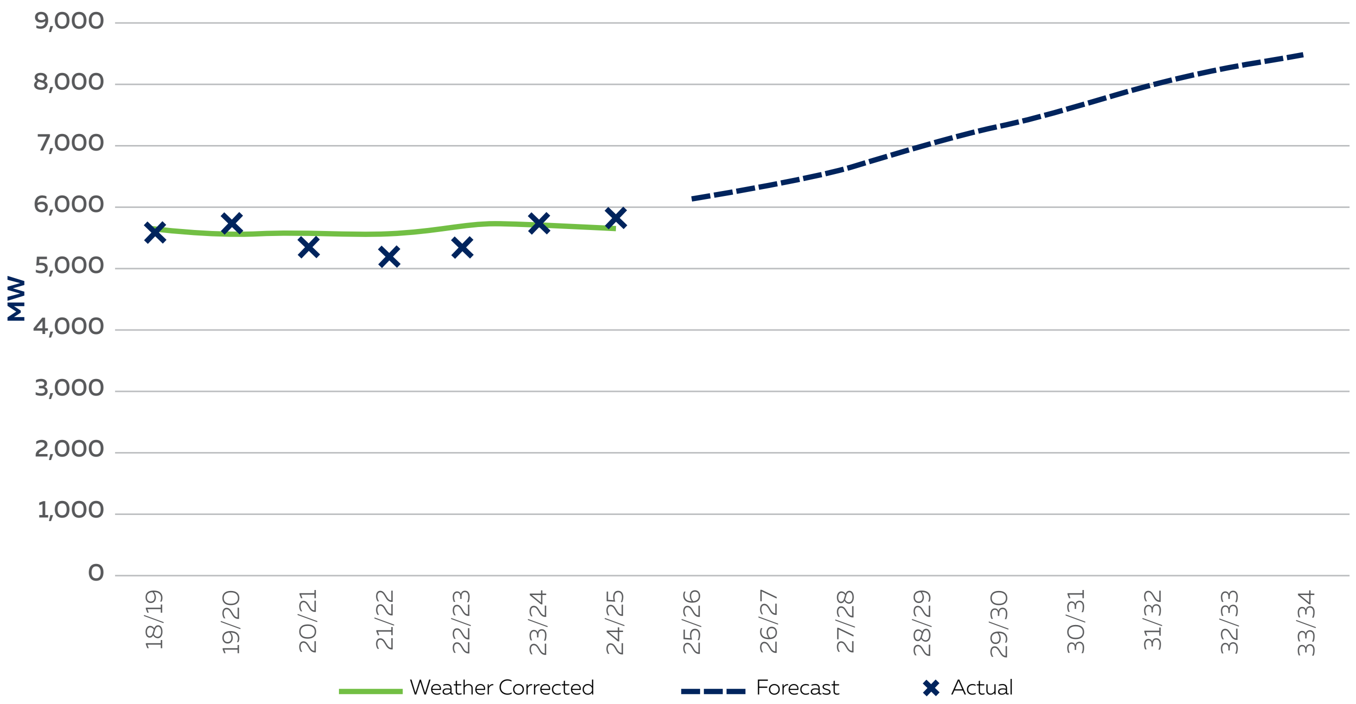
2.2.3 Inter-Network Impact

The Augmentation proposals described in this report are reliability projects and do not have a detrimental material inter-network impact.

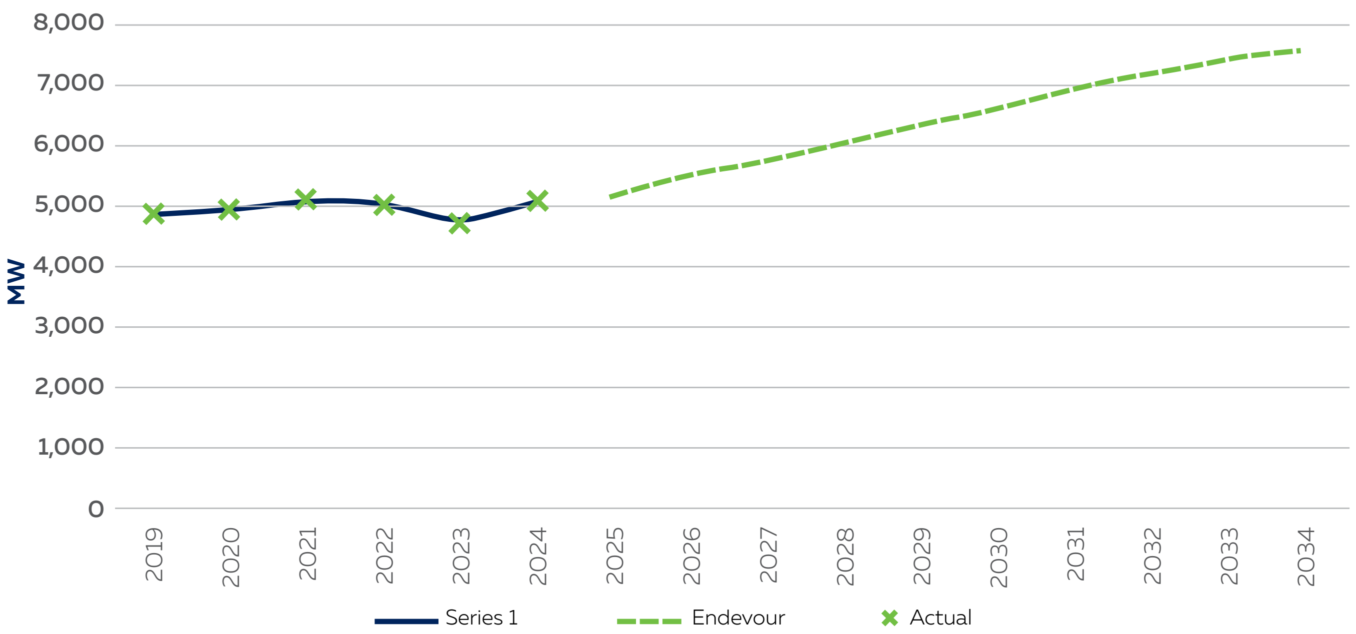
2.3 Ausgrid System Total Maximum Demand Forecasts

The forecast system total (non-coincident) summer maximum demand and the system total (non-coincident) winter maximum demand is shown below. Each chart displays the actual and weather corrected actual maximum demand to 2024/25 and the 50% Probability of Exceedance (PoE) forecast maximum demand Step Change scenario from 2025/26 in megawatts (MW).

2025 Step Change Summer Maximum Demand

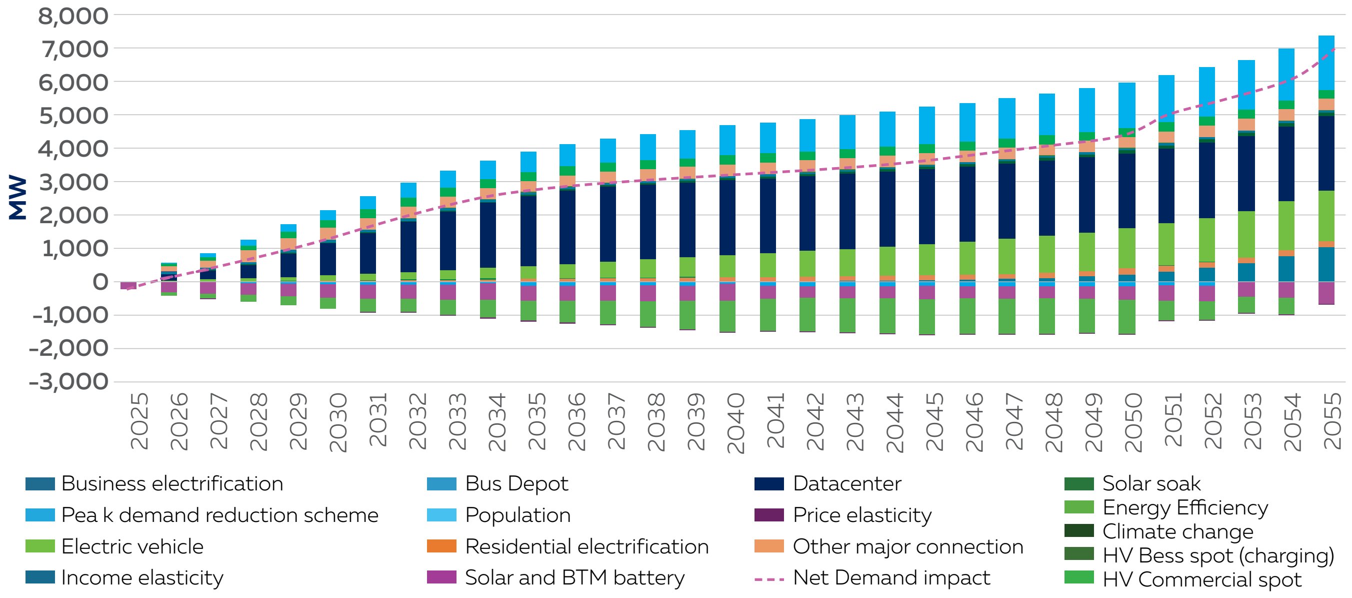


2025 Step Change Winter Maximum Demand



The forecast system total summer maximum demand components are shown below. This chart displays the contribution of each forecast element in each year out of 2055 based on the 50% Probability of Exceedance (PoE) forecast maximum demand Step Change scenario from 2024/25 in megawatts (MW).

Non-coincident total impact of forecast elements



2.4 Frequency Control and Load Shedding

Emergency control schemes are designed to make decisions across various scenarios so as to prevent the system from experiencing undesired conditions, particularly to prevent large catastrophic disturbances. As a transmission network service provider, Ausgrid has implemented various control schemes aimed at maintaining system security. Some emergency control schemes that have been implemented or proposed to be implemented are described as below.

- **Network switching and splitting:** To prevent circuits tripping due to thermal overloads as a preventive measure to ensure frequency control within limits, thus maintaining system stability during high-demand periods or network outages.
- **UFLS schemes:** UFLS schemes are widely implemented across most zone and subtransmission substations. They will be implemented on existing substations when an opportunity arises during augmentation or replacement works. Given the rising penetration of photovoltaic, Ausgrid has started enhancing new UFLS schemes with reverse power flow blocking mechanisms to prevent unnecessary load shedding. This improvement addresses the challenges posed by increasing 'behind-the-meter' generation and is also being considered for retrofit at substations experiencing or anticipated to experience reverse power issues. This proactive approach has been integrated into Ausgrid's planning process, and enhancements are implemented wherever feasible.
- **Joint planning:** In collaboration with Transgrid, Ausgrid engages in joint planning efforts to identify and implement load-shedding schemes in alignment with connection agreements. This ensures that load-shedding strategies are coordinated across network boundaries.

2.5 Stability

As per NER S5.1.8, the network service providers are required toplan and operate their network in a manner that supports stable operation of the national grid, following three criteria. Ausgrid coordinates closely with Transgrid as part of joint planning process to ensure power system stability is maintained.

- **Power system synchronism:** To ensure system synchronism, Ausgrid has taken proactive measures to avoid conditions that could disrupt synchronised operation. During this period, no new generators or major system augmentations were commissioned that would impact system synchronism.
- **Adequate damping of power system oscillations:** Ensuring adequate damping is essential to prevent oscillations that could lead to system instability. Ausgrid confirms that no new generators or major augmentations were introduced during this period that would impact the damping of power system oscillations, maintaining stability across the network.
- **Voltage stability criteria:** Voltage stability is critical for reliable operation, requiring that voltage remains within acceptable limits during normal conditions and in the event of the loss of a single network element. Ausgrid conducts regular QV (reactive power vs. voltage) analysis to verify that there is adequate reactive margin at each 132kV bus within the network. The margin criterion specifies that reactive margin, expressed in megavolt-amperes reactive (**MVAr**), should be less than one percent of the maximum fault level (in megavolt-amperes (**MVA**)) at each connection point. Based on the latest QV analysis, Ausgrid has determined that all 132kV buses have sufficient reactive margin, ensuring voltage stability across the network. To address potential reactive power needs, Ausgrid also considers the strategic installation of shunt reactors and capacitors where necessary. The current analysis confirms that reactive margin is adequate, with no immediate need for additional reactive support across Ausgrid network.

2.6 Primary Distribution Feeder Limitations

2.6.1 Maximum Demand and Load Growth

Ausgrid proactively plans its primary distribution feeders to maintain sufficient capacity under both normal (N-state) and contingency (N-1 state) conditions. Our approach reflects the changing energy landscape, where electrification and customer energy resources (CER) are reshaping demand profiles and introducing new planning challenges.

Currently, **four feeders** have exceeded or are forecast to exceed their cyclic rating within two years under normal conditions, and **100 feeders** under N-1 contingency conditions. Projects have been initiated for **13 feeders**, with a further **28 feeders** in development. The remaining feeders are under investigation

Key Drivers of Load Growth and Risk

- Electrification Uptake: Increased adoption of electric vehicles and transition from gas to electric heating and cooking.
- Urban Development: Higher-density housing and rezoning accelerating localised demand growth.
- Customer Energy Resources: Rooftop solar, batteries, and emerging technologies influencing load patterns and introducing reverse power flows.
- Policy and Incentives: Government programs driving decarbonisation and electrification.

Planning Actions

- Identification of needs through scenario modelling that incorporates electrification and CER trends.
- Development and assessment of options, including traditional augmentation and innovative solutions such as batteries, microgrids, and network automation.
- Justification and initiation of projects based on cost-benefit analysis and reliability standards.

2.6.2 Provision of Distribution Services for Distribution Connected Units

Ausgrid is committed to supporting the safe and efficient integration of distribution-connected generation across our network. This is an evolving space, with increasing interest from both small-scale and large-scale generation proponents seeking to connect to our network.

To identify limitations, Ausgrid reviews existing and forecast growth in demand for embedded generation services and models performance under peak and minimum load conditions. We assess each embedded generator application individually and incorporate application data into our scenario modelling to understand potential impacts and hosting capacity. Ausgrid is moving toward proactive hosting capacity planning, providing clear and timely information to proponents about available capacity for both load and generation. This approach improves transparency, supports informed investment decisions, and enables efficient integration of distributed energy resources while maintaining network performance.

Currently, no limitations have been identified on HV primary distribution feeders for the provision of services to distribution-connected units. At this stage, constraints are predominantly occurring on the LV network. To identify limitations, Ausgrid reviews existing and forecast growth in demand for embedded generation services and models performance under peak and minimum load conditions—as we evolve our approach toward proactive modelling of load and generation hosting capacity described above

3. Network Performance

3.1 Reliability Measures and Standards

Ausgrid seeks to comply with regulatory requirements at reasonable costs, given the condition and utilisation of existing network assets and the funding available to maintain and augment the electricity network.

Under the NSW Reliability and Performance (**R&P**) Licence Conditions for Electricity Distributors[3], Ausgrid is required to comply with specific individual feeder standards and standards for Ausgrid owned low-voltage Stand Alone Power Systems (SAPS). The purpose of the licence conditions is to facilitate the delivery of a safe and reliable supply of electricity. Ausgrid is required to report to the Minister to ensure compliance with the R&P licence conditions.

The AER facilitate the Service Target Performance Incentive Scheme (**STPIS**)[4], which provide Ausgrid financial incentives to improve customers' reliability performance compared to historic outcomes (as well as penalties if the performance level deteriorates).

Reliability measures used are System Average Interruption Duration Index (**SAIDI**), or minutes off supply for the average customer, and System Average Interruption Frequency Index (**SAIFI**), or number of interruptions experienced by the average customer. The reliability performance is monitored at distribution feeder level as well as each individual SAPS for unplanned interruptions (excluding major event days, planned interruptions and circumstances beyond the reasonable control of the electricity distributor).

Ausgrid monitors network outages and records the duration of outage events into the Advanced Distribution Management System (**ADMS**). For reliability reporting purposes, the network performance is measured at the whole of network, feeder category (encompassing both IPART and AER feeder categories) and individual distribution feeder level.

Excluding any excluded events (eg planned interruptions and Major Event Days), the recorded outage information provides Ausgrid with the frequency and duration of outages that are used to determine the SAIDI and SAIFI of individual feeders. In turn these individual feeders are grouped into categories, to enable an average SAIDI and SAIFI to be determined for each feeder category for the two reporting systems.

Our customers must plan around the possibility that the electricity supply may not always be available and that interruptions could occur without notice, or with notice in accordance with their supply contract.

3. The Minister for Energy established licence conditions for distribution network service providers on 1 August 2005 (revised December 2007, July 2014, for the Ausgrid Operator Partnership ("Ausgrid") on 1 December 2016, and for the operator of a transacted business on 4 December 2017. These were further amended in February 2019, October 2022 and September 2023). See: https://www.ipart.nsw.gov.au/Home/Industries/Energy/Energy-Networks-Safety-Reliability-and-Compliance/Electricity-networks/Licence-Conditions-and-Regulatory-Instruments

4. https://www.aer.gov.au/system/files/AER%20-%20Service%20Target%20Performance%20Incentive%20Scheme%20v%202.0%20-%2014%20November%202018%20%28updated%2013%20December%202018%29.pdf

Network Supply Reliability Performance in the Preceding Year

SAIDI and SAIFI Performance

While there is no requirement in either reporting system for organisational performance, it can be used to see long term trends. The following graphs depict the normalised (i.e. Major Event Days data excluded) SAIDI and SAIFI trends over the period 2010/11 to 2024/25.

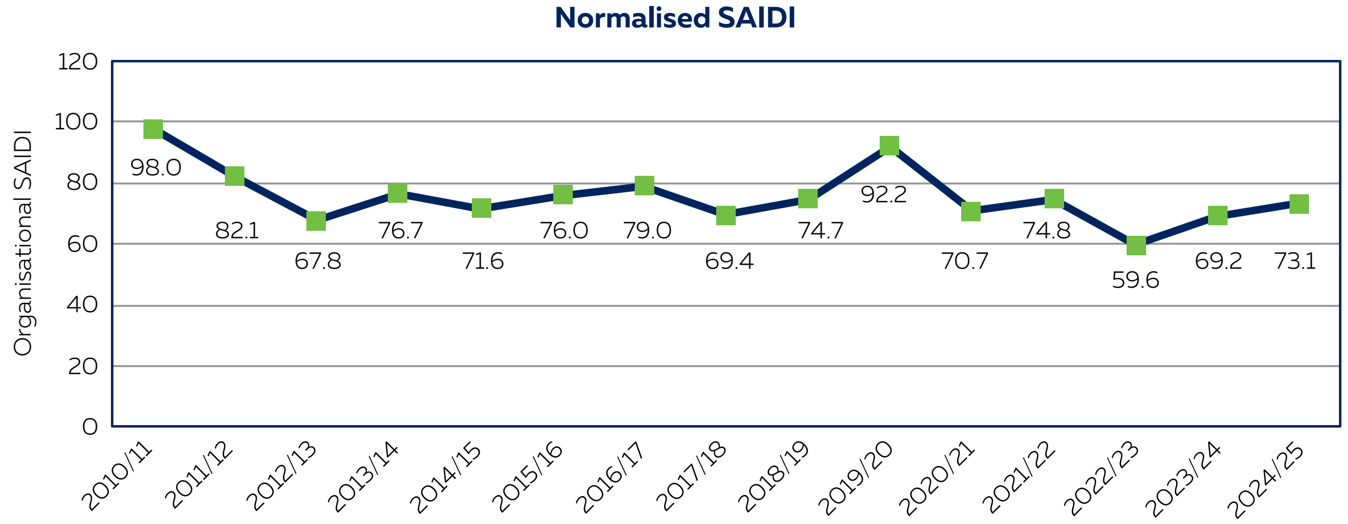


Figure 3-1: Global unplanned SAIDI

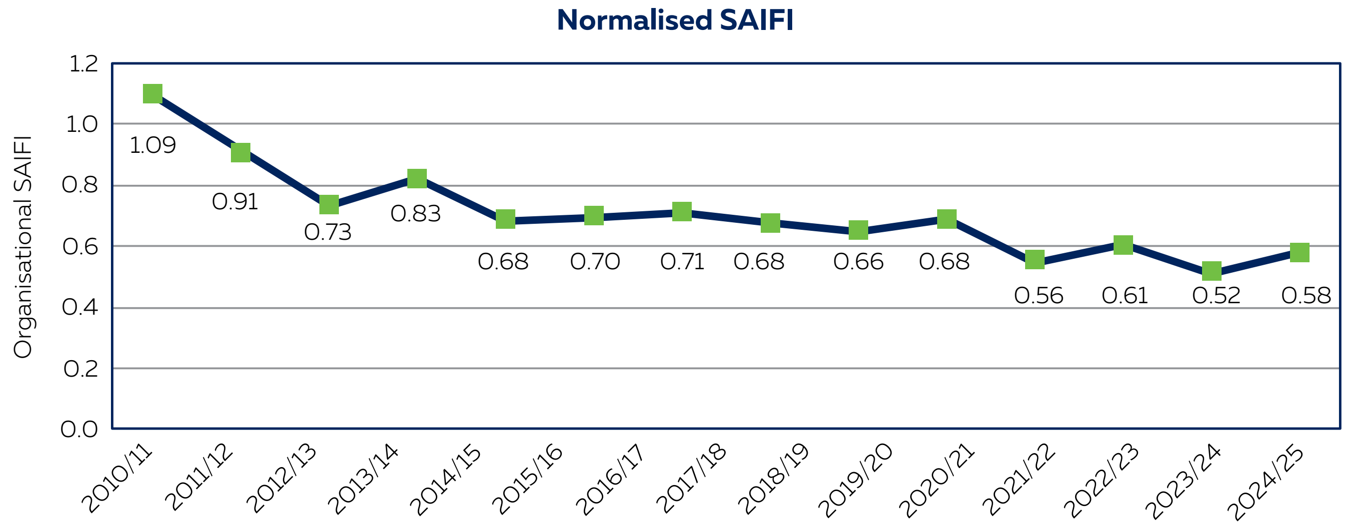


Figure 3-2: Global unplanned SAIFI

Major Event Days

Ausgrid uses the methodology described in IEEE 1366 standard for defining Major Event Days (MED), as outlined in the R&P licence conditions and AER STPIS Definitions.

