



Distribution and Transmission Annual Planning Report Summary

December 2023



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 2023. Our 2023 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.

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Junayd Hollis
Group Executive - Customer, Assets & Digital

Foreword

The impacts of electrification, decarbonisation, and decentralisation continue to accelerate as governments and society seeks to limit the impacts of climate change and achieve net zero emissions by 2030. Like many electricity network operators around the globe, Ausgrid is faced with the challenge of cost effectively enabling this transformation, and promoting the long term interests of the customers and communities we serve.

The last 12 months has seen a substantial increase in the rate of customer energy resource (CER) adoption in our network area, including rooftop solar systems, battery installations and electric vehicles. Over the same period we have also seen a sharp increase in level of connection activity associated with grid scale generation and storage projects.

In responding to these changes, Ausgrid is actively pioneering new approaches and technologies to enable customers to get maximum value from their energy investments, and help NSW meet its net zero goals.

Ausgrid is further supporting energy transition through the development of new infrastructure such as Battery Energy Storage Systems (BESS), Electric Vehicle Charging Infrastructure (EVCI) and Renewable Energy Zones (REZ), in line with the NSW Government's Electricity Infrastructure Roadmap.

Over the past year, Ausgrid has:

- Commissioned three Stand-alone Power Systems (SAPS) in the Upper Hunter network area (Singleton), to improve reliability, resilience and reduce costs for customers. Over the coming year, Ausgrid is continuing Phase 2 of the SAPS trial across the Hunter region with interested landowners;
- Delivered the first two community batteries under the Government's Community Batteries for Household Solar Program, at Cabarita in Sydney's Inner West and Narara in the Central Coast. These are the first of six community batteries Ausgrid is delivering under this program. The next will be installed in the following suburbs - Bondi/Bondi Beach, Cammeray, Warriewood and North Epping. Community batteries can help increase the renewable energy available to local communities and prepare the grid for increased electricity demand from electric vehicle charging;
- Connected 25 JOLT EV charging sites at our distribution substations, increasing the number of available EV smart chargers, promoting EV adoption;
- Partnered with Upper Hunter Shire Council and Merriwa community to trial a microgrid technology, and deliver a more responsive, resilient and reliable power supply to the community. Ausgrid is currently finalising the microgrid design phase to begin construction in the coming year;

- Awarded Energy Network Australia's 2023 Industry Innovation Award for Project Edith, a project known as a world-leading innovation that showcases how the grid can facilitate the participation of green energy solutions in the energy market while staying within distribution network capacity limits;
- Contributed to collaborative research through our involvement with Reliable Affordable Clean Energy (RACE) for 2030 and the International Community for Local Smart Grids focused on local solutions for the net-zero transition.

This year, the Distribution and Transmission Annual Planning Report (DTAPR) has been divided into two separate documents. This one serves as a summary, focusing on the Ausgrid's strategies, accomplishments, and challenges as a distribution network service provider. The main DTAPR outlines our 2023 annual planning review and delineates our obligations as a Distribution and Transmission Network Service Provider in the National Electricity Market.

Looking forward to the 2024-2029 period, we anticipate challenges and opportunities in the following areas:

- Building resilience to climate change
- Transitioning to net zero
- Providing efficient infrastructure
- Providing an affordable service
- Continuing the path to digitisation

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 - Customer, Assets & Digital

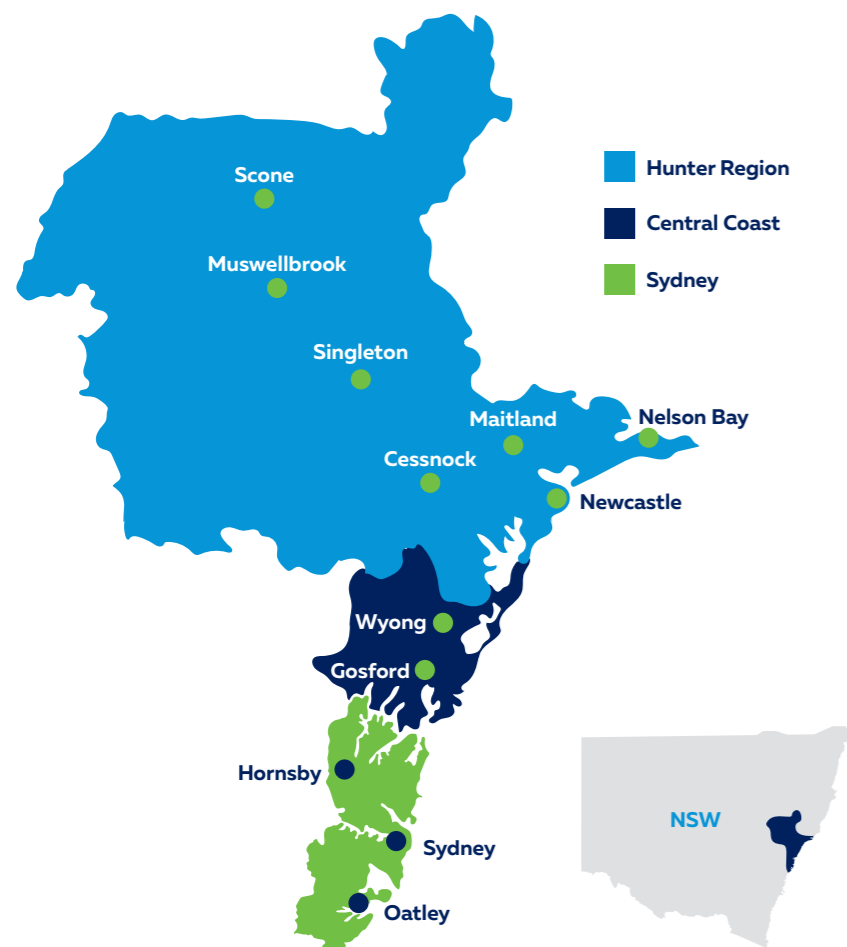
About Ausgrid

Ausgrid is operated under a long-term lease via a partnership between the NSW Government and AustralianSuper, APG Asset Management Group 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 connects communities and empowers the lives of our customers and their communities today and for over a century.

Our core business is to provide distribution network services to our customers. Each day we build, operate and maintain the 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 and where 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 an efficient lower carbon future.



Our Network

- » Supports over 20% of the national gross domestic product
- » Serves over 4 million people in almost 1.8 million homes and businesses
- » Covers 22,275 km² made up of large and small substations connected through high and low voltage powerlines, underground cables and power poles
- » Includes most densely populated areas in NSW
- » Supplies customers as far north as the Upper Hunter Valley, as far south as Waterfall and to Auburn in Sydney's west

Ausgrid Network Includes

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

Ausgrid is regulated by statutory and legislative requirements, including Work Health and Safety (WH&S), environmental, competition, industrial, consumer protection and information laws, National Electricity Regulation (detailed below), and the NSW Electricity Supply Act 1995 (ESA). We must also comply with the conditions of our NSW Distribution Network Service Provider licence (under the ESA) and Security of Critical Infrastructure Act 2018.

The National Electricity Regulation is primarily represented by the National Electricity Law (NEL) and National Electricity Rules (NERs) which regulate the National Electricity Market, and the National Energy Customer Framework. Ausgrid operates in the National Electricity Market (NEM) as both a distribution and transmission network service provider (DNSP and TNSP). The National Electricity Objective (NEO), as stated in the National Electricity Law 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:

- price, quality, safety, reliability and security of supply of electricity; and
- the reliability, safety and security of the national electricity system."

Source: National Electricity Objective (NEO)