For the 2024/25 financial year the threshold was 2.99 SAIDI minutes.

There were five Major Event Days for 2024/25 financial year.

Major Event Days in 2024/25		
Date	**Excluded SAIDI**	**Cause**
15/01/25	87.7024	Storm
16/01/25	6.0616	Storm
17/01/25	26.6701	Storm
18/01/25	4.1112	Storm
28/01/25	4.0616	Storm

3.1.1 Reliability and Performance Licence Requirements

Every quarter Ausgrid prepares a report of the network performance against the Individual Feeder and SAPS Service Standards. This report is used to determine any feeders or SAPS that are not performing within the prescribed limits and record the subsequent actions taken to investigate the causes, develop solutions and initiate those actions as detailed in the Licence Conditions.

Feeders are designated as either CBD feeders for those that are specified in the defined Sydney network, or as Short Feeders. There is a Long Feeder category for feeders that are over 500km in length, but Ausgrid does not have any feeders that long.

When traditional network options are not practical or economical, some customers are supplied by Stand Alone Power Systems (SAPS). These systems have a SAIDI limit of 1817 minutes and a SAIFI limit of 9.4. There are presently 10 of these systems in the Ausgrid network area.

Ausgrid is required to monitor the reliability of the network and record it every quarter and submit a final report to the Independent Pricing and Regulatory Tribunal (**IPART**) and the Minister administering the Electricity Supply Act 1995 by 31st August each year.

The report lists performance against the SAIDI and SAIFI individual feeder standards and low-voltage SAPS, along with any reasons for non-compliance and Ausgrid's plans to improve the feeder performance. It details the date at which performance first exceeded the relevant standard and the SAIDI and SAIFI performance for that 12-month period, including details of the remedial action to be taken to improve performance, and the planned date of completion for the action plan. Typical remedial action plans include either operational and/or capital expenditure, or alternatively there is the option of a non-network solution.

Operational work may include works like vegetation maintenance or critical repairs to electrical mains and apparatus. Any identified and reported operational work is due to be completed by the end of the third quarter following the feeder first exceeding the individual feeder standards.

Capital expenditure to improve feeder reliability can be in the form of a network augmentation project involving feeder reclosers or covered overhead mains to prevent or correct some known outage triggers. Any required capital work is to be developed, planned and commenced by the end of the second quarter following the feeder first exceeding the individual feeder standards. Some investigations find that a feeder outage occurred due to a one-off event that is not likely to occur again.

Non-network solutions may include energy storage systems to provide ride-through capability during outages or low-voltage SAPS installations.

Performance Monitoring, Reporting and Information Disclosure

The purpose of the R&P licence condition Section 6 – "Performance monitoring, reporting and information disclosure" is to:

- Specify minimum standards of reliability performance;
- Require a distribution network service provider to focus continually on improving the reliability, and
- Enable the reliability performance to be monitored over time.

Reliability and Performance Standards		
Standard	**Minutes Interrupted**	**Number of Interruptions**
CBD	100	1.4
Short	262+108 ×√Length + min (160, 5500/Length)	3.1+0.44 × √Length + min (0.65, 21/Length)
Low-voltage SAPS	1817	9.4
Direct connection	530	4.2

Feeder Reliability Performance

As required under the R&P Licence Conditions for Ausgrid, each feeder that exceeds their relevant Standard is analysed and an investigation report identifying the causes and, as appropriate, any action required to improve the poor performance, is prepared.. The majority of feeder exceedances were determined to be random events and action was limited to monitoring ongoing reliability performance. A small number of feeders required remedial actions such as vegetation management and repairs to network assets or capital works.

All required actions were completed in the timeframes required.

Ausgrid has an ongoing reliability management program that targets those feeders that have exceeded their relevant Standards as outlined in Appendix 1 of the R&P Licence Conditions. A summary of the performance of the feeders against the standards are given in the table below.

Summary of Performance Feeders Against the Standards				
Feeder Type	**CBD**	**Short**	**Low-voltage SAPS**	**Direct connection**
Feeders (Total Number)	155	2383	10	0[5]
Feeders that Exceeded the Standard during the Year	5	37	0	0
Feeders Not Immediately Investigated	0	0	0	0
Feeders Not Subject to a Completed investigation report by the Due Date	0	0	0	0
Feeder Not having Identified Operational Actions Completed by Due Date	0	0	0	0
Feeders Not having a Project Plan Completed by Due Date	0	0	0	0

3.1.2 STPIS

The AER's distribution STPIS provides a financial incentive for Ausgrid to maintain or improve its reliability and customer service performance over time. As part of the AER final determination for Ausgrid, the AER set elements of the STPIS for the 2024/25 – 2029/30 period including at-risk revenue caps, reliability targets, and customer service targets. The revenue at risk for each regulatory year is capped at 4.5 percent for the reliability of supply component.

The STPIS system operates using a different set of feeder categories from the R&P Licence Conditions. Ausgrid maintain separate reports within the reliability reporting system, based on these category definitions, to record performance against those categories and facilitate the operation of the STPIS system.

The SAIDI and SAIFI targets set by the AER in their final determination for each feeder category for the reliability component of the STPIS are set out in the tables below[6].

STPIS results 2024/25 – Unplanned SAIDI and SAIFI Targets vs Actuals				
	Target SAIDI	**Actual SAIDI**	**Target SAIFI**	**Actual SAIFI**
CBD	13.02	32.6	0.04	0.11
Urban	64.79	61.03	0.56	0.50
Short Rural	129.04	119.53	0.93	0.93
Long Rural	841.16	1174.05	2.27	2.89

5. Ausgrid does not have any direct connection customers.
6. Table extracted from the AER's Final Decision Ausgrid Determination 2019-24 Attachment 10 Table10.2 – Service Target Performance Incentive Scheme.

3.2 Quality of Supply Standards

Ausgrid makes best endeavours to provide a level of quality of supply within available funding, asset conditions and utilisation constraints that enables customers to satisfactory operate their equipment. Ausgrid's network standard NS238 Supply Quality sets out the quality of supply performance that customers can expect from Ausgrid's network, including steady-state voltage, voltage unbalance, harmonic distortion and rapid voltage variations. The quality of supply is influenced by the characteristics of connected loads and generators, the configuration of the network and the occurrence of network events.

Ausgrid does not control the frequency of electricity supplied through its network. Frequency standards are set at the generation and transmission level and regulated by the Australian Energy Market Commission (AEMC) for the national grid.

3.2.1 Voltage Range for Supplied Electricity

Supply voltage is the voltage, from phase to neutral or phase to phase, for electricity that is supplied at a customer's point of supply. Maintaining the steady state supply voltage is important to ensure the customer experience, and the efficiency and stability of the network. When Ausgrid identifies or is notified that the steady state supply voltage is outside the specified target range, Ausgrid will investigate by carrying out relevant measurements on the network in conjunction with the existing network monitoring to determine the remediation necessary. An increase in solar PV installations made steady state voltage the most prominent quality of supply parameter.

Low Voltage Network

Ausgrid's LV steady state voltage objective is to maintain the 10 minute average phase to neutral voltage within 216–253 V range at customers' points of supply under normal operating conditions, in accordance with AS 61000.3.100. Compliance is assessed using the 99th (V99) and 1st (V1) percentiles of 10 minute averages over the reporting period. A recent statistical survey of LV supply points stratified by region, customer types, and customer energy resource (CER) penetration, which was designed to estimate the network-wide non-compliance rate to within ±1 percentage point at 95% confidence for the full LV population. This survey found that around 8% of monitored sites recorded V99 values greater than 253 V, while undervoltage non-compliance (V1 below 216 V) remained comparatively rare. Overall, voltages are generally within the required standard on a weekly basis but are more heavily concentrated towards the upper end of the allowable range. Because local loads and generation vary over time, the sites above the limit are not necessarily the same each day, so over longer periods a larger share of customers may experience at least one interval where the 10-minute average voltage exceeds the 253 V upper limit.

These statistical indicators are consistent with the probabilistic approach in the AS/NZS 61000 series and are broadly aligned with international practice, such as EN 50160, which specifies voltage characteristics at a user's supply terminals in public electricity networks.

High Voltage Network

Ausgrid's medium and high voltage network operates at several nominal voltage levels. Customers are required to obtain from Ausgrid the relevant network characteristics for supply voltage at their location, particularly before undertaking project expenditure or equipment selection.

Applicable Quality of Supply Codes, Standards and Guidelines

Ausgrid relies on the following standards and/or guidelines when setting and assessing network voltage performance:

- Network Standard: NS 238 Supply Quality
- Australian Standards: AS/NZS 60038 and AS 61000.3.100

3.2.2 Harmonics and Total Harmonic Distortion

Voltage waveform distortion, including harmonics, results from equipment that draws non-sinusoidal current from the network. Harmonic distortion causes the supply voltage to deviate from a pure sine wave and, if not adequately controlled, can lead to interference and damage to sensitive customer and network equipment. Adverse impacts include light flicker, incorrect operation of ripple-control devices, maloperation of electronic equipment, audible noise and increased vibration and heating in induction motors.

Applicable Quality of Supply Codes, Standards and Guidelines

Ausgrid relies on the following standards and/or guidelines when limiting and assessing harmonic performance:

- Network Standard: NS 238 Supply Quality
- Australian Standards: TR IEC 61000.3.6:2012, AS 61000.2.2:2023, AS 61000.3.12:2023, SA/SNZ TR IEC 61000.3.14:2013
- NER S5.1a.6 – Voltage Waveform Distortion
- NSW SIR: Section 1.17.2.1 (b) refers to AS/NZS 61000.3.2, 61000.3.4, 61000.3.12.
- ENA guideline – ENA Doc 033 – Power Quality: Harmonics, which provides national guidance on the application of IEC/TR 61000.3.6 for setting harmonic planning levels in MV and HV networks.

3.2.3 Voltage Fluctuations (Flicker) – Applicable Quality of Supply Codes, Standards and Guidelines

Rapid or cyclic variations in voltage can cause visible flicker, particularly in lighting. While several complaints are registered each year as flicker, investigations generally show that most are not non-compliances against IEC/TR 61000.3.7 but are associated with ripple-control signals used to control off-peak hot-water systems.

Ausgrid relies on the following standards and/or guidelines when limiting and assessing Voltage fluctuations performance:

- Network Standard: NS 238 Supply Quality
- Australian Standards: TR IEC 61000.3.7:2012, AS 61000.2.2:2023, AS 61000.3.12:2023, SA/SNZ TR IEC 61000.3.14:2013
- NER S5.1a.5 – Voltage Fluctuations
- NSW SIR: Section 1.17.2.1 (b) refers to AS/NZS 61000.3.3, 61000.3.5, 61000.3.11
- ENA guideline – ENA Doc 034 – Power Quality: Flicker, which supports the application of IEC/TR 61000.3.7 for planning levels and assessment of voltage fluctuations.

3.2.4 Voltage Unbalance – Applicable Quality of Supply Codes, Standards and Guidelines

While the overall network performs satisfactorily, voltage unbalance is an emerging disturbance of concern, particularly in LV networks. Monitoring shows that a proportion of LV sites exceed, or are close to, the planning limits, whereas MV sites generally remain well within their corresponding limits.

Ausgrid relies on the following standards and/or guidelines when limiting and assessing Voltage Unbalance performance:

- Network Standard: NS 238 Supply Quality
- Australian Standards: TR IEC 61000.3.13:2012, AS 61000.2.2, AS 61000.2.12, SA/SNZ TR IEC 61000.3.14:2013
- NER S5.1a.7 – Voltage Unbalance.
- ENA guideline – ENA Doc 037 – Power Quality: Voltage Unbalance, which supports the application of IEC/TR 61000.3.13 for planning levels and assessment of voltage unbalance.

3.3 Quality of Supply Performance for Preceding Year

Ausgrid monitors quality of supply through a combination of customer complaints, permanent monitoring at selected locations across the network, power-quality data obtained from customer smart meters, and participation in the Power Quality Compliance Audit (PQCA) conducted by the Australian Power Quality Research Centre at the University of Wollongong.

Smart-meter data is now used actively to assess compliance and to proactively manage steady-state voltage performance, particularly in areas with high solar penetration.

3.3.1 Supply Voltage Performance

Distribution substations with voltage monitoring showed that 100% of sites met the V1% limit (216V) and over 95% met the V99% limit (253V). Smart-meter measurements indicate that 8.2% of sites have indices that exceed the limits; however, the proportion of non-compliant sites has continued a long-term downward trend. The increase I non-compliant smart meter sites is due to a dramatic increase in measurements from smart meters.

High penetration of embedded generation continues to create localised voltage issues. Customers mainly observe these as curtailed exports due to inverter behaviour prescribed under AS/NZS 4777. During the reporting period a significant number of complaints were received, approximately half relating to solar systems. In most cases these were resolved by adjusting inverter power-quality response modes (AS/NZS 4777.2) or by changing the tap position of the supplying transformer.

3.3.2 Harmonic Content of Supply Voltage Waveform

Harmonics non-compliance levels across the network including MV and HV remain low with performance this year similar to that of last year.

3.3.3 Voltage Fluctuations (Flicker) Performance

Several complaints were registered as flicker; none were confirmed as flicker within the definition of IEC/TR 61000.3.7. Most cases involved light flicker caused by ripple-control signals for off-peak hot-water systems.

3.3.4 Voltage Unbalance Performance

There are no widespread issues, but unbalance levels are increasing and are now the disturbance of most concern from a compliance perspective. Around 12.8% of LV sites have indices exceeding the limit and a further 2.7% are within 10% of the limit, while MV sites remain largely within their limits.

3.4 Corrective Action Planned to Meet Quality of Supply Standards

3.4.1 Supply Voltage

Growth in customer energy resources (**CER**), including small-scale solar and batteries, is changing customer awareness of network voltages. Ausgrid's voltage-management approach is evolving accordingly from a largely reactive, peak-demand focus to a more proactive strategy. The voltage management process adopts a holistic end-to-end view, from Ausgrid's connection to Transgrid through to LV customers, enabling the most efficient options to be selected across all network levels. Combined models allow voltage regulation at all levels to be incorporated into local voltage analysis.

Proactive monitoring of voltage data from multiple sources, combined with customer-complaint data, provides a view of network voltage performance and feeds into voltage-regulation planning. Where emerging or forecast issues are identified, Ausgrid endeavours to implement mitigation options. Current activities to improve supply quality and deliver network functional compliance include:

- Joint planning with Transgrid to optimise bulk-supply point (**BSP**) voltage settings;
- Optimisation of STS, zone substation and pole-top regulator voltage settings;
- Review and update of distribution-substation tap settings;
- Integration of upstream voltage behaviour into low level network modelling;
- Deployment of smart devices such as STATCOMs, community batteries, and grid-supporting inverters for local voltage smoothing.

3.4.2 Flicker, Harmonics and Unbalance

Ausgrid continues to monitor customer complaints and implements corrective actions as required to address flicker, harmonic and unbalance issues.

3.4.3 Outlook and Improvement Initiatives

Ausgrid is implementing a range of forward-looking initiatives to improve voltage quality, support higher penetrations of customer energy resources (CER), and prepare the network for future operational challenges. These initiatives combine investment, operational optimisation, and data-driven voltage management.

Ausgrid forecasts significant growth in DER, including rooftop solar, batteries, EV charging, and community energy storage systems. This continued growth will increase reverse-power flow on LV networks and raise the importance of voltage management. Ausgrid is embedding enhanced LV monitoring and CER-aware voltage-control strategies to ensure compliance with voltage standards across the distribution area.

As part of the Hunter-Central Coast Renewable Energy Zone (**HCC REZ**), Ausgrid is preparing for significant growth of renewable generation interfacing with its network which is expected to improved capacity and dynamic voltage performance across bulk supply points. The project has already strengthened network modelling capabilities in the power quality related areas.

Ausgrid's future operating environment will require increased visibility, flexibility and coordination across all network levels. The combined initiatives outlined above are designed to:

- Improve steady-state voltage compliance and ongoing power-quality stability.
- Minimise customer export limitations caused by voltage rise.
- Enable broad DER integration at least cost.
- Defer network augmentation through coordinated local solutions.
- Maintain compliance with Australian Standards and NER voltage-quality obligations.

Together, these actions position Ausgrid to maintain high levels of quality-of-supply performance as the network transitions to a CER-dominated operating environment.

4. Asset Management

4.1 Ausgrid's Asset Management Approach

The organisation's vision is for communities to have the power in a resilient, affordable, net-zero future. Our asset management objectives are a key enabler of this vision. These objectives are:

Asset Management Objectives	What does this mean?	How will it be achieved?
Enhancing Safety Protecting people from harm so far as is reasonably practicable.	Applying prudent risk management and prioritisation to eliminate safety hazards 'so far as is reasonably practicable' (SFAIRP) to minimise safety incidents.	Improving safety incident performance, applying risk assessments, measuring and monitoring asset failure trends.
Improving Network Performance Improving the reliability, security and resilience of supply to create a better customer experience and meet our obligations to protect our critical infrastructure.	Enhancing the network's ability to accommodate disruptive technology, meet security and resilience requirements, and anticipate and respond to outages to minimise supply interruptions to customers.	Monitoring SAIDI, SAIFI, CAIDI, STPIS performance against guaranteed service levels and asset failure trends to identify and capture strategic improvement opportunities. Monitor compliance against SOCI requirements.
Delivering Affordability Delivering customer affordability through optimisation of whole of life costs and improved operational performance.	Applying prudent risk management, prioritisation, and cost benefit analysis to make balanced investment decisions that avoid boom/bust investment cycles. Streamlining and enhancing processes and systems to capture delivery efficiencies and productivity gains.	Internal and external benchmarking of capex and opex activities.
Increasing Sustainability Transforming the network through reducing emissions and providing choice and control for customers to more easily access sustainable energy.	Investing on a 'no regrets' basis to facilitate: the adoption of new technology and innovation; customer choice in energy services; and support energy decarbonisation to meet our current and future network needs.	Monitoring of system level performance and Board reporting on the State of the Network.
Making a commercial return Provide dividend certainty through effective and optimised investment that responds to incentives.	Ensures that asset management decisions and activities reflect the need to provide dividend investment in the asset base with a focus on certainty to shareholders through optimised responding to incentives.	Monitoring STPIS, CESS, EBSS and EBITDA performance to identify areas requiring improvement and further focus.

Effective asset management practices will be applied across all levels of the organisation to deliver this vision. In providing services to our customers, we manage, operate and maintain a diverse and expansive electricity network. The following diagram outlines how Ausgrid's asset management system structures our approach to apply a systematic, risk based, whole of life approach, which considers stakeholder requirements, regulatory frameworks and embeds continual improvement and innovation to continue to deliver on our strategic objectives in the context of an ever-changing operating environment.

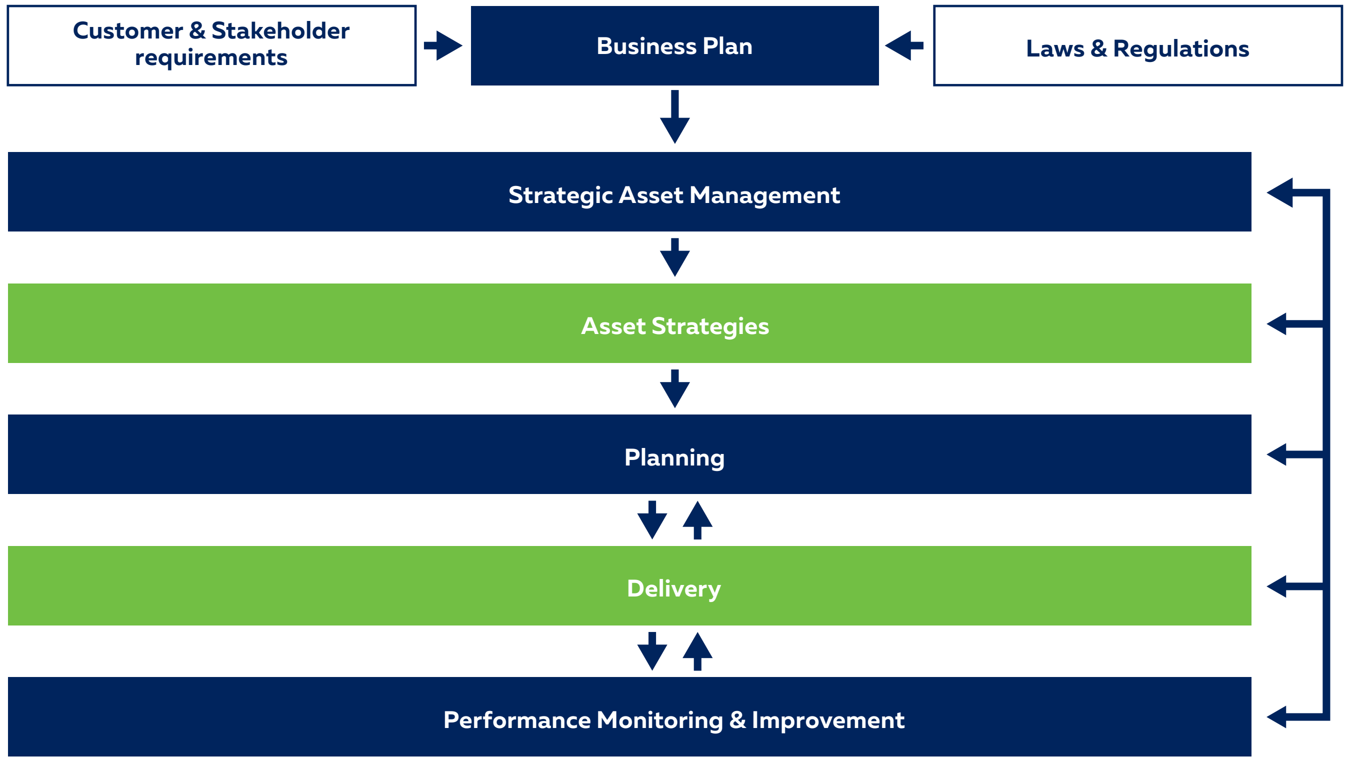


Figure 4-1: Overview of Ausgrid's Asset Management System

This approach also ensures we deliver and align with the NEO and our regulatory and legal requirements, in particular obligations under the WHS Act 2011 and associated regulations, the Electricity Supply (Safety and Network Management) Regulation 2014 (NSW), the NEL and the Electricity Supply Act 1995 (NSW).

Our asset management system, including the strategies, models and processes adopted by Ausgrid, has been certified to conform with the requirements of AS ISO 55001:2014 Asset Management – Management Systems – Requirements in accordance with our Distribution Licence Conditions.

This structured approach to asset management ensures that we continue to deliver on our vision and meet the goals of our customers, shareholders and employees.

4.2 Risk Management Strategies

The asset management objectives captured within the Asset Management System align to the organisation's objectives and risk appetite. Asset decisions are informed through structured risk assessments in accordance with the Risk Management Board Policy, Risk Management Framework and Risk Appetite Statement. Ausgrid's asset management approach utilises risk management techniques to manage risk within the organisation's risk appetite.

Risk management techniques applied to inform asset decision making consistent with the organisation's legislative responsibilities and AS/NZS ISO 31000-2018 Risk Management – Principles and Guidelines for managing risk. Ausgrid applies numerous techniques for managing risk at various scales, leading to various decision pathways across the life cycle of an asset. The asset management system draws on AS/NZS IEC 31010:2020 Risk management – Risk assessment techniques (IEC 31010) to guide a structured approach to decision making. Risk management techniques such as reliability centred maintenance and cost benefit analysis are used to evaluate risks and determine maintenance and investment requirements respectively.

An overview of significant asset class investment strategies is outlined in the following sub-sections.

4.2.1 Sub-Transmission Underground Cable Strategy

Ausgrid's sub-transmission cables are an essential part of our supply network. Ausgrid has approximately 1,074km of sub-transmission cables with the majority operating at either 33kV or 132kV and a small number at 66kV. These assets cannot routinely be taken out of service except for brief periods necessitated by the need for maintenance and repair, particularly those which operate at 132kV supplying the inner metropolitan area of Sydney.

There are four cable technology types used for these cables – these are listed below (from oldest to youngest type):

- 159km of self-contained fluid filled (**SCFF**) cables;
- 33km of gas pressure cables;
- 213km of paper insulated, lead covered ('paper lead') cables; and
- 660km of cross-linked polyethylene (**XLPE**) cables.

Approximately 50% of Ausgrid sub-transmission cables operate at 132kV and many of these form the critical backbone of the sub-transmission network. Failure of multiple 132kV cables can have significant impacts upon our customers, particularly in the Sydney CBD and surrounding urban areas.

A risk assessment has been undertaken on our sub-transmission cables using an asset failure probability model and consequence assessment, with timing of any retirement decision based on cost benefit analysis. From the assessment, SCFF and gas pressure cables are approaching end of life and have been forecast for retirement / replacement over the next 15-20 years.

SCFF cables operate at 132kV. Due to the environmental risks posed by these cables, Ausgrid consults with the Environmental Protection Agency (**EPA**) to take reasonable steps and exercise due diligence regarding the management of the environmental risks. The cost benefit analysis takes into consideration:

- The unavailability of individual SCFF cables (failure probability),
- Condition of individual SCFF cables primarily based on their level of fluid leakage and the condition of the cable,
- Network restoration and repair times for failures and defects,
- The environmental risk from individual cables, in particular those crossing major waterways, and
- The unserved energy (customer reliability impacts) which are realised in the event of an asset failure.

Gas pressure cables equate to approximately 3% of Ausgrid sub-transmission cables and they all operate at 33kV. The failure of mechanically fatigued joints, degradation of the cable system resulting in increasing gas leakage rates and the lengthy restoration and repair times, support the retirement of gas pressure cables. As supported by cost benefit analysis, retirement of all remaining gas pressure cables is expected in the next 20 years.

Ausgrid also has a substantial population of paper lead cables which all operate at 33kV. These cables formed the backbone of the sub-transmission network at its inception and remain relatively reliable despite their age, with some sections up to 95 years old. The lifespan of these cables is generally considered to be approximately 80 years; however, individual circuits may be retired prior to reaching this age based on condition (issues related to corrosion of the lead sheath or loss of resistance in the paper insulation) as supported by cost benefit analysis and other network needs.

XLPE cables are the current technology being installed for 33kV, 66kV and 132kV circuits. Ausgrid has been utilising this cable technology for approximately 30 years and is expecting a 60-year operating life. There are currently no plans to retire these assets within the planning horizon.

4.2.2 11kV Switchgear Strategy

Between the late 1930s and the early 1970s Ausgrid progressively installed a large number of compound insulated 11kV switchboards with bulk oil circuit breakers (**OCB**). As technology progressed, air insulated switchboards (non-internal arc classified technology) with bulk oil circuit breakers (OCB) became widely available and were installed from the late 1960s until the late 1970s, when vacuum circuit breakers (**VCB**) were introduced. From 2004, internal arc classified switchgear became the accepted industry standard for new installations. This progression of technology has resulted in a corresponding reduction in the risk of catastrophic failure (both likelihood and consequence). This reduction in risk was traded off against a larger construction footprint in a typical urban style Zone Substation.

In rural and lower loaded areas, outdoor 11kV switchgear (cubicle or recloser style) has generally been used as this is a more economical design than indoor switchgear in those areas. However, due to the increased exposure to local environmental conditions, this type of switchgear has deteriorated over time, leading to more frequent failures and higher maintenance costs.

Risk assessments considering likelihood and consequence have been conducted on 11kV indoor switchgear. Application of cost benefit analysis to the age and condition issues associated with 11kV compound switchboards, confirm that these are approaching end of life. Switchgear risks are considered in conjunction with other planning needs in the local area to determine the optimal replacement timeframes, with consideration given to work bundling opportunities. The cost benefit analysis takes into consideration:

- The unavailability of individual switchboards / switchboard sections,
- Condition of individual components primarily based on maintenance test results,
- Network restoration and repair times for failures and defects,
- The risks from switchboard failures, and
- The unserved energy (customer reliability impacts) which are realised in the event of an asset failure.

Oil filled circuit breakers pose an additional risk to safety, reliability and secondary asset damage due to the catastrophic nature in which they can fail. To mitigate this risk and defer retirement of older style air insulated switchboards, 11kV oil filled circuit breakers in zone substations have largely been replaced with vacuum equivalents where practical.

4.2.3 Additional Replacement Programs

Additional key replacement programs include:

- Condition based replacement of poles,
- Replacement of higher risk overhead conductor types,
- Reconfiguration of low voltage streetlight mains (conversion to regular mains supply), and
- Replacement of low voltage underground cable types with conditions/reliability issues.

4.3 Distribution Network Losses

Distribution network losses refer to the difference in energy obtained from the transmission network to that supplied to customers. Ausgrid's distribution network losses as a percentage of total energy for the 2024/25 financial year was 3.14%[7].

Electrical energy losses represent a cost to network service providers and customers, and therefore it is Ausgrid's objective to minimise these losses, while maintaining a safe and reliable electricity supply, at minimum cost to the community. When considering potential network projects under the NER's Regulatory Investment Test for Distribution, Ausgrid must consider changes in electrical energy losses if they are material or may alter the selection of a preferred investment option.

Ausgrid's methodology for calculating losses is published on its website as part of the requirements of the NER to maintain a method for calculating Distribution Loss Factors (**DLF**). This methodology is to utilise the Incremental Transmission Loss Allocation where losses to specific load or generation points are allocated according to its effect on the total losses of the system. The aim of this methodology is to enable the quantification of incremental values of network loss savings in the assessment of proposed network project options, and the quantification of network losses as required under the RIT-D. Additionally, the methodology enables the calculation DLF for Individually Calculated Tariffs (**ICT**) customers and embedded generation systems.

Ausgrid's technical specifications for the assessment of losses for primary plant such as subtransmission transformers, distribution transformers, shunt reactors etc, specify the method of assessing capitalised losses when comparing tender offers from suppliers.

4.4 Obtaining Further Information on Asset Management

Further information on asset management may be obtained from Ausgrid's Asset Management Policy (available on request from the Group Executive – Customer, Assets & Digital), and our Electricity Network Safety Management System (ENSMS) Annual Performance Report available on the Ausgrid website.

7. The distribution network losses are reported at the end of each calendar year, using the previous financial year's accumulated loss data.

5. Non-network Opportunities

5.1 Demand Management

When Ausgrid identifies a network limitation, SAPS and non-network options are considered as an alternative to the preferred network option.

A SAPS alternative means providing customers affected by the identified network limitation an alternative supply source to the electricity grid. A typical SAPS would comprise a renewable energy supply source such as solar, battery storage and a backup generator such as a diesel generator.

The implementation of a non-network alternative is commonly referred to as demand management in that the solution has historically involved the reduction or modification of customer demand for grid supplied electricity. But with rapidly developing alternatives such as advanced solar and battery inverter control, demand management solutions can now include support for voltage unbalance, power factor and harmonics management.

Demand management is an important part of efficient and sustainable network operations; and can help address a network need due to rising customer demand, aging network assets, voltage unbalance or other investment driver. Effective use of demand management reduces the cost to maintain the network and results in lower electricity bills for all customers.

There are a range of demand management or non-network solutions available for use by electricity networks. Examples include:

- Energy efficiency (e.g. replacing lights with more efficient, lower wattage options).
- Demand response (e.g. operating appliances at lower power demand for short periods such as air conditioner load control).
- Operation of embedded generators (including renewable generators).
- Energy storage (e.g. batteries).
- Power factor correction (a form of energy efficiency).
- Load shifting (shifting equipment use from peak to non-peak periods such as off-peak hot water).
- Converting the appliance energy source from electricity to an alternative (e.g. switching from electric to gas heating).
- Voltage management (e.g. operation of customer inverters in voltage support modes).

When a review of a network limitation is initiated, a review of options that includes both network and non-network options is completed. The goal is to identify the solution which offers the highest net benefit and meets the required reliability standards. The solution may be:

Modifications or additions to the existing network (i.e. network solution).

Support of the existing network by others (i.e. non-network or demand management solution).

Blended solutions incorporating network modification or additions and non-network demand management elements (including, though not limited to SAPS and microgrids).

Ausgrid's planning process assesses network needs across different network areas. Solution options are developed by area for all known network needs to allow for comprehensive solutions to address multiple needs.

To ensure a thorough investigation, Ausgrid consults with the community on larger projects about the network requirements and the potential non-network options available.

To determine the right balance, we apply the process depicted in Figure 3.1 following. For projects where the preferred network option cost is greater than $7 million, the RIT-D process is followed. The green boxes denote the reports which are published as part of the RIT-D process.

For projects where the preferred network option cost is less than $7 million, Ausgrid applies a similar but simplified process appropriate to the cost of the project.

The RIT-D process is a cost-benefit test that must be applied to all network investment projects where the most expensive credible option costs more than $7 million. It must be applied by network distribution businesses when assessing the economic efficiency of different investment options to select the option with the highest market benefit that address the network needs.

This helps to promote better consistency, transparency and predictability in our planning processes and follows the NER rules under Chapter 5.

The AER published an update to the regulatory investment test for transmission (RIT-T) and RIT-D application guidelines in August 2022 which stipulated that DNSPs can connect customers to a SAPS where it may be cheaper, safer and more reliable than connection to the grid. These will become regulated SAPS.

Customers connected to regulated SAPS will receive an equivalent level of customer protections and will pay for their electricity in the same way as grid customers. Both SAPS and grid customers can benefit from lower charges and improved system reliability.

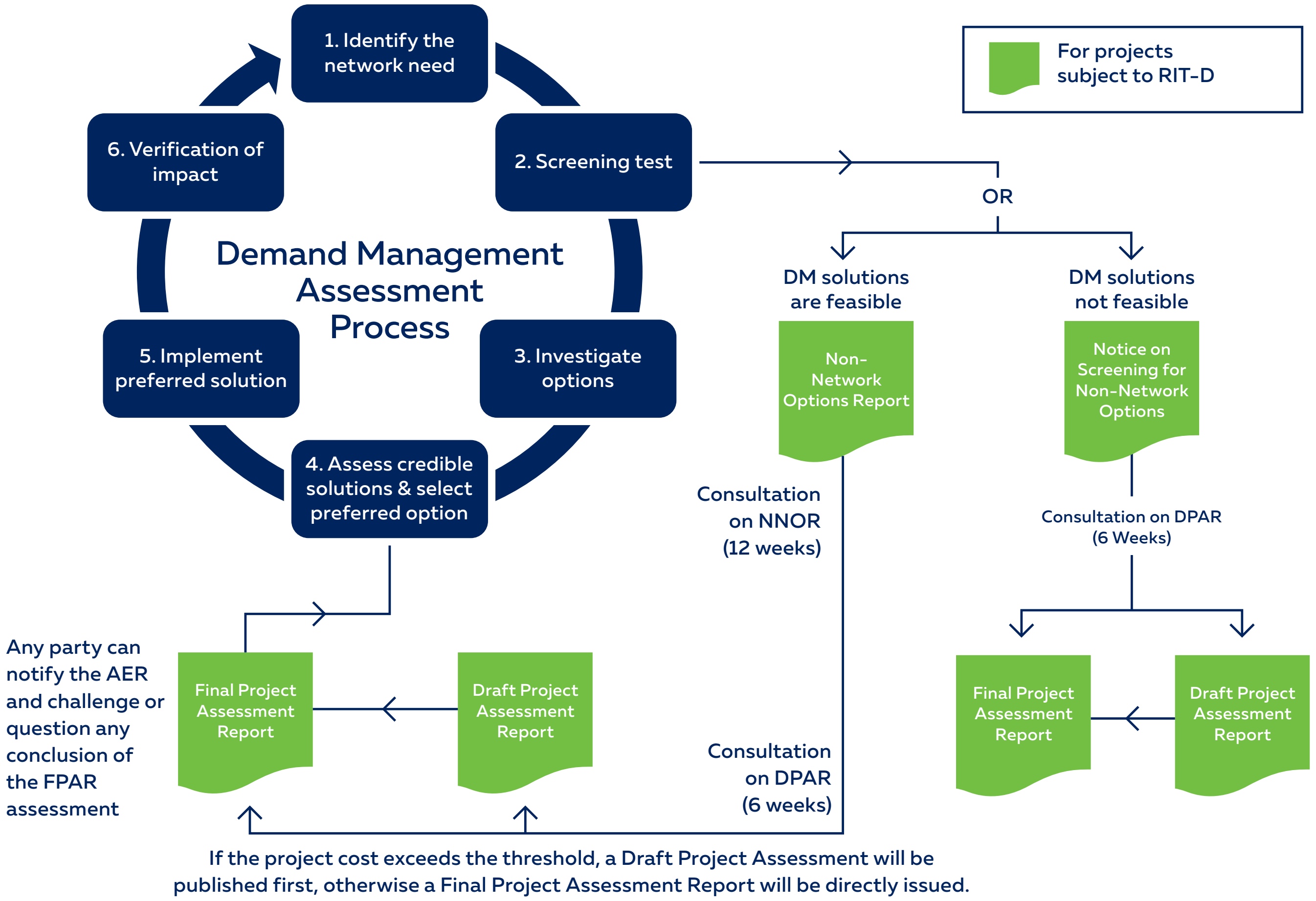


Figure 5-1: Demand Management Assessment Process

5.2 Demand Management Considerations

5.2.1 Demand Management Considerations in FY25

Based on the assessments in FY25, there were no major projects confirmed to include a non-network solution as part of the solution mix. It should be noted that the level of analysis is of a high level nature and that the assessments for all projects were based upon preliminary assumptions for project costs, unserved energy and other benefits.

A full assessment conducted as part of the RIT-D process, including a request for submissions via the Non-Network Options Report or equivalent, will occur in future for each respective project at the relevant time. Refer to Section 6 of this report for the forward schedule for our RIT-D projects.

5.2.2 Demand Management in the Forward Planning Period

There are currently no forecast demand management projects to address network constraints. This is primarily due to the nature of the network constraints, which are largely driven by the replacement of aged assets. There were 16 major projects in the forward planning period which were considered for SAPS and demand management options. Ausgrid assesses the viability of demand management alternatives for projects that meet minimum threshold costs.

While Ausgrid has no confirmed network investment projects in the forward planning period that include non-network solutions, there are potential projects in the future that may incorporate demand management as part of the least-cost solution.

Where demand management is confirmed as feasible, Ausgrid will conduct public consultation and publish relevant information on its website. Registered Interested Parties will be notified of any opportunities.

To register, visit: https://www.ausgrid.com.au/Industry/Demand-Management/Demand-management-news

5.3 Demand Management Activities in FY25

5.3.1 Demand Management Projects Initiated in FY25

There were no demand management projects initiated in FY25 that were linked to a network investment need.

5.3.2 Demand Management Projects Implemented in FY25

There were no demand management projects implemented in FY25 that were linked to a network investment need.

5.3.3 Demand Management Innovation

As part of our efforts to explore alternative demand management solutions, Ausgrid investigates potential demand management solutions that may offer cost-effective alternatives to traditional network options. These research and development projects are funded through the Demand Management Innovation Allowance Mechanism (**DMIAM**) and approved by the Australian Energy Regulator.

Ausgrid's demand management innovation program aims to explore innovative technologies and concepts that can assist with demand management such as BESS (Battery Energy Storage System), electric vehicles, thermal load flexibility, hot water load control, dynamic pricing and to explore solutions enabled by smart meters.

Ausgrid strongly encourages interested parties to engage with us on new and innovative project ideas or proposals that aid the transition to our net zero future. To discuss further please email us at demandmanagement@ausgrid.com.au.

During FY25, Ausgrid progressed five DMIAM projects. A description of the projects is provided below.

Project Edith

Project Edith aims to explore the effectiveness of dynamic network pricing in influencing Consumer Energy Resources (CER) to help reduce network costs associated with managing minimum and maximum demand, minimise solar curtailment and avoid unnecessary network upgrades. The project involves setting dynamic network prices based on actual conditions at a specific time and location, which provides opportunities for customer agents (aggregator or retailer) to optimise CER based on the dynamic network prices.