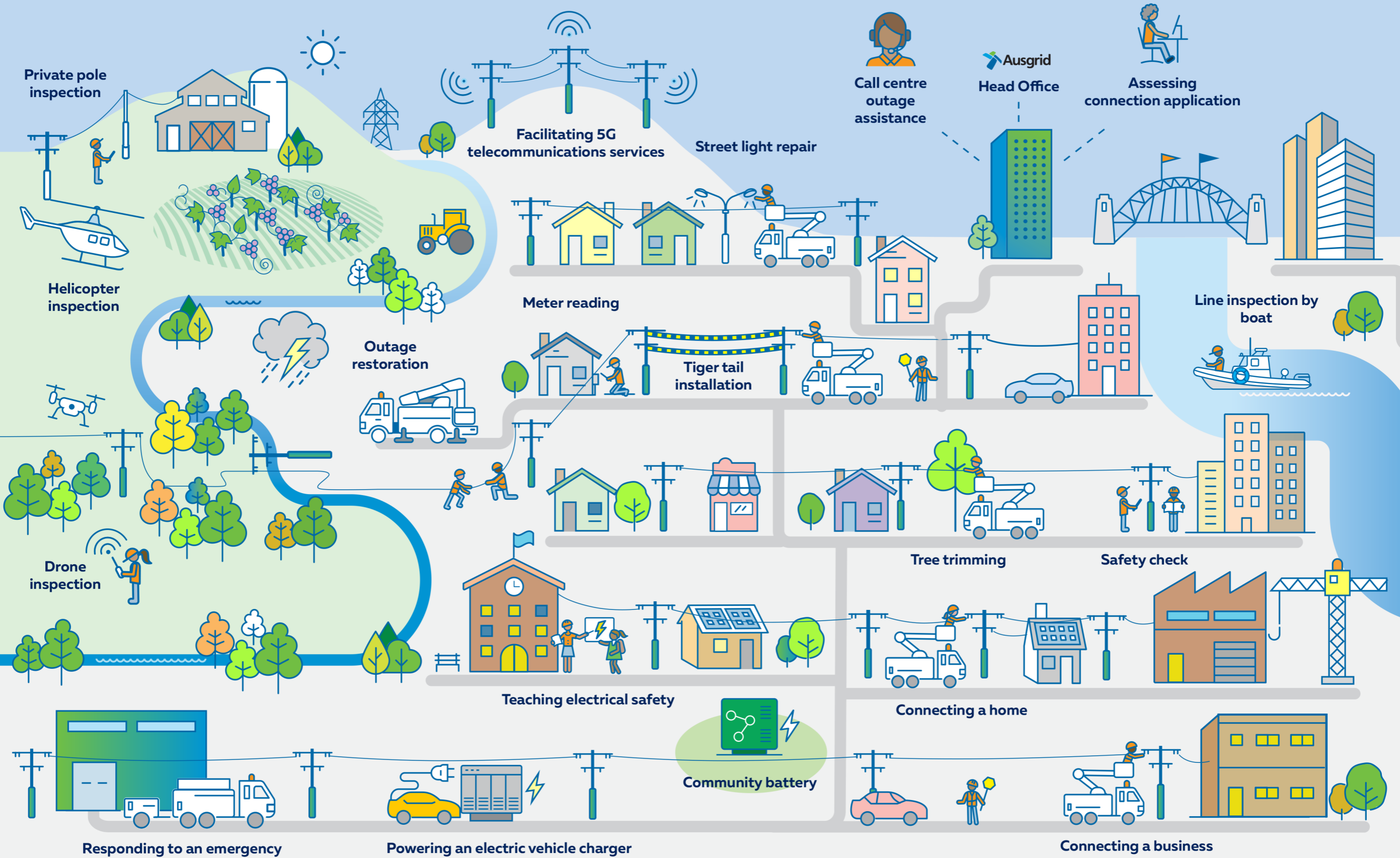
We meet these obligations with investments that address our customers' requirements for safe, affordable, reliable and sustainable network services.

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 Our purpose is 'connecting communities, empowering lives.'	Our Vision Our vision is for communities to have the power in a resilient, affordable, net-zero future.	Our Values <ul style="list-style-type: none"> » Work safe, live safe » Customer-focused » Commercially minded » Collaborative » Honest and accountable » Respect
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Our Role in the Community

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





Purpose of the Distribution and Transmission Annual Planning Report

This Distribution and Transmission Annual Planning Report (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 200 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 2022 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 Distribution Annual Reporting Requirements 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 subtransmission 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.

Disclaimer

Ausgrid, registered as both a Distribution and Transmission Network Service Provider, provides this DTAPR 2023 under National Electricity Rules (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 may not contain all necessary information for prospective investors or participants. Ausgrid does not consider individual investment objectives, financial situations, or specific needs. Therefore, readers and users should independently verify the information for accuracy, completeness, reliability, and suitability.

Ausgrid makes no guarantees regarding the accuracy, reliability, completeness, or suitability of the information in this document. Readers and users acknowledge that Ausgrid, its employees, agents, and consultants assume no liability, except as required by applicable statutes.