The key objectives are to:

- Remove barriers to the participation of customers' energy resources in energy markets through efficient and fair pricing.
- Allocate distribution network capacity in a decentralised manner and incentivise network support from customers' energy resources.
- Identify and inform key areas for implementing this model, share insights and engage the industry.

Phase 1

Demonstrated how existing systems could be adapted to implement dynamic pricing to unlock additional value for and from CER.

Phase 2 Current Status

At the end of FY25, there were 1,190 customers participating in the program, and the intention is to maintain this level during the next regulatory year.

Phase 3

On-market tariff trial is expected to be launched July 2026.

Hot Water Load Control

This project explores hot water load control as a demand management solution, aiming to benefit consumers and enhance network efficiency through internal analysis, customer engagement, industry collaboration, and field trials.

The key objectives are to explore:

- Appropriate dynamic operating schedules and tariff conditions for managing demand of controlled load hot water
- Impact of dynamic controlled load on the customer and the network capacity
- Technologies that enable hot water load control

Phase 1

Involved preparatory work including identifying trial locations, assessing smart meter technology, understanding market models, and conducting customer research on perceptions of load control.

Phase 2

Trialled a daytime "solar soak" window for controlled load cusotmers to shift energy use to daylight hours. Success led to updating Ausgrid's ES7 Price Guide requirements to include "solar soak" window for all controlled load customers with a smar meter.

Phase 3 Current Status

In FY25, Ausgrid continue to collaborate with retailers to explore dynamic controlled load. At the national level, Ausgrid is working to establish a consistent frameowrk for hot water dynamic controlled load. Currently more than 65,000 customers are participating in this initiative.

C&I Integrated Flex

This project aims to assess the effectiveness of thermal load flexibility ("thermal flex") co-optimised with BESS for commercial and industrial (C&I) customers in addressing localised network demand issues. Sites such as supermarkets, shopping centres, and refrigerated distribution centres may provide significant load flexibility during peak and minimum demand conditions.

The key objectives are to:

- Assess the quantum and reliability of integrated flex as a demand management solution.
- Evaluate the ability to shape responses for maximum network benefit.
- Investigate customer acquisition strategies and take-up of thermal flex.
- Understand the impact on customer comfort and product requirements.
- Evaluate customer experience, procurement, and operating costs.
- Determine the viability of integrated flex solution.

Phase 1

In this phase, the initial discussions with market providers and preliminary investigations for demonstration sites were conducted. Key activities for this phase included setting up partnerships, trial agreements, and site selection.

Phase 2 Current Status

Field trials to test the effectiveness of integrated flex in line with project goals.

Phase 3

Potential development of integrated flex into a solution based on outcomes of Phases 1 and 2.

Heat Pump Hot Water Systems

The project aims to understand the process of electrifying domestic hot water (**DHW**) systems by installing heat pump hot water (HPHW) systems. The project is part of the RACE for 2030 initiative, with partners including the NSW Land and Housing Commission (**LAHC**), NSW Aboriginal Housing Office (**AHO**), UTS, NSW Office of Energy and Climate Change (**OECC**), and Essential Energy.

The key objectives are to:

- Investigate opportunities and barriers for electrifying and upgrading hot water systems.
- Understand the demand impacts of HPHW systems on the network.
- Explore optimal charging schedules to manage peak and off-peak demand.
- Assess compatibility of HPHW systems with controlled load.
- Gather consumer and industry perspectives on energy efficiency and decarbonisation.
- Evaluate energy efficiency, performance, consumer experience, and cost savings of HPHW systems.
- Understand various HPHW technologies and installer practices.

Phase 1

Replaced old hot water systems with HPHW systems at approximately 100 social housing properties, with tenants voluntarily participating. Analysed customer experience, financial, environmental and demand impacts of these replacements.

Phase 2 Current Status

Ongoing monitoring of energy usage data from installed HPHW systems over two years.
This phase aims to assess long-term changes in HPHW performance and tenant hot water usage behavior, providing valuable insights for refining demand management and electrification strategies.

Scenarios for Future Living

The project explores how household behaviours, social trends, and emerging technologies shape energy use and demand in Australia. A key focus is on enhancing demand management through better forecasting, scenario planning, and the design of demand responsive strategies.

The key objectives are to:

Refine demand management strategies through better understanding of customer behaviours and technology trends.	Integrate socia-technical insights into energy planning and modelling.	Inform policy and regulation based customer-centred research.

Phase 1 Current phase

This phase involves research into household behaviours and emerging technologies through survyes, home visit interviews and measured data. This phase will lay the groundwork for evidence-based scenario planning and demand management.

Phase 2

This phase focuses on refining scenarios and building modelling tools that incorporate socio-technical insights. It also explores customer interaction with innovative products and services.

Phase 3

The final phase aims to implement project learnings into internal processes and strategies.

5.5 Demand Side Engagement

Ausgrid continued to inform and engage interested parties over a range of activities to improve demand management outcomes in meeting network needs.

Our main channel of engagement continued to be through

- Demand management engagement register: https://www.ausgrid.com.au/Industry/Demand-Management/Demand-management-news
- Demand Management team's email: demandmanagement@ausgrid.com.au
- For RIT-D notifications https://www.ausgrid.com.au/Industry/Regulation/Network-planning/Regulatory-investment-test-projects

For more information on how Ausgrid investigates and implements non-network solutions, please refer to our Demand Side Engagement Document at https://www.ausgrid.com.au/Industry/Demand-Management/Our-demand-management-strategy

5.6 Embedded Generator Enquiries and Connection Applications

The following table summarises distribution connected unit enquiries and applications that Ausgrid received under NER clause 5.3A.5, 5.3A.9, 5A.D.2 and 5A.D.3 during the financial year 2024-25.

Item Description	Quantity
Connection enquiries received under clause 5.3A.5	18
Applications to connect received under clause 5.3A.9	6
Average time taken to complete applications to connect	17 Months*
Connection enquiries received under clause 5A.D.2 in relation to the connection of micro embedded generators or non-registered embedded generators	36
Applications for a connection service under clause 5A.D.3 in relation to the connection of micro embedded generators or non-registered embedded generators	35,559

*Based on one complex connection application.

6. Network Investments

6.1 RIT-D Assessments Completed and in Progress

There were no RIT-D assessments completed in the preceding year.

Previous year's reports for RIT-D assessment are available in Ausgrid's website at the following link: Regulatory investment test projects - Ausgrid

6.2 RIT-D Assessments for the Forward Planning Period

This section describes the network investments for which a RIT-D assessment is expected to be initiated within the next five years.

Region	Constraint	Project Name	Expected Project Completion	Indicative Cost ($m)	Indicative RIT-D initiation
Distribution Assets					
Sydney	Asset Condition	Darlinghurst ZS 33kV Feeders 386 & 389 Replacement	Mar-28	8.3	FY26
Sydney		Botany ZS 11kV switchgear replacement	Feb-29	10.0	FY26
Sydney		Willoughby STS 33kV switchgear replacement	Apr-32	70.0	FY26
Hunter		Merewether STS 33kV switchgear replacement	Sep-30	47.1	FY27
Hunter		Blakehurst ZS Decommissioning	Sep-29	22.7	FY27
		Pymble ZS 11kV switchgear replacement	Sep-31	25.5	FY27
Sydney		132kV feeder 202 Rozelle STS-Drummoyne ZS replacement	Dec-31	21.4	FY28
Sydney		132kV feeders 203 & 204 Mason Pk STSS-Drummoyne ZS replacement	Dec-31	55.6	FY28
Sydney		Drummoyne ZS 132kV switchgear replacement	Dec-31	26.2	FY28
Sydney		Lidcombe ZS 11kV switchgear replacement (Group 1)	Dec-31	18.9	FY29
Sydney		Leightonfield ZS 11kV switchgear replacement	Dec-31	11.8	FY29
Sydney		Paddington ZS 33kV feeders replacement	Mar-31	11.1	FY30
Sydney		132kV Feeder 283/2 Milperra ZS – Revesby ZS	Sep-32	15.9	FY31
Dual Function Assets					
Sydney	Asset Condition	132kV Feeders 91A & 91B Beaconsfield BSP to St Peters ZS	Sep-32	22.3	FY30
		132kV Feeder 9FF Beaconsfield BSP – Bunnerong STSS oil section replacement	Dec-32	23.6	FY30
	Load Growth	New 132kV Mascot East STSS	Dec-32	55.9	FY30

These network investments are primarily expected to address condition issues identified in several network assets:

- Aged underground subtransmission cables, which have experienced failures and leaks.
- Aged 11kV switchgear installed in several zone substations across the network and 33kV switchgear in subtransmission substations, with insulating materials that can be a fuel source in the event of failure.
- Aged 132kV switchgear at sites with concurrent subtransmission cable replacement works.

These asset condition issues result in growing EUE that justifies replacement investments at proposed dates, with additional benefits in terms of reduction of environmental risks and repair costs.

In addition, there are large customers requesting connections in the Macquarie area, driving the need to augment the subtransmission network.

6.3 Indicative Developments Beyond the Planning Period

This section provides an overview of potential network investments in distribution and dual function network assets beyond the 5-year planning period, for which Ausgrid may initiate RIT-D assessments if the criteria are met.

Region	Constraint	Project Name	Expected Project Completion	Indicative Cost ($m)	Indicative RIT-D initiation
Distribution Assets					
Hunter	Asset Condition	Cardiff ZS 11kV switchgear replacement	Sep-33	13.2	2031
Sydney		St Ives 11kV switchgear replacement	Sep-33	30.7	2031
		North Head ZS 33kV & 11kV switchgear replacement	Sep-33	28.4	2031
		Surry Hills ZS 33kV Feeders 383, 384 & 385 Replacement	Jun-34	13.1	2031
		Matraville ZS 33kV Feeders 313, 318, 324 & 340 Replacement	Mar-34	13.4	2031
		132kV Feeder 9S6/1 & 9S9/1 Pyrmont STS - Haymarket BSP Replacement	Jun-34	26.9	2031
		Riverwood ZS 11kV switchgear replacement	Sep-36	14.9	2032
		Miranda ZS 11kV switchgear replacement	Sep-35	15.5	2032
		132kV Feeder 262 Double Bay - Clovelly Replacement	Jun-34	17.9	2032
		132kV Feeders 90R & 9SB/2 Campbell St ZS-Surry Hills STS Replacement	Jun-34	35.4	2032
		132 kV Feeders 9E3(1) & 9E4(1) Replacement	Jun-34	29.5	2032
		132kV Feeders 9M1 & 9M2 Syd East STSS - Warringah STS Replacement	Jun-34	19.1	2032
		Campsie ZS 11kV switchgear replacement	Sep-36	27.8	2034
		New Noraville 33/11kV ZS	Dec-36	33.4	2034
Dual Function Assets					
Sydney	Asset Condition	132kV Feeder 9SE Beaconsfield BSP - Green Square ZS Replacement	Jun-34	7.5	2033
		132kV Feeder 270 Kingsford ZS - Maroubra ZS Replacement	Jun-34	10.1	2033

Similar to those projects included in the previous section, these network investments are expected to address condition issues identified in aged underground subtransmission cables and 11kV switchgear equipment.

The proposed dates represent the current view of optimal timing for replacement investments, based on the latest available information on these network assets.

6.4 RIT-D Assessments Not Proceeding

There were no identified network needs that are not expected to proceed into network investments and/or require RIT-D assessments in the next five years.

6.5 Completed Investments

A network investment is considered completed when the project required to address the identified network need is commissioned and in service. The following projects described in the DTPAR 2023 have been completed or cancelled during the preceding year.

Load Area	Completed Network Investments	Reason / comments
	Distribution Assets	
Eastern Suburbs	New 33kV supply to Garden Island and decommission Graving Dock 33/11kV ZS	Completed
Inner West	Lidcombe ZS 11kV Switchgear Replacement & 33kV feeders – Homebush to Lidcombe ZS and Auburn ZS Replacement	Completed
Upper Hunter	Muswellbrook STS refurbishment	Completed
Eastern Suburbs	Surry Hills ZS 11kV switchgear replacement	Completed
Newcastle Ports	Waratah 132/33kV STS refurbishment	Completed
Camperdown and Blackwattle Bay	Pyrmont STS cable egress enabling works	Completed

6.6 Committed Investments

Ausgrid has identified all committed network investments (refurbishments, replacements, or augmentations) with an estimated capital cost of $2 million or more.

Capital cost estimates are shown in nominal dollars and exclude contingency costs.

Load Area	Committed Refurbishment, Replacement or Augmentation Investments	Expected Project Completion	Indicative Cost (nominal $m)
	Distribution Assets		
St George	Peakhurst STS 33kV switchgear replacement	Jun-26	25.2
Sydney CBD	Decommissioning of City East ZS	Jun-26	44.4
Sydney CBD	Decommissioning of Dalley St ZS	Dec-26	12.5
Eastern Suburbs	Sydney Airport ZS 33kV switchgear replacement	Jun-26	8.4
Maitland	Tarro ZS 11kV switchgear replacement	Jun-26	14.8
Singleton	New 66kV Capacitor Banks Singleton STS	Jun-26	3.6
Inner West	132kV feeders 923 & 924 Strathfield TP-Burwood ZS replacement	Dec-26	13.4
Inner West	Concord ZS 11kV switchgear replacement	Oct-27	20.0
Canterbury and Bankstown	Milperra ZS 11kV switchgear replacement	Dec-27	16.5
Upper North Shore	132kV Feeders 9E1 & 9E2 Sydney East-Kuringai STS oil sections replacement	Dec-27	12.2
	Dual Function Assets		
Sydney CBD	Decommissioning of 132kV Feeders Lane Cove STSS – Dalley St ZS	Dec-26	3.1
Eastern Suburbs	132kV feeder 264 Beaconsfield BSP-Kingsford ZS replacement	Jul-26	24.1
	132kV feeders 9SA & 92P replacement & Loop Zetland ZS into feeder 92P	Jun-26	26.9
Carlingford	New Macquarie STS Transformer 3	Dec-25	13.6

7. Information and Communications Technology Systems Investments

7.1 Information, Communication and Technology

Information, Communication and Technology (**ICT**) provides the critical business systems to enable Ausgrid to perform its network operations, which includes undertaking effective asset management planning, and fulfilling regulatory and statutory reporting obligations.

ICT systems are integral to performing functions such as asset lifecycle management, asset operations, customer and market management and financial reporting, with Supervisory Control and Data Acquisition and Network control systems being integral to performing key network activities such as monitoring and managing the electrical network.

ICT also allows Ausgrid to prudently adopt and effectively implement technology that enables Ausgrid to deliver better services to network customers and reduce costs over time. Key ICT systems support the following Ausgrid core business functions:

Domain	Description
Asset Lifecycle Management	Asset management is one of Ausgrid's most critical functions. The asset management business function concerns the management of all physical components of Ausgrid's electrical system across the lifecycle of assets from investment through to retirement/replacement at the component level. It is also tightly integrated with operations and planning at the Network level. The asset management systems are therefore integral to providing services, reliability and quality of supply and protecting the safety of customers, community and employees.
Works Management	Works management refers to the efficient management of Ausgrid's resources in the delivery of services within the Network. It encompasses processes which are tightly associated with the asset management capability described above, scheduling and dispatch, warehousing and mobility.
Market Management and Customer Management	Market management includes all of the processes related to the collection of revenue resulting from the provision of energy distribution services. The main processes in delivering this business capability are metering, revenue management, and network billing. Market management also incorporates network pricing, market transactions, meter data management and financial reporting. Customer management includes functions and processes related to customer interactions, connections and disconnections, as well as the provision of a customer contact centre.
Enterprise Management	Commercial and corporate includes functions necessary for executive control and oversight of normal organisational functions, such as finance, reporting, strategy development and implementation, human resource management, non-system asset management and property management.
IT Management	The effective management of information across Ausgrid has become crucial. The nature of the business dictates that information needs to be collected, managed and analysed in order to provide timely and effective decision support. Information management is also required to satisfy regulatory obligations and core financial and organisational reporting and analysis. Infrastructure provides the backbone to Ausgrid's business capabilities and systems. It includes all of the hardware, communication, operating systems and devices required to support the business.
Asset Operations	System IT provides the core functions regarding provision and development of the **ADMS** and Supervisory Control and Data Acquisition (**SCADA**) systems, core telecommunication networks (MPLS, 4G) and distribution network monitoring and control.

7.1.1 ICT Investment Actual 2024/25 and Forecast

Throughout the year, key applications and infrastructure have been maintained to enable a reliable, scalable and secure computing platform. These include our SAP applications, enterprise content management platform, customer relationship management platform, supporting Ausgrid critical infrastructure licence conditions, metering systems and data centre and telecommunications technologies. Ausgrid has also commenced the migration of applications from data centres to the cloud.

In the development of the forward plan and strategy the following principles were adopted:

- **Simplifying:** simplifying our technology to reduce complexity and remove duplication and legacy;
- **Fit for purpose:** delivering fit-for-purpose solutions with the appropriate security and commercial model;
- **Automation:** where possible, automating to reduce errors and drive consistency;
- **Data Management & Analytics:** improve data quality and access to make better decisions;
- **Cyber Security:** protecting the network and customer information including compliance with laws and the distributor licence conditions, and to be recognised as the leader in cyber security within the Power and Utilities industry.

The table below contains a summary of actual ICT investment in 2024/25 and forecast investment in 2025/26 through to 2029/30.

ICT Investment actual 2025/25 and forecast 2025/26 to 2029/30 (Nominal $) *						
	Actual ($m)	Forecast ($m)				
	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Total ICT Capital Investment	93	108	113	91	88	103

*Excludes the Advanced Distribution Management System.

7.2 ADMS

Ausgrid's distribution network is managed using a group of systems where control room staff integrate various information flows and take consequent actions to manage the network, this includes maintaining the security and stability of the network. The ADMS is the core operational management tool in that group of systems, providing an integrated set of tools to monitor and control the network, manage system outages, improve planned and emergency event management, and optimise fault location and restoration processes.

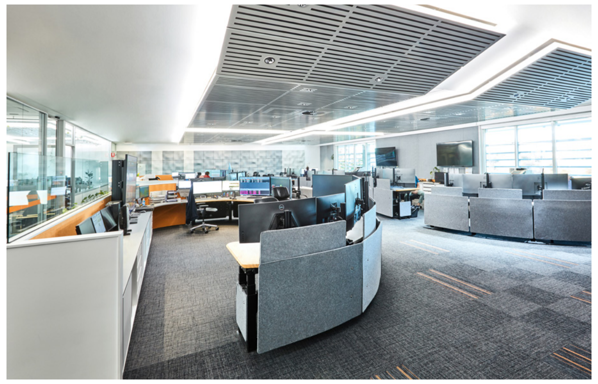
The core ADMS monitoring, and control functionality was implemented in November 2022. The remaining functionality which covers the management of system outages (unplanned and planned) and a group of sophisticated system-management tools, will be implemented over the next few years further replacing existing legacy technologies and providing new capabilities such as Fault Location, Isolation, and Service Restoration (**FLISR**) and integration of Advanced Metering Infrastructure (**AMI**). Once complete, this will enable the continued expansion of features to better manage distributed energy resources in conjunction with a Distributed Energy Resource Management System (**DERMS**) and other developing technologies.

This will allow Ausgrid to provide the services expected by customers and stakeholders in the rapidly changing energy market.

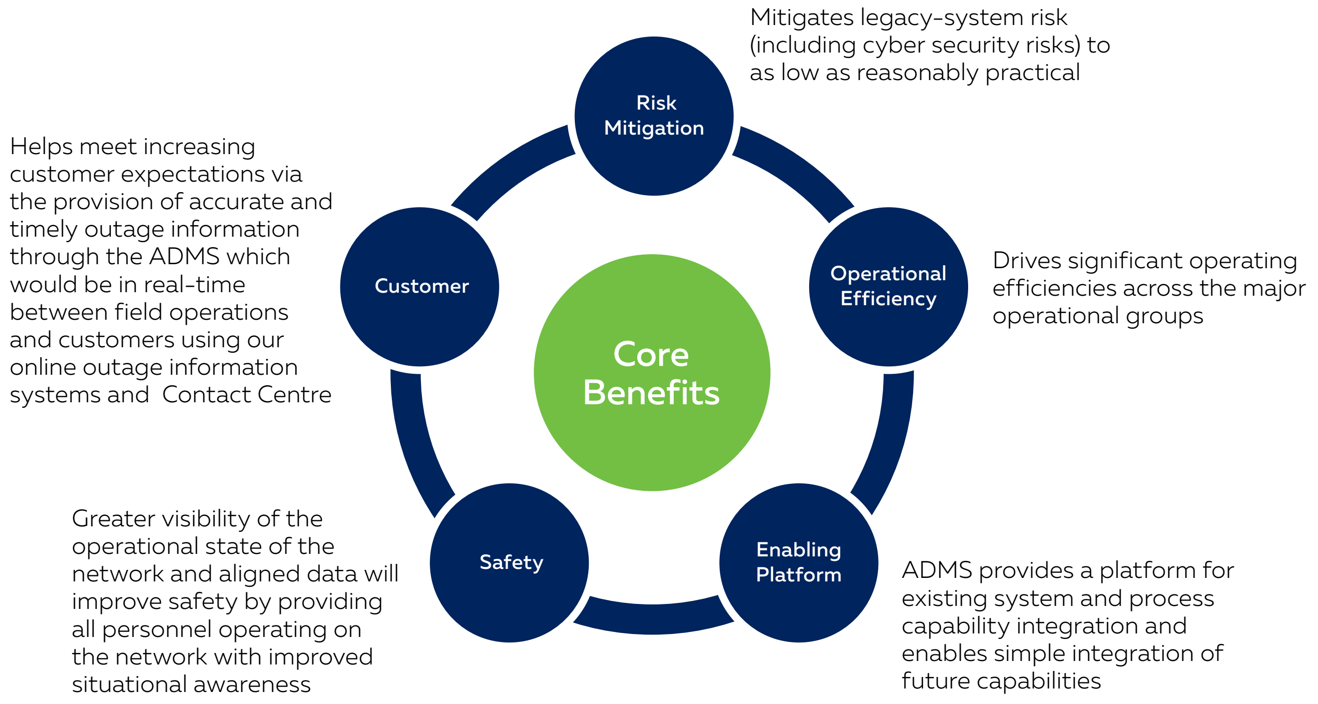
7.2.1 ADMS Benefits

A mature ADMS will deliver benefits to customers with the following improvements to current functionality:

- Management of system outages and restoration works;
- Planned and emergency event management;
- Situational awareness from power-flow analysis;
- Network fault location analysis, automated isolation and restoration capabilities;
- Provision of a platform for the integration of distributed energy resource management systems as well as other corporate systems enabling the Distribution System Operator (DSO) construct;
- An ability to better integrate with Ausgrid's enterprise systems to ensure a consistent real time situational view (that is not dependant on staff entering and updating information in multiple systems); and
- The ability to use digitised switching instructions which would enable non-verbal communications between the control room and field operators.



The core benefits assessed in the business case for the ADMS implementation are described in the following diagram.



7.2.2 ADMS Program Implementation

The overall program is delivered via a phased approach which has been adopted to mitigate the risks of a large technology rollout and to allow the business time to adapt to the ADMS functionality across three phases, each building upon new capability acquired in the prior phase.

Phase	Description	Timing
1	Replacement of legacy distribution management system – this delivers mission-critical monitoring and control functionality (SCADA) – Practically complete	2019 – 2022
2	Modernisation of operations for planned and unplanned work, deployment of additional distribution management applications and establishment of a Low Voltage Network model	2019 – 2025
3	Implementation of Advanced Applications – this delivers Automated Fault Detection and Isolation Restoration and advanced applications to enhance the optimisation of the network, e.g. Distribution Energy Resource Management	2022 - 2026

Each phase will follow a sequence of 5 stages as outlined below:

Design
- System, process, and business design specifications

→

Build
- Network Model building and testing
- Building of business process
- Work Instructions development
- Train the trainer Sessions

→

Test
- Factory acceptance testing
- Site acceptance testing
- User acceptance testing

→

Deploy
- Development of end-user straining and system support
- ADMS Functionality becomes 'live' and accessible across the business

→

Sustain
- Manage and maintain the implementation
- Embed continuous improvement of the solution

Key Updates for 2025

Phase 2 Go Live:

- Transition to ADMS Outage Management System
- Unplanned Work Solution (integrated Go Live of ADMS, Customer Relationship Management, and Work Management Systems).
- Adoption of the ADMS Field Client tool for Unplanned works
  Planned Work Solution (Implementation of Network Access Request and adoption of ADMS Field Client for planned works)

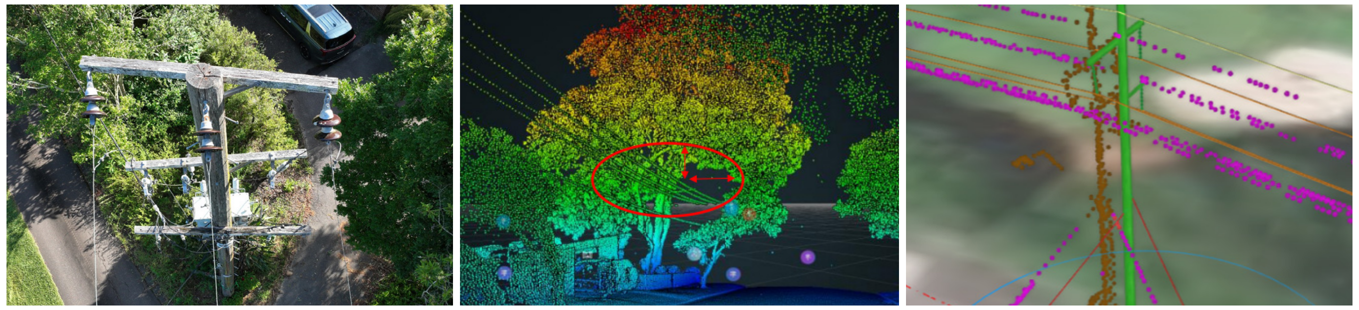
Phase 3 (Advanced Applications and version migration v3.8 to v3.10):

- FLISR Go Live in Automated Mode – go live in Automated mode of FLISR - the largest implementation of the Schneider FLISR worldwide.
- Remaining advanced applications and version 3.10
- Factory, System, and User Acceptance Testing completion

7.3 Network Digitisation Program: Transforming Network Insights

Ausgrid's Network Digitisation Program is progressing steadily as Ausgrid continues to enhance the Digital Twin capabilities, integrate drone technology, broaden LiDAR capture program, and develop AI-powered big data platforms. This program is a key enabler of our broader digital transformation strategy, aimed at improving network reliability, operational efficiency, and customer outcomes.

By leveraging cutting-edge technologies, the program extracts and processes advanced spatial, physical, and electrical data. These insights are used to optimise asset management, reduce operational costs, and support a safer, more resilient electricity network—particularly in the face of extreme weather events and growing bushfire risks.



7.3.1 The Benefits of Ausgrid's Network Digitisation Program

The **Network Digitisation Program** is progressing steadily as we continue to enhance our Digital Twin capabilities, integrate drone technology, broaden LiDAR capture program, and develop AI-powered big data platforms. This program is a key enabler of our broader digital transformation strategy, aimed at improving network reliability, operational efficiency, and customer outcomes.

These advancements enable Ausgrid to gather comprehensive and accurate data at significantly reduced costs, leading to numerous benefits:

Streamlined Internal Design and Work Planning	• Enhanced information availability and validation streamline internal design processes. • Improved planning efficiency ensures that projects are executed more smoothly and effectively.
Automated Design Validation and Construction	• Faster, automated design validation accelerates the construction process. • Efficient asset information exchange benefits Accredited Service Providers (ASPs) and enhances overall project management
Optimised Bushfire and Vegetation Management:	• Advanced technologies optimise bushfire and vegetation management programs. • Improved tree-scapes and vegetation management reduce the risk of bushfires and enhance environmental sustainability.
Enhanced Safety in Design	• Technologies like LiDAR and AI contribute to safer design practices, such as identifying low mains or poles at risk of failure. • Reduced dependency on manned aircraft for bushfire management lowers operational risks and costs, and results in improved environmental outcomes.
Design Optimisation and Major Event Response	• Optimised design processes improve response times and effectiveness during major events. • Reduced vegetation impact enhances the resilience of the network against natural disasters.

7.3.2 Network Digitisation Program Implementation

The Network Digitisation Program has been a transformative initiative. This program has successfully delivered a digital twin of the overhead network and high-resolution pole top drone photography giving unparalleled network insights and advanced design functionalities. This digital twin serves as a virtual replica of the physical network, enabling efficient and high-quality designs and network wide insights.

Key focus area will include:

Digital Twin: Enabling Intelligent Design and Asset Insight	Virtual model of the overhead network enabling intelligent design, compliance checks, and scenario testing.	Improves data accuracy (e.g., pole locations, heights, lean) and integrates with Ausgrid's Asset Risk Management System.	Trials underway with ASP3s for wider rollout in 2026.
LiDAR Strategy and Capture Program	Annual LiDAR capture in bushfire-risk areas for vegetation management and safety compliance.	Mobile Laser Scanning (MLS) vehicle capturing high-resolution ground-based data.	Centralised LiDAR repository enabling enterprise-wide data access and collaboration.
Drone Operations: Enhancing Network Visibility and Emergency Response	Expanding drone fleet for inspections, vegetation monitoring, and emergency response.	Critical in storm and bushfire recovery, providing live feeds and supporting rapid restoration.	Future integration of LiDAR sensors for advanced 3D mapping.
Artificial Intelligence and Enterprise Image Repository	AI models automating asset identification, defect detection, and maintenance prioritisation.	Centralised image repository for staff access, integrated with the Digital Twin.	Enhances efficiency, accuracy, and decision-making across the organisation.

The system ensures that imagery is organised, searchable, and integrated with the Digital Twin, fostering greater collaboration and efficiency across the organisation.

Data Acquisition & Collection

- Building on the successes of Phase I, further integrating AI and ML to derive deeper insights and drive more efficient network management.
- LiDAR capture of the complete overhead network to allow greater insights and modelling.

Drones & Bushfire Surveillance

- Expanding the range of drone applications to cover more aspects of network inspection and maintenance, including incident response and network construction support.
- Trialling Drones with LiDAR sensors to ensure economic, high quality LiDAR data capture in hard to reach areas of the overhead network.

Digital Twin Enhancements

- Expanding the digital twin concept to broaden the asset scope providing a holistic view of the wider network infrastructure.
- Uplifting network design capability by allowing ASP3 partners to access Digital Twin data and design functions, as well as encompassing As Built compliance assurance and uplifting compliance with network standards in routine construction activities.

The estimated program costs are provided in the table below.

Program cost estimates including contingency & overhead ($m, nominal)				
	FY26	**FY27**	**FY28**	**FY29**
Network Digitalisation	4.5	4.2	3.6	4.2

8. Planning Coordination

Joint Planning is carried out with other Network Service Providers, in particular Transgrid, Endeavour Energy and Essential Energy.

8.1 Process & Methodology

8.1.1 Transgrid

Ausgrid plans its transmission network jointly with Transgrid as the Ausgrid 132kV dual function network provides support to Transgrid's 330kV network. In carrying out joint planning Transgrid and Ausgrid:

- Meet regularly, at least 4 times per year;
- Record minutes and decisions;
- Prepare work plans and monitor progress;
- Assess augmentation options on the basis of least cost to the community;
- Initiate projects within each organisation following the normal approval processes; and
- Jointly consider demand management as an option.

Ausgrid and Transgrid have established a Joint Planning Committee structure which comprises a steering committee and a joint planning sub-committee to coordinate the planning activities of Ausgrid and Transgrid in accordance with the joint planning requirements of the NER. Under the agreed terms of reference, there are quarterly meetings of the sub-committee and bi-annual steering committee meetings. Members include relevant planning, operations, design and project development staff. The key considerations of the joint planning committees are specified in the joint planning charter. Committee activities and deliverables are managed through an agreed work plan, with decisions documented in approved Joint Planning Reports for major milestones.

From 1 July 2018, Transgrid and Ausgrid are required to comply with the "NSW Electricity Transmission Reliability and Performance Standard 2017". This standard requires the NSW electricity transmission network to be designed and planned to a certain level of redundancy and level of EUE. This is a significant change from the former deterministic assessment of the network.

8.1.2 Other DNSPs

Ausgrid follows the same principles when joint planning with Endeavour Energy and Essential Energy. However, due to the limited number of network dependencies between the organisations, joint planning meetings may only take place once per year, or less, unless a particular issue has been identified and needs to be progressed and monitored.

Joint planning meetings may be initiated by any party to discuss planning issues, identified network needs and proposed solutions near adjoining network boundaries that are likely to affect either party. The joint planning meetings are also the forum used to discuss proposed changes on the network that may have a material impact on either DNSPs network.

8.2 Joint Planning Completed in 2025

8.2.1 Transgrid

Sydney Inner Metropolitan Transmission Load Area

Existing and future constraints on the Sydney Inner Metropolitan transmission network are centred on two critical areas:

- Transmission supply into Beaconsfield BSP from Bulk Supply Points at the edge of the city, Sydney South, Sydney North, and Rookwood Rd BSP. This is known as Transmission Corridor 1 (**TC1**).
- Transmission supply into Haymarket BSP and surrounding Ausgrid 132kV zone substations from Sydney South BSP (Cable 42) and Ausgrid 132kV connections from Beaconsfield BSP and the meshed 132kV network. This is known as Transmission Corridor 2 (**TC2**).

Both transmission corridors operate as meshed systems of 330kV and 132kV circuits, with significant interdependencies between both corridors. Both have limitations due to the age and condition of existing circuits, including significant reduction in capacity of cables where in-situ conditions are not adequate to support design ratings. The Inner Metropolitan Area Joint Planning strategy must resolve issues on both corridors.

After extensive consultation from 2014 through the RIT-T, Transgrid's 2018-2023 regulatory submission and numerous other forums, Transgrid began construction in 2020 on the first stage of the preferred strategy for Powering Sydney's Future. This strategy consists of:

- A combination of non-network solutions to manage the risk of unserved energy before the network option can be commissioned;
- Installing two 330kV cables in two stages, with commissioning of the first cable in time for the 2022/23 summer;
- Operating 330kV Cable 41 at 132kV from 2022/23; and
- Decommissioning Ausgrid's cables in two stages.

Commissioning of the first stage was completed in June 2022. This includes the first 330kV cable and operating 330kV cable 41 at 132kV. Decommissioning of the first stage of Ausgrid's cables was completed in 2023. Early development work is now starting on the second stage of this project.

Sydney's Macquarie Park Area

The main drivers in Sydney's Macquarie Park area are the NSW Government's Urban Development Program (UDP) including rezoning under Transport Oriented Development (TOD) Accelerated Precincts and intense data centre interest. Key suburbs in the Macquarie Park area include Macquarie Park, Lane Cove, and North Ryde. The TOD Accelerated Precincts aim to accelerate development growth in Sydney to ease the housing crisis. This is done by rezoning the land to allow for development of higher density housing. The NSW Government has set targets which will be delivered via the UDP and TODs. While there has long been interest from existing and new data centre proponents in the Macquarie Park area, this has accelerated in the past year both in terms of the number of proponents as well as the size of the requested load.

More broadly, Sydney is experiencing significant growth due to a number of distinct but material drivers including increased uptake of electric vehicles and electrification of homes and businesses.

Currently, power transmission capacity into this area is primarily constrained by Ausgrid's 132kV network. With anticipated demand escalation, these feeders are experiencing capacity constraints, highlighting the urgent need for network augmentation. To address this, Transgrid and Ausgrid have commenced joint planning efforts aimed at expanding network capacity. Specifically, work is actively underway to establish of a new 330kV bulk supply point within Sydney's Macquarie Park area to support the economic growth of this area and enhance overall network reliability.

Other Transmission Load Areas

Transgrid's Sydney East 330/132kV BSP was commissioned in 1974. The substation is a major interconnection point in the Transgrid 330kV network and is the sole source of supply to Ausgrid's substations in Sydney's Northern Beaches and North Shore areas. A condition assessment of Sydney East BSP identified that the Secondary Systems require replacement, requiring Ausgrid to carry out works on the Ausgrid end of the impacted feeders. On TransGrid's request, Ausgrid is facilitating the required protection replacement works on all affected Ausgrid feeders. Protection upgrades are expected to coincide with Transgrid's program of works at Sydney East BSP which are scheduled for completion by 2027/28.

The growth concentrated in Sydney's Macquarie Park area is also being experienced to a lesser extent more broadly across Sydney. This is likely to result in additional transformers being required at a number of BSPs supplying the Sydney area.

Voltage Planning

Transgrid and Ausgrid initiated a voltage specific joint planning stream in 2020. The voltage specific planning stream provides for a BSP to LV customer planning approach for our whole network whilst aligning with the upstream Transgrid voltage requirements. This has provided efficient solutions in improving voltage issues and DER hosting capacity. This work has continued in 2025.

Embedded Generation Planning

A number of large embedded generator and Battery Energy Storage System connections to the Ausgrid network has and may require joint planning and assessment with Transgrid.

8.2.2 Endeavour Energy

A joint planning meeting with Endeavour Energy was held in June this year. The focus of discussion was mainly on the below topics as given below:

- AEMC consultation paper on improving the NEM Access Standard for the large loads such as data centres and hydrogen electrolysers.
- Update on analysis of feeder 926/927 supply to Endeavour Energy owned Carlingford transmission substation.
- Update Connection Agreement Databook to include existing and proposed Inter distributor supply and cross border arrangements.
- Medium to long term plan to address large influx of data centre enquiries by Ausgrid and Endeavour Energy
- Ausgrid Forecast methodology approach with respect to minimum demand, treatment of data centres and BESS and Distributed Energy Resources (DER)

8.2.3 Essential Energy

A joint planning meeting with Essential Energy was held in May and October this year. The main points for discussion were around growth areas within each DNSP network that may require additional capacity at the connection points. Essential Energy shared information regarding the proposed growth at Clarence Town and the likely future load requirements for new housing and additional town facilities such as a new school and supermarket. Ausgrid raised concerns about growth at Karuah, requiring additional connectivity in the area to maintain customer reliability and adequate voltage levels on the network.

Both DNSPs have agreed to meet twice a year to provide updates on growth areas that may impact the connection points between the Ausgrid and Essential Energy.

8.3 Planned Joint Network Investments

8.3.1 Transgrid

Planned future network investments, excluding committed projects, discussed at Transgrid - Ausgrid joint planning meetings in the preceding year include:

- The shunt reactor at Sydney East BSP has been identified for replacement due to asset condition issues. It is essential to manage the voltage and power factor at Sydney East BSP
- The Ausgrid network is experiencing high voltages and leading power factor for an increasing proportion of the year. One of the potential solutions may require installation of a new shunt reactor at Beaconsfield BSP. Investigations continued in 2025.

8.3.2 Endeavour Energy

There is currently a project to supply Ausgrid's Auburn and Lidcombe zone substations from Endeavour Energy's Camellia Transmission Substation.

8.3.3 Essential Energy

There were no jointly planned network investments with Essential Energy in the preceding year.

8.4 Additional Information

Further information on Transgrid and Ausgrid's completed joint planning and joint network investment can be found in Transgrid's Transmission Annual Planning Report. It is published on their website as well as AEMO's website. Further information on completed Ausgrid and other DNSP joint planning and joint network investments may be found in other section of this report.

Where a proposed future project satisfies the requirements for a RIT-T or RIT-D project, the identification of non-network options, the consultation on potential credible options and their economic assessment will be published in accordance with the NER.

Appendix A: How We Plan the Network

A.1 Ausgrid and the DTAPR

A.1.1 Distribution Network

The NER (Version 232) require that the annual planning review includes the planning for all assets and activities carried out by Ausgrid that would materially affect the performance of its network. This includes planning activities associated with replacement and refurbishment of assets and negotiated services. The objective of the distribution annual planning review is to identify possible future issues over a minimum five-year planning horizon that could negatively affect the performance of the distribution network to enable DNSPs to plan for and adequately address such issues in a sufficient timeframe.

This document provides information to Registered Participants and interested parties on the nature and location of emerging constraints on Ausgrid's subtransmission and 11kV distribution network assets, commonly referred to as the distribution network. The timely identification and publication of emerging network constraints allows the market to identify potential non-network options and Ausgrid to develop and implement appropriate and timely solutions.

A.1.2 Transmission Network

The NER require network service providers, who own and operate dual function assets to register as TNSPs by virtue of the definition of 'TNSP' in the rules. Certain parts of the rules treat dual function assets in the same way as other subtransmission assets. However, for the purposes of the transmission annual planning review and reporting, dual function assets are treated as transmission assets requiring a TAPR. For the purposes of economic evaluation and consultation with Registered Participants and Interested Parties, dual function assets are treated as distribution network assets and are subject to the same economic evaluation test.

Ausgrid's dual function network is defined as those assets with a voltage of 66kV and above that are owned by Ausgrid, and operate in parallel with and provide material support to the Transgrid transmission network. These assets may either operate in parallel with the transmission network during normal system conditions or can be configured so that they operate in parallel during specific system conditions.[8]

An asset is deemed to provide material support to Transgrid's transmission network if:

- There is otherwise limited or no system redundancy within the transmission network, or
- Investment in the transmission system would be required within the regulatory period if that network asset did not exist, or
- The feeder provides operational support to the transmission network (e.g. to facilitate maintenance of transmission assets or improve security of supply) and the asset provides an effective parallel with the transmission network via a relatively low impedance path.

Ausgrid reviews the function of its dual function assets periodically to determine if they continue to provide material support to Transgrid's transmission network. This review is used as input for preparing Ausgrid's regulatory reporting, the regulatory submission, and pricing methodology. For the purpose of AER Revenue Determination submissions, the list of dual function assets is determined based on the forecast load and the system configuration as at the beginning of the regulatory period.

A.2 Ausgrid's Planning Approach

The network planning and development process for both the distribution and transmission networks is carried out in accordance with the NER Chapter 5, Part D, Network Planning and Expansion. Planning for distribution and subtransmission assets is carried out in accordance with NER 5.13.1 - Distribution annual planning review and NER 5.12.1 - Transmission annual planning review for dual function assets.

A.2.1 Investment Objectives and Decision Criteria

Ausgrid's investment objectives are set to comply with the **NER** and the NSW Licence conditions for a DNSP, to ensure the safety of the people and improve the efficiency of the business

8. Network Planning Standard NIS433: Classification of Dual-Function Assets

The following table, taken from Ausgrid's Asset Management Strategy, provides a summary of Asset Management objectives:

Enhancing Safety
Protecting people from harm so far as reasonably practicable

Improving Network Performance
Improving the reliability, security and resilience of supply to create a better customer experience.

Delivering Affordability
Delivering customer affordability through efficient optimisation of whole of life costs and improved operational performance.

Increasing Sustainability
Transforming the network through reducing emissions and providing choice and control for customers to more easily access sustainable energy.

Making a commercial return
Provide dividend certainty through effective and optimised investment that responds to incentives.

These investment objectives are supported by the development and delivery of investments which efficiently achieve the key network performance outcomes outlined below:

Customer Connection
Connect customers to the network so that they can receive electricity supply, or supply energy to others.

Resilience & Reliability
Deliver network performance (resilience and reliability) that is equitable across customers and only to a level that customers are prepared to pay for.

Capacity
Deliver a system that can supply forecast customer demand for and supply of electricity.

Fault Level
Fault currents which are within a range which allows network and customer equipment to operate correctly and safely.

Voltage
Maintain the operating voltage within specified limits to support customer behind the meter activities including DER.

Power Quality
Provide supply that allows customers to successfully operate their equipment in the same network as others

System Stability
Facilitate the stable operation of the national electricity market (NEM)

Network Planning Process

Ausgrid follows a structured planning process that can be summarised by the following diagram from our Network Investment Policy. The planning phase involves identifying the investment needs and risks based on the probability and consequence of adverse events; developing one or more options to address these needs; assessing costs and benefits associated with those options under various scenarios to select the preferred option and initiating the preferred option.

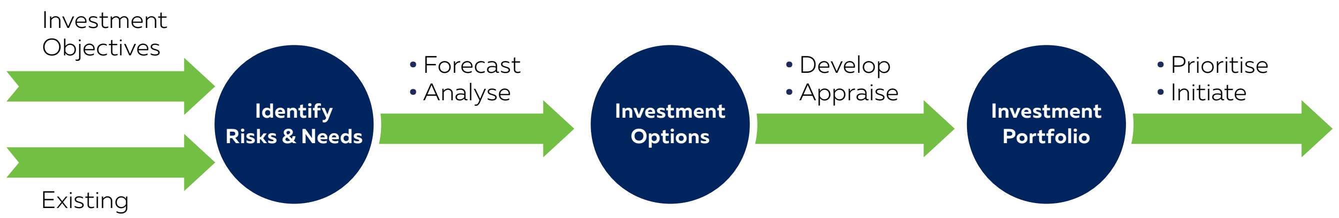


Figure A-1: Ausgrid planning process

The timeframe and complexity of this process varies according to network level, risk profile, and the project scale and intent. Accordingly, Ausgrid organises its planning activities by distinct investment categories. This approach allows Ausgrid to adopt a level of analysis and justification that is commensurate with the costs, risks and obligations associated with each investment category discussed below:

Area Plan Strategies	• Consider the development requirements of interconnected areas over a 20 year investment window to capture synergies between projects and drivers. • Detailed analysis considering a number of alternatives is typical. • Often consider alternative network architectures
Distribution Network	• Investments to provide for the evolving needs of our existing customers and connection of new small customers. • High volume of low-medium value investments with largely standard solutions that are initiated reactively once network constraints are identified (i.e. demand growth, voltage, supply quality and fault duty requirements) • Up to 6 year planning horizon
Customer Connections	• Direct investment to connect customers. • These investments are initiated by customer applications for a connection • Larger customers are responsible for connection costs and thus determine efficient level of investment
Reliability Planning	• Investments to address gaps in reliability performance • Proactive investment responding to forecasts of reliability performance. • Reactive investment determined through an assessment of reliability outcomes based on actual performance.
Replacement	• Lifecycle management of existing infrastructure considering asset performance, risks and costs to determine when to maintain, renew, replace or retire those assets. • Investment is either to meet specific obligations and standards; or justified based on an assessment of cost and benefits, in terms of risk mitigated.

The following tools have been implemented to assist Ausgrid in making prudent, cost-effective investment decisions:

1. Governance Framework

The Governance Framework provides guidance and accountability for the planning, development, endorsement, and approval of network investments. It defines how Ausgrid plans and invests in its network.

The governance framework is comprised by the following stages

I. **Policies and standards** are used to define the technical requirements for any future changes to the network and therefore drive the nature and size of network investments.

II. **Long-term plans and strategies** provide a long term view of the network and outline a 5-10 year program of works required to meet known asset performance requirements, new large connections, infrastructure standard compliance gaps and likely capacity constraints. Sub-transmission area plans are used to identify needs/constraints up to 20 years in advance and allow investment decisions to be made in the short term to enable the lowest cost solutions to be delivered over the long term.

III. A resource strategy is developed in the form of **program delivery models**. They consider resource requirements by work program or job type, current utilisation rates and productivity targets.

IV. The integration of these guidelines makes possible the development of a **Portfolio Investment Plan (PIP)**, which is updated on annual basis and approved via a Gate process. At **Gate 1**, investments are reviewed and approved by Ausgrid's Board at the portfolio level. Once approved, the PIP becomes the baseline for the annual budget/ Management Business Plan (MBP) and for the regulatory proposal (in years when a proposal is submitted to the AER).

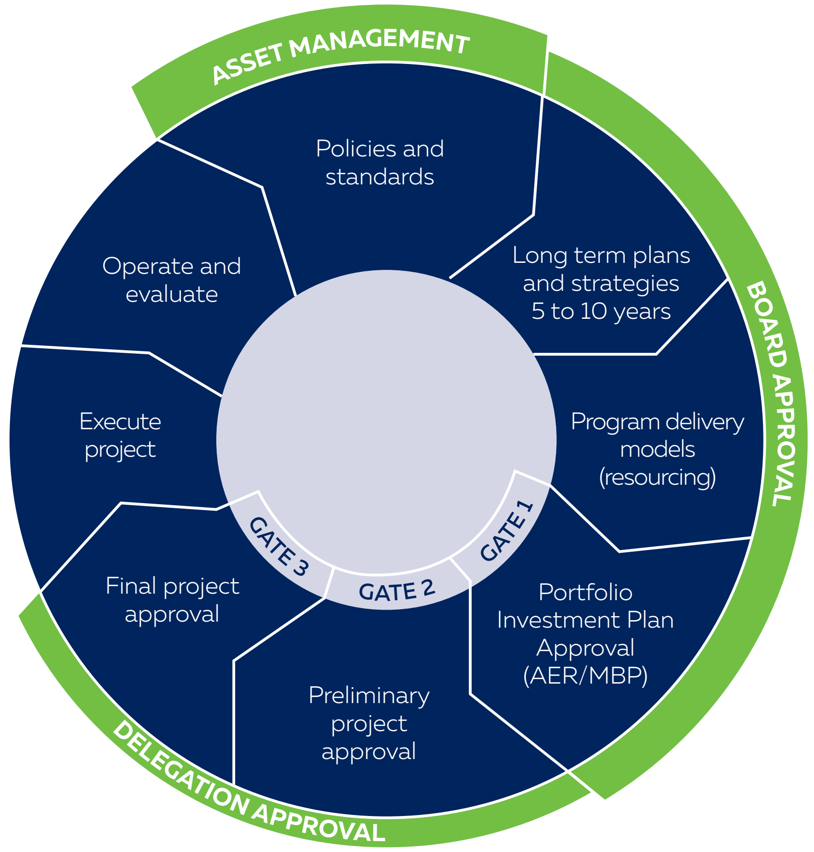
V. At **Gate 2**, **preliminary approval** is provided for investments at the project and program level. The focus is placed on assessing the network need for the program/project, prior to proceeding to the detailed estimate stage. Preliminary funds can be authorised to enable completion of design work, place orders for long lead time standard equipment and seek market consultation for externally delivered works.

VI. At **Gate 3**, **final approval** is provided for investments. The governance focuses on testing the efficiency of the delivery model and confirming the project/program timing, risk and cash flows. Investment approvals are obtained in accordance with applicable delegations and sub delegations of authority.

VII. After that, **project and program execution** can be initiated. Delivery is monitored for each individual project or program and milestones are reviewed on monthly basis. Variations can be raised if delivery and risk outcomes cannot be achieved within existing approval limits.

VIII. Once investments are completed, the resulting assets are commissioned and ready to **operate**. Projects must have a formal close-out. Post-implementation reviews are required to **evaluate** performance and provide feedback/ lessons learnt for similar investments in the future.

These stages are illustrated in the diagram below, representing the governance lifecycle:



2. Cost Benefit Analysis (CBA) / Options Analysis

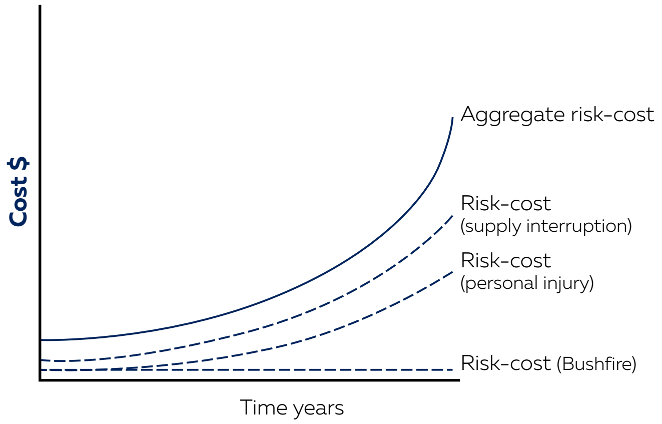
CBA is an investment decision support tool that measures the benefits of an action minus the costs of taking that action. It typically involves tangible 'cash' metrics such as capex invested or operational costs saved as a result of the decision to pursue a project, and often includes intangible benefits and costs, such as reduced supply, environmental or safety risks, with a dollar value assigned to the intangible items to make them comparable with the tangible financial components on a common basis.

Capex, ongoing opex, savings in future capex and opex are tangible elements that can usually be estimated with a reasonable degree of accuracy. They are typically modelled as direct cash flows in the CBA.

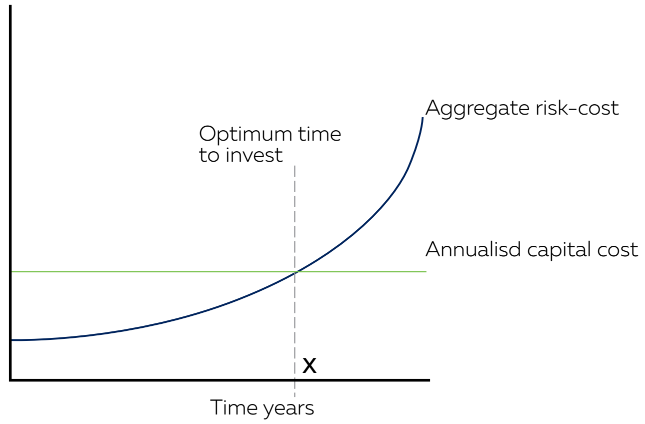
Loss of supply (i.e. unserved energy), safety and environmental risks are typically unknown and can only be included on a probabilistic basis – i.e. the likelihood of an event in any given future year is multiplied by the monetised risk cost associated with that event occurring. If an investment is implemented to avoid these risks, they will become benefits from a customer perspective and modelled as indirect cash flows in the CBA.

At the point where the annual benefit to society of an investment exceeds the costs customers will incur under the regulatory framework if the investment is made, the investment is considered justified and should proceed.

If the condition/capacity of a network is expected to deteriorate over time then the probability of failure increases. Resulting risks can be monetised and aggregated as an annualised risk-cost.

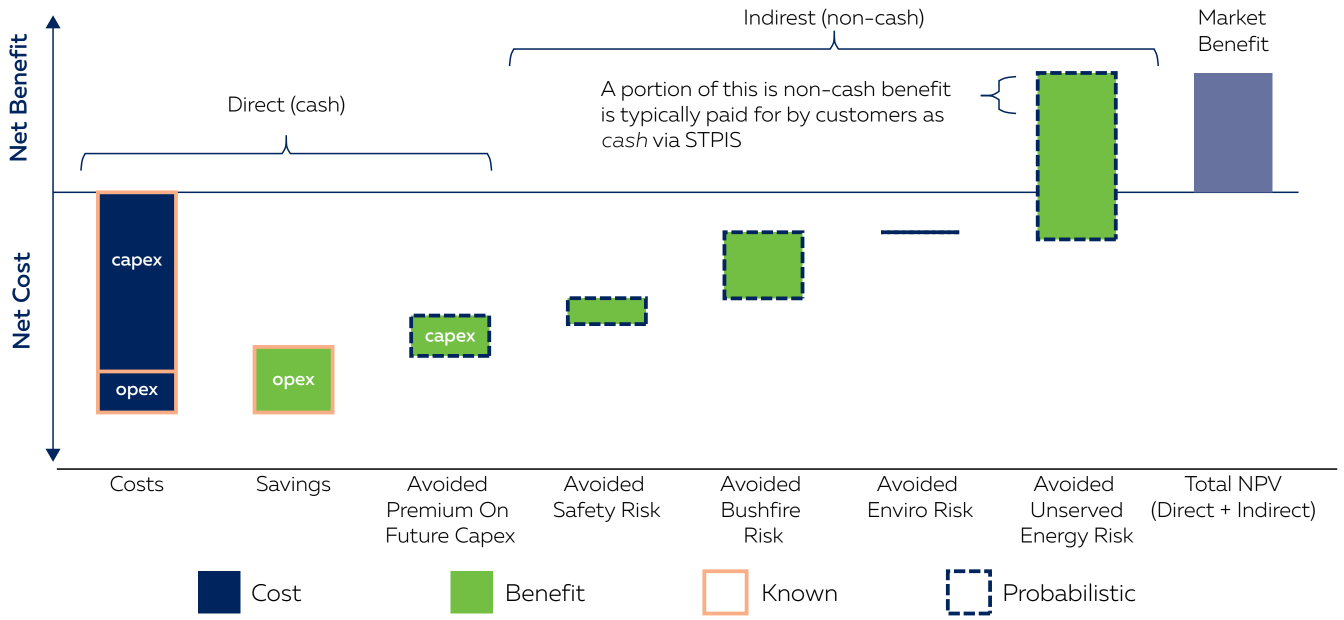


Optimal investment timing is identified when the aggregate risk-cost exceeds the annualised cost of the investment required to mitigate the risk.



The AER published guidelines with details on what they expect network businesses to include when using CBA to justify a capital investment.

In most network investments, the costs and benefits span multiple years. Therefore, a present value approach is applied to ensure future benefits can be compared on a like for like basis with expenditure now. Where future costs and benefits are discounted at or above the current regulated cost of capital, the CBA is implicitly comparing the option of making an investment against the opportunity of having the cash available for other purposes.



The CBA needs to identify the option that "maximises the net economic benefit across the Market". As a result, costs and benefits must be assessed in aggregate across all market participants, including those that "consume, generate, and transport electricity".

CBA is useful to assess the relative value of different investment options.

An investment option showing a positive NPV is not enough to justify a decision to go ahead with such investment. It should be assessed against other investment options that could also manage/mitigate the identified risks, to determine which option has the highest NPV.

The investment option with the highest market NPV (i.e. the most favourable to the overall community) should be the preferred option.

3. Capex Prioritisation/Optimisation

The outcomes of CBA applied to projects and programs (i.e. NPV results, Benefit/Cost ratios) are used as input information to rank and prioritise capital expenditure across the network investment portfolio.

Consideration is also given to the contribution made by projects/programs to support customer outcomes, corporate strategy and network performance targets, along with their ability to mitigate/reduce identified risks (i.e. workplace and public safety, environment, loss of supply, financial, etc) on the network.

A.2.2 Network Area Plans

Area Plans relate to major investments in the network and considers all of Ausgrid's obligations (irrespective of network type, voltage or investment drivers). The majority of investments within the Area Plans are subtransmission investments due to the greater interconnectivity of the network at this level and because these investments are generally complex and high in value.

To ensure Ausgrid's investment is prudent and efficient, our planning of major investments in the network:

- Is based on meeting the requirements of geographic areas, defined on the basis that they represent discrete electrical areas and with relative independence from network interconnections;
- Considers Ausgrid's obligations under the NER and other applicable regulatory instruments in a holistic manner; and
- Considers identified needs over a twenty-year planning horizon to allow for the development of a long term strategy that addresses various drivers and minimises long term cost.

Projects that comprise the preferred strategy for each Area Plan are determined by a probabilistic planning approach. This approach assesses cost and benefit, based on the risk of EUE and the VCR, with the preferred strategy entered in the Major Project List (Project List). Each project initiated is based on this list and on the expected project lead times, and in accordance with Ausgrid's Investment Initiation Standard. The Project List records the identified system limitation and need date, the required completion date and the estimated cost for each project.

The Area Plans are reviewed as significant changes to network needs are identified. In order to optimise project implementations, the timing of major projects is reviewed annually as new information and forecasts become available. Within the area plan cycle, major changes are captured in Area Plan Addendums or Planning Reports. The Project List also forms the basis of the economic assessment, consultation and reporting requirement under the RIT-D.

Appendix B: Demand Forecast

B.1 Data Tables Online

In keeping advice from the AER, that data should be made accessible in a format that can been readily interrogated, forecast and related data tables are published online and can be accessed via Ausgrid's website at www.ausgrid.com.au/DTAPR.

Table definitions for the 'Substation capacity and demand forecast' table and the 'Dual Function asset 10-year demand forecast' table located on Ausgrid's website are as follows:

Substation capacity and demand forecast table definitions

Heading Label	Description
Area Plan	An area as defined by Ausgrid used to describe a collection of substations of similar geographical region
Substation	Name of the substation. Details on the primary and secondary voltages of the substation included in the name to differentiate some locations of similar naming convention
Substation Type	Denotes either Zone Substation (ZS) or Subtransmission Substation (STS)
Total Capacity (MVA)	Maximum load able to be carried by the substation with all elements in service. A summer and winter Total Capacity value is provided
Firm Capacity (MVA)	Load able to be carried by the substation with the largest rated element out of service. A summer and winter Firm Capacity is provided
Load Transfer Capacity (MVA)	Amount of load that can be restored in the event of a whole zone outage by switching the distribution network. The transfer capacity assumes that a single zone is rendered out of service and the rest of the network is in system normal configuration. A summer and winter Transfer Capacity is provided
95% Peak Load Exceeded (hrs/yr)	The number of 15 minute occurrences that exceeded the 95th percentile value of maximum demand was summed and divided by four to determine the "hours within 95% of peak" value. A summer and winter 95% Peak Load exceeded value is provided
Embedded Generation - Solar PV (MW)	The Solar PV capacity by zone substation is consistent with the information used in the forecast and is current as at 31 March 2022 and 31 August 2022 for summer and winter respectively and includes all known systems. The solar generation capacity is based on information gathered from the application for connection forms completed at the time of applying for a solar installation and recorded in the Distributed Energy Resources Register
Embedded Generation - Other (MW)	Embedded generation "Other" includes all known diesel, landfill biogas, coal seam methane, natural gas including tri-generation and co-generation, hydro and mini hydro, coal washery, and waste heat recovery generating units known to Ausgrid. Not all of these units export to the grid as they are not capable of operating in parallel with the Ausgrid network and are intended for standby operation in island mode.
Actual Load (MVA)	Recorded peak demand for the substation. A summer and winter actual is provided. The actual loads are provided for the three years with the most recent year analysed being summer 2021/22 and winter 2022.
Actual Load (PF)	Recorded power factor for the substation at time of peak load. The value is compensated and takes into account the actual switching of capacitors at the substation at time of peak load. A summer and winter actual is provided
Forecast Load (MVA)	POE50 planning forecast peak demand in MVA for each respective forecast year for the substation. A summer and winter forecast is provided with the forecast starting from Summer 2022/23 and winter 2023.
Forecast Load (PF)	Forecasted power factor as calculated from POE50 planning forecast for each respective forecast year for the substation. The value is compensated and takes into account the forecasted switching of capacitors at the substation for any given forecast year. A summer and winter forecast is provided

Dual function asset 10 year demand forecast table definitions

Heading Label	Description
Substation	Name of the substation. Details on the primary and secondary voltages of the substation included in the name to differentiate some locations of similar naming convention
Substation Type	Denotes either Zone Substation (ZS) or Subtransmission Substation (STS)
Substation Actual MW	Recorded peak demand in MW for the substation. A summer and winter actual is provided
Substation Actual MVAr	Recorded peak reactive load for the substation. The value is compensated and takes into account the actual switching of capacitors at the substation at time of peak load. A summer and winter actual is provided
Substation Forecast MW	POE50 medium scenario planning forecast peak demand in MW for each respective forecast year for the substation. A summer and winter actual is provided
Substation Forecast MVAr	POE50 medium scenario planning forecast peak reactive load in MVAr for each respective forecast year for the substation. The value is compensated and takes into account the forecasted switching of capacitors at the substation for any given forecast year. A summer and winter actual is provided

B.2 Zone and Subtransmission Load Forecasting Methodology

This section describes the maximum demand planning forecasting methodology (the forecast) used by Ausgrid for zone substations and subtransmission substations.

The forecasts of peak demand are prepared at the zone substation level and at the subtransmission substation level. These spatial forecasts form a key input into the planning of Ausgrid's capital expenditure program. The forecast is developed based on the following high level steps:

- A bottom-up build by segregating Ausgrid's 1.8 million customers into representative types (segments) based on key differentiators such as size, CER and off-peak tariffs, developing representative segment demand profiles and forecasting those segments separately. Weather normalisation is applied to customer segments and a representative annual profile is determined per segment,
- Developing separate models for each demand driver using a mix of internal and external analysis and applying them as appropriate to each customer segment. For example, population growth is only applied to residential segments whereas business electrification is only relevant for the business customer segments,
- Aggregating up to the network to derive network forecasts using connectivity datasets that show how each Ausgrid customer is supplied from the hierarchical electricity network. Key metrics such as representative day types by season as well as maximum demand and minimum demand are determined.
- Currently, the network forecast granularity is at the zone substation level. Ausgrid plans to forecast deeper into the network in future years.

The forecast is prepared seasonally for summer and winter.

Ausgrid adopts a scenario-based approach to forecasting given the level of uncertainty in future technologies, pace of decarbonisation and customer behaviour all of which influence electricity demand. For the current forecast Ausgrid has developed forecasts based on the three incumbent AEMO Integrated System Plan (**ISP**) 2026 scenarios: Slow Transition (formerly Progressive Change), Step Change and Accelerated Transition (formerly Green Energy Exports). Step change has been identified as the most likely option in the 2026 ISP. Subsequently Ausgrid has adopted Step Change forecast as the most likely scenario on which to apply planning models and expenditure forecasts.

B.2.1 Bottom-up Customer Segmentation and Weather Correction

A bottom-up approach is applied to customer segmentation and weather correction to accurately represent customer demand behaviour under varying weather conditions for planning and forecasting purposes. The process involves developing weather- and calendar-normalised segment-average half-hourly demand profiles, as outlined below:

a. Ausgrid's total customer base is segmented into representative groups based on electricity usage size and shape.

- Size is determined by energy usage bands.
- Shape considers factors such as the presence of solar PV systems, batteries, and off-peak tariffs.

For weather correction, segments are broadly classified as either weather-dependent or non-weather-dependent. Large commercial and industrial customers, whose demand patterns are not materially influenced by weather, are treated as non-weather-dependent and are not weather corrected.

b. Using historical interval metering and solar generation data, segment-average half-hourly underlying demand profiles are developed for the past seven years for all weather-dependent segments. These profiles are based on customers with interval metering, while customers with accumulation meters are assumed to follow similar patterns within their respective segments. Behind-the-meter solar generation profiles are calculated using region-specific avg solar analytics data and multiply it by customers installed capacity.

c. An eXtreme Gradient Boosting (XGBoost) machine-learning model is trained to derive the impact of historical weather conditions and calendar effects on customer demand. It simulates half-hourly demand against categorical and non-categorical variables, including half-hourly weather metrics (temperature, wind speed, humidity, rainfall, etc.), calendar effects (public holidays, day of week, month of year, season) and day type (working vs non-working days). Daily weather statistics like daily maximum, minimum, and average of temperature as well as heating and cooling degree days, are also modelled to account for deviation in weather from normal weather standards.

d. Historical weather observations are bootstrapped in 14-day blocks to generate 1,000 synthetic weather years, each containing 17,520 half-hourly observations (48 intervals × 365 days). Random day shifts of –3 to +3 days are applied to each bootstrap to enhance variability. The trained XGBoost model is then used to simulate 1,000 segment-average half-hourly demand profiles from the synthetic weather simulations. Two sets of residual variability are introduced using an autoregressive model, producing 2,000 simulations per segment to represent natural randomness. Behind-the-meter generation profiles are subsequently overlaid on each simulation based on the corresponding calendar indices.

e. The simulated segment-average net demand profiles are aggregated to the zone substation level using network connectivity data. Non-weather-dependent customers are incorporated individually, using their actual interval-metered demand profiles to preserve their unique characteristics. Ausgrid plans to extend this process to lower asset levels in future forecasting iterations.

f. Weather normalisation is performed for 10%, 50%, and 90% Probability of Exceedance (POE) levels. For each desired asset level, all 2,000 simulated annual demand profiles are ranked by daily maximum demand (using half-hourly values). Three representative days—maximum, minimum, and typical demand days—are then identified for each POE, season, and day type (working/non-working). Using the simulation index identifiers, the corresponding half-hourly demand profiles are extracted to serve as baseline weather- and calendar-normalised demand profiles for each asset.

B.2.2 Forecasts of Demand Driver Components

The baseline weather- and calendar-normalised demand profiles described previously are adjusted to account for the numerous demand drivers in future years for long term forecast. A description of each forecast component is described below.

a. A system level econometric model. The econometric model is derived from key drivers at the local and system total level for both residential and non-residential customers broadly that incorporate both price and income response elements.

i. The residential component includes drivers for the change in real retail residential electricity prices and the change in real average household disposable income. The non-residential component includes drivers for the change in real retail non-residential electricity prices and the change in NSW Gross Value Added Services. The residential component also includes impacts from any forecast changes in population growth. Forecast variation in real retail residential electricity prices, real average household disposable income, real retail non-residential electricity prices and NSW Gross Value Added Services are obtained.

ii. For the 2025 forecast, this data was obtained from the Australian Energy Market Operator (AEMO) and is the data used for AEMO's 2024 ISP. Due to the collinearity of the historical customer price response with historical impacts from energy efficiency improvement, the model is based upon the total 'electricity services' to customers. The 'electricity services' includes the total metered demand (grid supply), the historical demand impacts from embedded generation and the historical demand impacts from Commonwealth and New South Wales government energy efficiency programs.

iii. A top-down view of historical Ausgrid total network electricity demand is obtained from 30 min bulk supply point meter data, which is combined with customer interval metered data into a regression model to estimate historical residential and non-residential customer 30 min demand due to partial coverage of interval metering across the customer base. Adjustments are made to account for customer PV systems as part of regression modelling.

iv. The historical and forecast demand impacts from Commonwealth and New South Wales government energy efficiency programs are obtained for four key programs. Ausgrid obtains the historical and forecast demand impacts for these energy efficiency programs principally from external expert advice. The demand impacts are allocated separately for residential and non-residential customers. The peak demand contribution is derived from the seasonal daily load factor on day of system peak.

1. The Minimum Energy Performance Standards (MEPS) program which sets national minimum energy performance standards for electrical appliances such as air conditioners, motors, televisions and refrigerators;
2. The Building Code of Australia (BCA) which sets minimum energy performance standards for buildings; and
3. The NSW Energy Savings Scheme (ESS) which encourages customers to invest in energy efficiency improvements in their homes and businesses.
4. The Peak Demand Reduction Scheme (PDRS) introduced by NSW Government to incentivise households and businesses to reduce their consumption during peak demand hours through a certificate scheme.

v. The historical 'electricity services' for residential customers and the 'electricity services' for non-residential customers are then regressed against the separate independent variables of price and income. The econometric model determines the elasticities for both income and price for each of the residential and non-residential customer sectors.

vi. Following derivation of the econometric elasticities, historical embedded generation and energy efficiency impacts are reversed out to return to the starting point. This process excludes effects likely to pollute the relationship between grid supplied electricity demand and the price and income variables. The forecasted demand impacts due to changes in price and income over time is derived by application of the elasticities to the forecasts for future electricity price and income.

Impacts due to new block loads, embedded generation, battery storage systems, energy efficiency, non-transport electrification, data centres, climate change, and electric vehicle take-up by customers are included as post model adjustments to the econometric model. Each post-model adjustment is allocated at the segment level using the current segmentation distribution and considering future population growth which means the spatial allocation of post-model adjustments for residential customer segments is in alignment with projected housing growth.

b. The impacts from household energy storage (BTM batteries) and rooftop solar, or distributed energy resources (DERs), are based on an internal uptake and simulation model. The uptake is derived from AEMO's ISP forecast of PV and BTM battery capacity. The recent trend in DER uptake across different customer segments and locations (zone substations) were used to derive a spatial uptake per segments over the next 30 years. Real measured solar generation data of around 3000 solar customers in Ausgrid's network were used to estimate average performance of solar systems across the network to simulate the BTM generation of DER customers and their contribution to different day types including max demand days.

c. BTM battery uptake is currently at very low levels but poised for near-term rapid take up. The Cheaper Home Batteries Program provides a ~30% discount for new battery installations. The program is accelerating battery uptake across Ausgrid's network since inception from 1 July 2025. Battery impacts demand profiles by charging up during the middle of the day when solar generation is abundant and discharges in the late afternoon to reduce peak demand.

d. The impact from electric vehicles (EV) has been guided by information obtained from AEMO and external consultancy advice, supplemented by knowledge obtained from Ausgrid's involvement in EV charging trials and EV owner customer surveys. Demand impacts are derived using 5 charging typology types (Bus, Fleet, Residential, Carpark, and DC fast charge). EV uptake and load profiles are spatially allocated using NSW vehicle registration data for electric vehicles obtained from Transport for NSW, ABS 2021 census statistics on population, dwelling and income. Spatial EV load profiles are then assigned to various customer segments using customer connectivity information.

e. The residential component includes impacts from forecast changes in population growth aligned with NSW Department of Planning and Housing Infrastructure policy. NSW government has committed to +377,000 new dwellings by 2029 in line with the National Housing Accord, of which a material proportion is expected to fall within the Ausgrid area and alongside this, have recently released granular datasets down the ABS meshblock level which has been incorporated into Ausgrid's spatial demand forecasts.

f. The near-term forecast horizon includes the impact of Major Customer loads, which typically connect at voltages 33kV and above. Of these, the overwhelming majority are datacentres and grid connected BESS systems. The data centre forecast reflects the present uncertainties in the data centre market due to volume and potential size of individual connections. A wide scenario band reveals that currently, the majority of Ausgrid's datacentre pipeline is considered early stage, however, potential connected volume could be significant. Major customer connections have a representative scaling factor applied that varies depending on the industry type and expected customer future demand profile. Where available, actual demand data from existing customers by industry type is used to derive coincidence factors. A further probabilistic factor is applied to reflect the probability of occurrence and oversizing to derive an overall scaling factor for each individual major customer connection.

g. The impact of the Electrification of residential gas appliances is considered by studying the current trends on the prevalence of gas appliances in new builds, as well as existing residential gas use by LGA.

h. Business electrification has been introduced for the first time in the 2025 forecast and reflects the potential for fuel switching away from fossil fuel sources to electricity alternatives across the business sector. Business electrification potential is dependent upon heat process temperatures which varies by business sector. Lower temperature heat processes can decarbonise earlier. Higher temperature processes are expected to take longer to decarbonise.

i. A climate change adjustment is now included in the 2025 demand forecast based on long-term climate projections data taken from NSW government (NARCliM data). This data reveals a trend increase of 1 degree out to 2055 and corresponding summer and winter peak demand impacts are derived based on historical load vs temperature sensitivity gradients.

B.2.3 Assumptions Applied to Substation Load Forecasts

Endeavour Supplied Substations

Note there are five Ausgrid zone substations not connected at 132kV within Ausgrid's network, but supplied from Endeavour Energy at 66kV and 33kV. Note also that Endeavour Energy does not have a transmission licence and that demand from these zone substations would be included in Endeavour's RIN data. Consequently, demand from these zone substations is not included in the aggregate data at the Transmission Connection Point, but is included in the aggregate data at the zone substation level. These zone substations are Epping 66/11kV, Leightonfield 33/11kV, Hunters Hill 66/11kV, Auburn 33/11kV and Lidcombe 33/11kV zone substations.

Customer Negotiated Capacity

Where a customer has negotiated a higher standard of service than the default planning standard and the agreed financial terms have been met, the substation load forecast is adjusted accordingly so that this capacity is reserved for that customer.

If a customer has negotiated a lower standard of service (e.g. to reduce their costs), this is generally not incorporated into the forecast. Generally, these requests are considered during network planning, or inherent in the connection of the customer.

Embedded Generation

The historical load data includes the impact of downstream embedded generation that was generating at the time of peak, consequently, the forecast includes the impact of non-dispatchable small scale generation such as rooftop solar installations.

Where a generator has a material impact on peak load that is not accurately reflected in the historical data and information is available about generator output and reliability, the forecast is adjusted to reflect the expected impact of the generator, taking into account:

- The historical reliability of the generator and expectations about its future reliability, including weather dependency where relevant;
- When the generator was installed and whether it is a temporary or permanent installation;
- Contractual obligations for Ausgrid to provide backup or standby supply to a site; and
- Network support agreements with the generator.

Larger generators that are relied on for network support are generally included as a negative block load. In determining whether a generator is 'large', Ausgrid uses the same approach as is used for block loads and transfers.

Capacitors for Power Factor Correction

Reactive compensation for locations with known capacitor installations is modelled according to the following guidelines:

- Growth rates are applied to the uncompensated MVAr component of load prior to switching in Ausgrid capacitors. In other words, growth rates are not applied to capacitors.
- The amount of reactive compensation for forecast years is applied according to the nameplate step size and maximum available MVAr capacity and the application of 2 adjustment factors, the voltage adjustment factor and the operational adjustment factor.
- The voltage adjustment factor calculated at 0.84 accounts for the difference between the nameplate rated voltage and the operational voltage at the corresponding substation. The voltage adjustment is the square of the ratio of nominal operational secondary voltage at the substation over the nameplate rated voltage of the capacity i.e. $(11/12kV)^2$ or $(33/36kV)^2$.

The operational factor accounts for the fact that capacitors are not necessarily switched in to maximise power factor. In determining the operational factor, historical patterns of capacitor switching are used.

Weather Correction

As described in B.2.1, weather correction is conducted at POE 10 and POE 50 levels using a half-hourly modelling approach. This process enables accurate estimation of maximum demand under typical and extreme weather conditions for planning and forecasting purposes. For further information refer to B.2.1.

Exceptions of Weather Correction

Weather correction is not applied where the demand or generation profile does not exhibit weather dependency for that season, or where the load exhibits weather dependency that does not follow the general trend expected for that season based on an examination of the seasonal load versus temperature relationship. As a result, weather correction is not applied to dedicated large customer loads (connected at the subtransmission level).

Rate of Growth

The rates of growth are determined using the compound annual growth rate (CAGR) method from the resultant forecast demand.

Block Loads and Transfers

Block loads for customer connections are included as an adjustment to customer segment population or as a post model adjustment in MW. A block load (or load transfer) can result in either an increase or decrease in the forecast load (e.g. load can be transferred to or from a zone substation).

This approach to block loads has been adopted as there is a need to distinguish between natural load growth and growth arising from larger customer connections. There is also a need to distinguish between customer connections that can be represented as a distribution of typical load cycles and customers with defined load cycles.

Block loads are differentiated to account for different load cycles. Scaling factors are derived from an analysis of historical customer demand and connection data. A summary of the block load categories is as follows:

Category	Description	Scaling Factor
11kV	General 11kV connections which have applied for connection	0.31
Major Customers	33kV+ connections or unique industry 11kV connections (e.g. rail, datacentres, large BESS)	based on load / generation category

As the 11kV scaling factors are derived from actual customer connection data and the actual resultant demand at the local 11kV panel and at the time of 11kV panel peak for real customer connections, they incorporate coincidence with peak and probability of proceeding. In the case of major customer connections the scaling factors are specific to load or generation category per connection.

B.2.4 Explanation of Substation Forecast Outcome

The 2025 forecast is higher than the 2024 forecast over the entire 10 year forecast period driven largely by a significant increase in customer connection activity, in particular data centres, as well as population growth and EVs.

Connections activity has increased, arising from a combination of the rapidly growing datacentre sector, key infrastructure projects such as surface rail network load increases, rail tunnels (metro) and road tunnel network expansions, as well as large generation and storage connections, all of which are represented in the forecast as block loads. High density residential development activity is expected to increase over the forecast horizon to ease the housing crisis as policies at all government levels are enacted to remove barriers towards increasing housing supply. These are represented in the forecast as block loads, which place upward pressure on forecast demand in the near term and have a sharp impact at the spatial level, particularly in areas where blocks loads concentrate, such from datacentres and population hotspots. Macroeconomic income and price factors, which drive existing customer decisions affecting electricity consumption (separate to population growth) also contribute to growth throughout the forecast, albeit modestly.

On the flip side, customer solar uptake will continue to grow both in standalone systems and paired with battery storage. Battery uptake is currently low, but is likely to grow rapidly driven by falling battery prices and government incentives. A planned update to building construction standards, via the National Construction Code 2025 update (NCC2025) which enhances the level of energy efficiency of new builds and major renovations, was paused to facilitate housing supply rollout. However, over the 10 year horizon, the growth drivers are expected to outweigh those that apply downward pressure to demand resulting in the overall increasing forecast.

Ausgrid prepares an annual transmission distribution connection point forecast which is provided to Transgrid in February each year as part of the annual planning review and load forecast information provisions of the NER. A forecast of future loads over a ten year forward planning period is prepared for each dual function subtransmission substation connected to the Transgrid transmission network. These load forecasts are presented in www.ausgrid.com.au/DTAPR.

B.3 Transmission – Distribution Connection Point Load Forecast

Ausgrid prepares an annual transmission distribution connection point forecast which is provided to Transgrid in February each year as part of the annual planning review and load forecast information provisions of the NER. A forecast of future loads over a ten year forward planning period is prepared for each dual function subtransmission substation connected to the Transgrid transmission network. These load forecasts are presented in www.ausgrid.com.au/DTAPR.

B.4 Subtransmission Feeder Load Forecasts

Ausgrid undertakes an annual review of subtransmission feeder capacity constraints ("the feeder load forecast") using load-flow analysis to simulate credible network contingencies. Initial analysis is conducted using network load-flow models for a forward looking 20-year period, based on:

- A 50% POE Planning Spatial Demand Step Change Forecast, including committed spot loads and uncommitted spot loads by applying a probability;
- Committed network developments and load transfers, and
- Line and cable cyclic normal and long-term emergency ratings.

The results of this analysis form an input into the Area Planning process and the Annual Capital Review process. During these processes, a cost benefit analysis based on a probabilistic criteria is undertaken in order to maximise the economic benefit of investment to relieve identified constraints.

B.5 Primary Distribution Feeder Load Forecasts

Ausgrid's primary distribution feeder forecast contains peak and minimum load values that are determined seasonally and adjusted to account for temperature variation and abnormal switching on the distribution network.

The summer and winter load scenarios are determined based on interval load data for the primary distribution feeders, zone substation interval data, customer meter data, customer connection information, and weather. This data is used to identify and exclude abnormal system states, and to estimate how this load is likely to be allocated across the network, to determine the expected load on the network during normal system conditions.

Zone substation forecast load rate of growth (ROG) and known network changes (spot loads and transfers) are then applied to estimate the demand on each feeder for the forward planning period (generally 6 years).

This forecast data is combined with network connectivity data to construct network models that can be used to simulate different scenarios to identify system limitations.

B.5.1 Load Transfer Capacities of Zone Substations

Load transfer capacity is the amount of load that can be restored in the event of a whole zone outage by switching the distribution network. The transfer capacities presented in the distribution demand forecast table as described in Section B.1 assume that a single zone is rendered out of service and the rest of the network is in system normal configuration.

Load transfers are generally considered to be a temporary solution, as transferring load to neighbouring zone substations will increase the utilisation of the destination zone and feeders. This restricts the operability of the network as the remaining distribution network is more highly utilised than planned and further restoration of subsequent contingencies may not be possible.

Transfer capacities presented in this document are based on the configuration of the HV network. Installation of additional HV interconnection and transfer capacity is typically a further consideration where it might provide a cost-effective alternative to other capital investment associated with zone substations or the subtransmission network.

Load transfer impacts are assessed on a case-by-case basis (typically in a load flow program) to ensure that the overall impact of load transfers does not overload assets in the distribution network.

Additionally, a load transfer alters the configuration of the distribution network, which may impact the capacity of subsequence load transfers. Therefore, the presented transfer capacities assume that no other load transfers have occurred.

This forecast data is combined with network connectivity data to construct network models that can be used to simulate different scenarios to identify system limitations.

B.6 Other Factors Having Material Impact on the Network

B.6.1 Fault Levels

Fault level management of the network is a critical consideration given the ongoing expansion of network infrastructure and the increasing connection of both loads and generators. However, with the proposed decommissioning of synchronous generators, fault levels across the network are expected to decrease, which pose new challenges. Careful and proactive management of fault levels is essential to maintain network stability and ensure the safety and reliability of the system.

In Sydney metropolitan area, the fault levels have been increased over the years, and to compensate this Transgrid has installed 50kA rated switchgear at Beaconsfield BSP during its condition driven replacement given that in some operating arrangements fault levels exceeded 40kA. AS such, Ausgrid is now installing equipment with this same fault rating in all new developments in the area. Nearby existing substations with 40kA rated switchgear, under certain operating scenarios, operate very close to their limits and this restricts some network configurations. There are numerous open points on the 132kV meshed transmission system due to these fault level limitations. These open points create more complicated switching arrangements and limit network flexibility.

The installation of the Kurri open cycle gas turbines (**OCGT**) by Snowy Hydro connected at 132kV in the Newcastle BSP load area has necessitated maintenance of additional open points in the 132kV network to manage the fault level to within equipment ratings at Newcastle BSP during periods of OCGT generation.

132kV series reactors have been installed by Transgrid at Rookwood Rd BSP in part to limit fault level contribution (along with power flow control). In addition to these reactors open points were created on the 132kV network to restrict fault levels to below equipment ratings.

For a number of 132/33kV STS refurbishments changes have been made in the standard arrangement for neutral earthing due to review of Ausgrid network standards. This results in individual transformer neutral earthing reactors being installed in place of a common neutral earthing resistor.

The HV Network Reinforcement program includes managing fault level constraints in the HV network. These include both high and low fault level constraints. HV feeders that have high fault levels may result in damage to customer and network equipment during faults. HV feeders with low fault levels may have protection systems that cannot see or discriminate between fault locations which may lead to increased clearing times or excessive customers being interrupted. Typical solutions to these constraints include network augmentation, modifying protection settings or altering the network configuration.

B.6.2 Voltage Levels

Network power flow is continuing to transition from a traditional one-way flow towards a two-way flow. A major contributor to this change up till now is the increase in CER, in-particular the large number of "behind the meter" solar generating plants now connected to the Ausgrid distribution network. These solar generating plants can have a significant impact on network voltages, especially during periods of high solar generation. To effectively manage voltage across network, we have adopted a comprehensive and holistic strategy that extends from BSP's to LV customers, ensuring efficient voltage management.

Voltage levels at our BSP's, STS's and zones are coordinated by local regulation schemes that are continually optimised where possible to enable transition in power flow, and where required localised network voltages are managed by traditional network options such as customer load balancing, transformer tap changes and network upgrades. These traditional options are complimented by innovative technology trials such as community batteries, STATCOMs and Advanced Voltage Control methods. Additionally, there are also network areas that require tailored approaches to address unique voltage-related challenges, ensuring the stability and reliability of the electrical network.

The meshed inner-metropolitan network is supplied by two large radial 330kV cables with very high charging capacitance. The inner-metropolitan network is also comprised of a number of long 132kV cables with significant cable charging. This means capacitor banks are required during cable outages to replace this lost reactive support, however during low load conditions shunt reactors are required to reduce voltages. One of these cables also has a series reactor with bypass capabilities for power flow and fault level control. Capacitor banks are located at Beaconsfield BSP, Peakhurst STS and Bunnerong STS and shunt reactors at Mason Park STSS, Rookwood Rd BSP, Beaconsfield BSP and Haymarket to help manage the voltage on the 132kV meshed network.

The meshed network connected to Muswellbrook BSP is supplied from three 132kV overhead feeders and spans a significant distance to Singleton 132kV STS. Under system abnormal conditions of the 132kV subsystem and high network loading, network voltages can drop below 0.9pu at Singleton 132kV STS. Closing of the normally open 132kV interconnector to Newcastle BSP will assist in maintaining system voltages during these conditions, however the use of this interconnector is frequently constrained by abnormal local 330kV network configuration and during periods of Kurri OCGT generation. Voltage control to manage 11kV network voltages is done at zone substations using tap changing transformers and where necessary capacitor banks.

B.6.3 Other Power System Security Requirements

Ausgrid's under frequency load shedding capabilities are assessed on a bi-annual basis to ensure compliance with NER requirements. Projects are created where compliance is no longer met due to network topology rearrangements or at the request of AEMO. Refer to 2.4 Frequency control and load shedding for more details.

B.6.4 Quality of Supply

Ausgrid is required to plan, design and operate its network to meet the quality of supply requirements set out in the National Electricity Rules (NER S5.1, S5.1a and S5.3), the NSW Service and Installation Rules and relevant Australian Standards, including AS 60038 *Standard Voltages* and the electromagnetic compatibility planning limits in the AS/NZS 61000 series. These obligations ensure that voltage magnitudes, harmonic distortion, flicker, unbalance and other power quality parameters at customer connection points remain within acceptable limits. This section focuses specifically on the characteristics of the voltage waveform supplied to customers rather than continuity of supply.

Ausgrid manages quality of supply by operating the network in accordance with these requirements and by ensuring that customer installations, embedded generation systems and other connected equipment comply with Ausgrid's network standards, the relevant electromagnetic emission standards, the AS/NZS 4777 series, and the applicable power-quality planning limits. These arrangements are broadly consistent with international approaches to voltage-quality management, including the European EN 50160 framework, which defines the expected characteristics of supply voltage in public networks.

Ausgrid also applies the technical guidance published by Energy Networks Australia (ENA), including:

- **ENA Doc 033 – Power Quality:** Harmonics, a guideline supporting the application of IEC/TR 61000.3.6 for establishing harmonic planning levels in medium- and high-voltage networks;
- **ENA Doc 034 – Power Quality:** Flicker, a guideline supporting the application of IEC/TR 61000.3.7 for assessing and limiting voltage fluctuations and flicker in medium- and high-voltage networks; and
- **ENA Doc 037 – Power Quality:** Voltage Unbalance, a guideline supporting the application of IEC/TR 61000.3.13 for assessing and managing voltage unbalance in medium- and high-voltage networks.

The location and number of permanent power-quality monitors are selected to provide a statistically representative view of voltage quality, consistent with international practice where compatibility levels are assessed using probability-based criteria rather than absolute deterministic thresholds (AS/NZS 61000 series, IEC/TR methodologies). Summary results from these monitoring activities are reported in Ausgrid's network performance and regulatory submissions.

Where monitoring or analysis indicates that quality-of-supply limits may be approached or exceeded, Ausgrid undertakes further assessment and, where necessary, network planning studies to determine appropriate mitigation measures. These may include network reconfiguration, voltage-control adjustments, installation of additional network equipment, targeted network augmentation, or connection-related measures required to maintain compliance.

B.6.5 Distribution Connected Units

Ausgrid has published on its website, guidance for proponents seeking to connect a Distribution Connected Unit (generating unit or bi-directional unit) under Chapter 5A or Chapter 5 of the NER. The information includes guidelines, Network Standards, Electrical Standards and proforma contracts, and Connection Application forms. A register of completed generator connections is also maintained in accordance with the NER requirements.

Ausgrid provides basic connection offer services for inverter coupled micro DER connections up to 200kW where augmentation of the network is not required. All other Distribution Connected Units are offered a negotiated template connection offer consistent with NER Chapter 5A for units that are not registered with AEMO and NER Chapter 5 in the case of Registered Generators.

Ausgrid continues to work with industry partners including the Clean Energy Council, ENA, AEMO and other DNSP's to better understand the current and future network impacts of micro and non-micro DER connections that connect under Chapter 5A of the Rules. This includes AEMOs DNSP Guideline 'Technical Requirements for 200kW to <5MW DER Connections' which aims to help align NSPs in filling the technical requirements void for this connection category where AS4777 or NER chapter 5 does not already apply as the Technical Standard.

Ausgrid has experienced a plateau in the number of customers applying to connect/modify micro DER whilst cumulative installed capacity continues to trend upward. This is commensurate with the industry as a whole and the push to Net Zero. This has also led to an increase in registered generator enquiries proceeding to formal application stage.

B.7 Additional Notes

B.7.1 ISP

The ISP is a whole-of-system plan that provides an integrated roadmap for the efficient development of the NEM. AEMO published the first ISP in 2018 and it has endeavoured to update every two years under the functions of NER to maintain and improve system security of NEM transmission grid. It provides an actionable roadmap for eastern Australia's power system to optimise consumer benefits and provides an overview of the current state and potential future development of the NEM transmission grid.

The ISP includes a review of the:

- Optimal development path needed for Australia's energy system
- Identification of forecast constraints on the national transmission flow paths
- Whole-of-system plan to maximise net market benefits, and
- Least-regret future scenario modelling, detailed engineering analysis and cost benefit analysis.

The current is 2024 ISP. Key features of the current ISP 2024 include three key areas:

1. The ISP is a roadmap through the energy transition
2. An optimal developemnt path for reliability and affordability
3. Delivering the optimal development path

It has focused on following key outcomes when delivering the ISP 2024.

- Supplying affordable and reliable electricity to customers in the NEM, while supporting Australia's net zero ambitions,
- Increasing the firming capacity of alternative energy sources including utility-scale batteries, hydro storage, gas-fired generation, and smart behind the meter "virtual power plants" (**VPPs**),
- Coal power stations are rapidly retiring, and supporting generation and storage investments in the optimal development path,
- Supporting the transmission projects in the optimal development path
- Establishment of Renewable Energy Zones to efficiently connect renewables

A copy of the current ISP 2024 is available on AEMO's website at https://www.aemo.com.au.

B.7.2 NSW Responsibility

In the ISP, network augmentation proposals by TNSPs that affect national transmission flow paths are taken into account by AEMO in the development of conceptual augmentation options and market development scenarios.

Transgrid is the Jurisdictional Planning Body (**JPB**) for NSW in the NEM. In this role Transgrid:

- Represents the NSW jurisdiction on the Inter-Regional Planning Committee (**IRPC**); and
- Provides jurisdictional information to the IRPC to enable it to assist AEMO in producing its annual Statement of Opportunities (**SOO**) and the ISP.

Accordingly, Transgrid is responsible for providing information concerning transmission developments in NSW which may affect the power transfer capacity of national transmission flow paths. Further details are available on Transgrid's website at https://www.transgrid.com.au

In addition to ISP, the NSW government has initiated an Electricity Infrastructure Roadmap (the Roadmap) which sets out the NSW Government's vision to coordinate investment in electricity transmission, generation, storage and firming infrastructure and transform the NSW electricity system into one that is cheap, clean and reliable. EnergyCo is a statutory authority and is responsible for leading the delivery of REZs as part of the Roadmap. As part of this, the State's first REZ in the Central-West Orana regions is in the development phase. Further details are available on EnergCo's website at https://www.energyco.nsw.gov.au.

Appendix C: Distribution Services for Embedded Generating Units

Forecast use of distribution services and hosting capacity assessments for zone substations, sub-transmission lines and transmission-distribution connection points is included in this year's report. We are continuing to review and develop our tools and methodologies for these assessments, and to improve the availability and accuracy of data and results.

The assessment results are outlined in the online Generator Export and Hosting Capacity data file which is available for download from Ausgrid's website at www.ausgrid.com.au/DTAPR.

C.1 Zone Substations

Ausgrid has considered the "use of distribution services by embedded generation units" as the total capacity collectively used by all individual customers to export their excess generation to the low voltage network at the time of maximum total export.

As part of our new forecast tool we are forecasting energy use of all of our customers including forecast elements, behind the meter generation and batteries, and new energy consumption drivers such as EV, Electrification, etc.

A separate simulation tool has been developed to estimate the behind the meter consumption of rooftop PV generation for all individual customers using a sample of around 5000 customers using real measure load profile, solar generation and forecast load profiles. This was used to estimate the collective EG export of individual customers at any time in any zone substation. We then report the maximum collective EG export (MW) for each zone substation. The forecasted installed PV capacity and batteries aligns with AEMO's Step Change scenario from AEMO's ISP 2025, applied in the Ausgrid area.

C.2 Subtransmission Feeders

Ausgrid has identified that some zones are experiencing reverse power flows but no system limitations of subtransmission feeders have been identified at this stage. As such, the subtransmsision feeders that are supplying these substations and are experiencing reverse power flows have not been reported at this stage.

However, there are situations where embedded generators are connected to the subtransmission network which are exporting power to the subtransmission network causing power flows through subtransmission feeders. While no system limitations have been identified as a result of these embedded generators at this stage, it is appropriate that the details of power flows on the subtransmission network and peak generation values are provided which may possibly be useful information to stakeholders.

Note that the simplistic analysis is undertaken using Ausgrid's peak power flow model which represents only one snapshot in time. The values presented in the table may vary during lighter loads and/or different operating conditions of the network.

C.3 Transmission-Distribution Connection Points

Refer to Appendix C.2 above.

C.4 Subtransmission Network Hosting Capacity

The hosting capacity is the amount of generation that can be added to the subtransmission network without requiring additional network investment in the network. The hosting capacity depends on a number of network parameters and limitations, including:

- Overvoltage,
- Overloads including subtransmision line and transformers,
- Fault level,

- Frequency,
- Protection,
- Power quality

At this early stage of the analysis, the primary boundaries considered in finding hosting capacity are overloading, overvoltage, and fault level limitations. Typically, it is required that the power generated is able to supply both network load and losses, that the generators produce power under specified active and reactive power limits. This ensures the bus voltages are within recommended values and that there is no overloading of the subtransmission lines and transformers.

Hosting capacity is calculated at each substation connection point and subtransmission line at n (total capacity) and n-1 (firm capacity) network security levels. The approach used for the calculation of hosting capacity at subtransmsision level is as follows.

- Choose performance indices: overvoltage, overloading and fault levels.
- Determine acceptable limits of those performance indices.
- Connect a generator at the substation connection point or subtransmission line.
- Vary the size of the generator and calculate the performance indices using power flow analysis and fault level analysis.
- Find the boundaries of the generator size which is the hosting capacity at that connection point.

It should be noted that the hosting capacity is dependant on the local load where the generator is connected as there is opportunity to consume the generator load at local level without violating performance indices at upstream levels. Thus, to obtain a prudent level of hosting capacity, the minimum load level (scaling the relevant loads down) where possible is applied when calculating the hosting capacity.

The hosting capacity presented in this report is only for general guidance and would not represent the optimum hosting capacity as a number of assumptions were made during the analysis given the limited time and resources to complete detail analysis at each and every location. This is a rapid method for obtaining an initial estimation of hosting capacities. It is proponent's responsibility to use this information with care and due diligence. The proponent must consult Ausgrid for detailed analysis of available capacity that suits a range of operating conditions at the interested location if required which ensures a more conservative and robust result can be determined for hosting capacity.

Appendix D: Glossary

ADMS	Advanced Distribution Management System
AER	Australian Energy Regulator
AEMC	The Australian Energy Market Commission is the rule maker and developer for Australian energy markets
AEMO	Australian Energy Market Operator
ARENA	Australian Renewable Energy Agency
Asset Condition	Refers to an asset being identified as having condition issues or approaching the end of service life, and cost benefit analysis has been applied to identify an optimum solution and its timing.
BESS	Battery Energy Storage Systems
BTM	Behind the meter
Capacity	Indicates there is a projected network capacity shortfall on the basis of expected unserved energy, and cost benefit analysis has been applied to identify an optimum solution and its timing
CBM	Condition Based Maintenance
CER	Customer Energy Resources
CPN	Community Power Network
DER	Distributed Energy Resources
DLF	Distribution Loss Factor
DPAR	Draft Project Assessment Report
DTAPR	Distribution and Transmission Annual Planning Report prepared by a Distribution Network Service Provider under the National Electricity Rules
DNSP	A Distribution Network Service Provider who engages in the activity of owning, controlling, or operating a distribution system, such as Endeavour Energy, Ausgrid and Essential Energy
DSP	Distribution System Planning
Dual Function Asset	Any part of a network owned, operated or controlled by a Distribution Network Service Provider which operates between 66kV and 220kV and which operates in parallel, and provides support, to the higher voltage transmission network and is an asset which forms part of a network that is predominantly a distribution network
EBM	Emergency Backstop Mechanism
EnergyCo	The Energy Corporation of NSW (EnergyCo) is a statutory authority established under the Energy and Utilities Administration Act 1987 and is responsible for leading the delivery of Renewable Energy Zones (REZs) as part of the NSW Government's Electricity Infrastructure Roadmap (the Roadmap)

ENSMS	Electricity Network Safety Management System
ESA	NSW Electricity Supply Act 1995
EUE	Expected Unserved Energy
EV	Electric Vehicle
EVCI	Electric Vehicle Charging Infrastructure
FLISR	Fault Location, Isolation and Service Restoration technology utilised for restoring electricity supply
FMECA	Failure Mode Effects and Criticality Analysis
FPAR	Final Project Assessment Report
GJ gigajoule	One gigajoule = 1000 megajoules. A joule is the basic unit of energy used in the gas industry equal to the work done when a current of one ampere is passed through a resistance of one ohm for one second
GWh gigawatt hour	One GWh = 1000 megawatt hours or one million kilowatt hours
HCC	Hunter Central Coast
HV high voltage	Consists of 11kV and 22kV distribution assets
JPB	Jurisdictional Planning Body
LV low voltage	Consists of 400V and 230V distribution assets
kV kilovolt	One kV = 1000 volts
kW kilowatt	One kW = 1000 watts
kWh kilowatt hour	The standard unit of energy which represents the consumption of electrical energy at the rate of one kilowatt for one hour
MRA	Maintenance Requirements Analysis
MVA	(unit of electrical power) Mega Volt Amp
MVAr	MVA (reactive). Where quoted as part of a demand forecast, it is assumed that capacitors are in service.
MW megawatt	One MW = 1000 kW or one million watts
MWh megawatt hour	One MWh = 1000 kilowatt hours
N capacity	The capacity of a network (or sub-section of network) with all elements in service.
N-1 capacity	The capacity of a network (or sub-section of network) following a failure of a single critical element.
NEL	National Electricity Law
NER	National Electricity Rules

NTFP	National Transmission Flow Path
NTNDP	National Transmission Network Development Plan
OCB	Oil Circuit Breaker
POE 50	In this document, refers to a demand forecast with a 50% probability of being exceeded (i.e. 1 in 2 years)
Primary distribution feeder	Distribution line connecting a subtransmission asset to either other distribution lines that are not subtransmission lines, or to distribution assets that are not subtransmission assets
pf	Power Factor
RCM	Reliability Centred Maintenance
REZ	Renewable Energy Zones
RIT-D	Regulatory Investment Test for Distribution
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SAPS	Stand Alone Power System
SCFF Cables	Self-Contained Fluid Filled Cables
SFAIRP	So Far As Is Reasonably Practicable
SOO	Statement of Opportunities
STPIS	Service Target Performance Incentive Scheme
STS	Subtransmission Substation
Subtransmission	Any part of the power system which operates to deliver electricity from the higher voltage transmission system to the distribution network and which may form part of the distribution network, including zone substations
Subtransmission system	Consists of 132kV, 66kV and 33kV assets, including dual function assets
TNSP	Transmission Network Service Provider
V volt	A volt is the unit of potential or electrical pressure
V2G	Vehicle-to-Grid charging technology
VCB	Vacuum Circuit Breaker
VCR	Value of Customer Reliability
W watt	A measurement of the power present when a current of one ampere flows under a potential of one volt
XLPE	Cross-linked Polyethylene
ZS	Zone substation

Contact Details

For all enquiries regarding the Distribution and Transmission Annual Planning Report 2025 and for making written submissions contact:

Ausgrid Head of Asset Management & Planning

Email: assetinvestment@ausgrid.com.au

Ausgrid