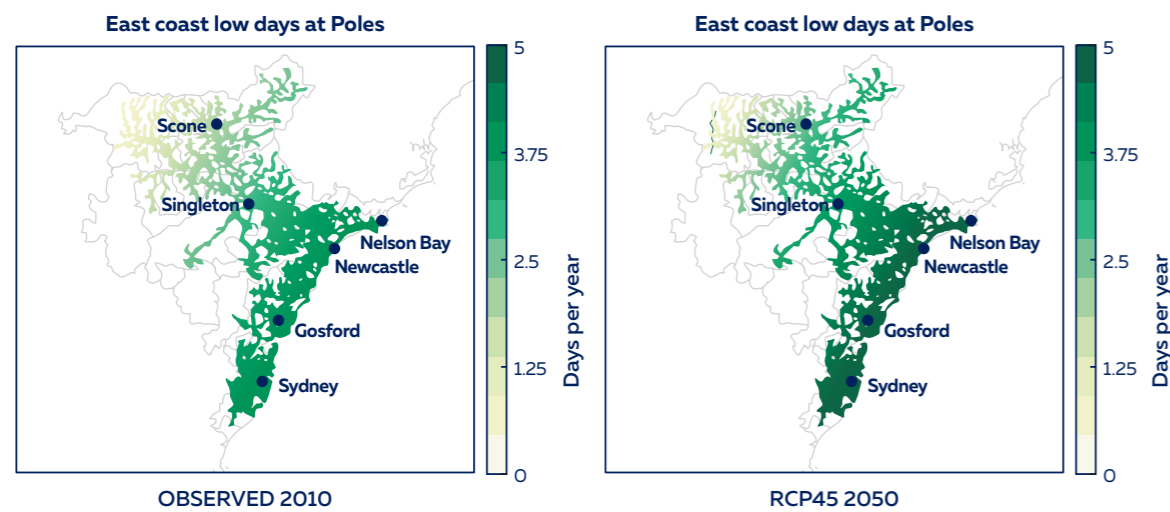


Upcoming Challenges – Building Resilience to Climate Change

Building resilience to climate change involves developing strategies, actions, and policies to enhance the ability of communities to withstand, adapt to, and recover from the challenges and disruptions posed by climate change.

Weather and climate extremes pose a significant danger to Australia's electricity network. Human-induced climate change is amplifying the frequency and intensity of certain extreme events, further aggravating these risks.

- Australia will experience higher temperatures, and intensified storms, floods and bushfires due to climate change.
- Actions to mitigate temperature rises through electrification make building resilience of our network even more important
- Our customers have made it clear that resilience is a priority that they want us to invest in.



To better understand the growth in Ausgrid's climate risk profile to 2050, we commissioned climate scientists to establish an understanding of the climate risks in our operating region. The climate risk assessment showed that the areas with the biggest exposure from climate change is from windstorms in the coastal regions. Under the mid-range climate scenario (RCP4.5) the increasing speed of maximum wind gusts and rising frequency of major storm events to 2050 due to climate change, when combined with Ausgrid network and load data, has been shown to result in a ~1% per annum increase in asset repair and unserved energy costs across Ausgrid's 11kV distribution network. Ausgrid has proposed adaptation investments as part of our Regulatory Proposal to mitigate this increase in risk.

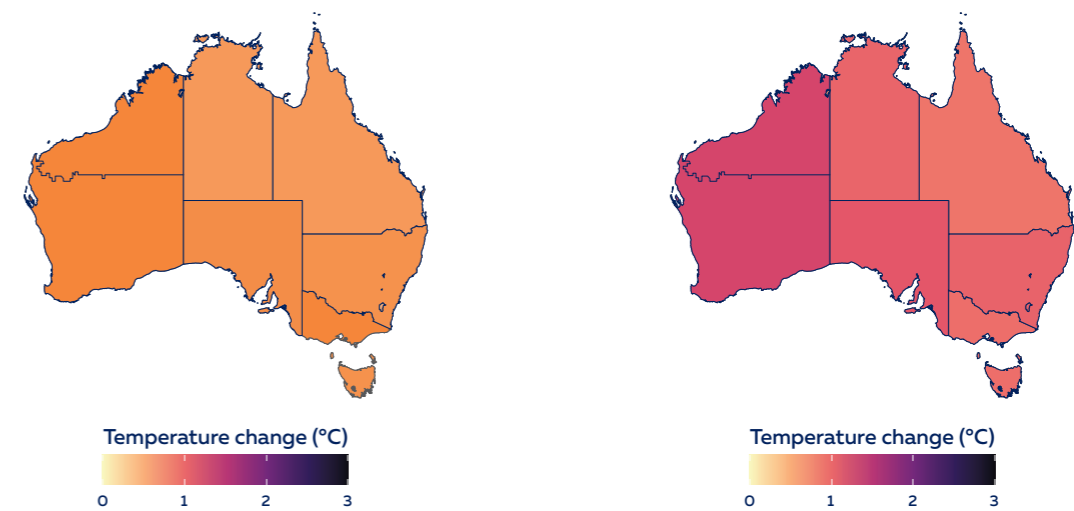
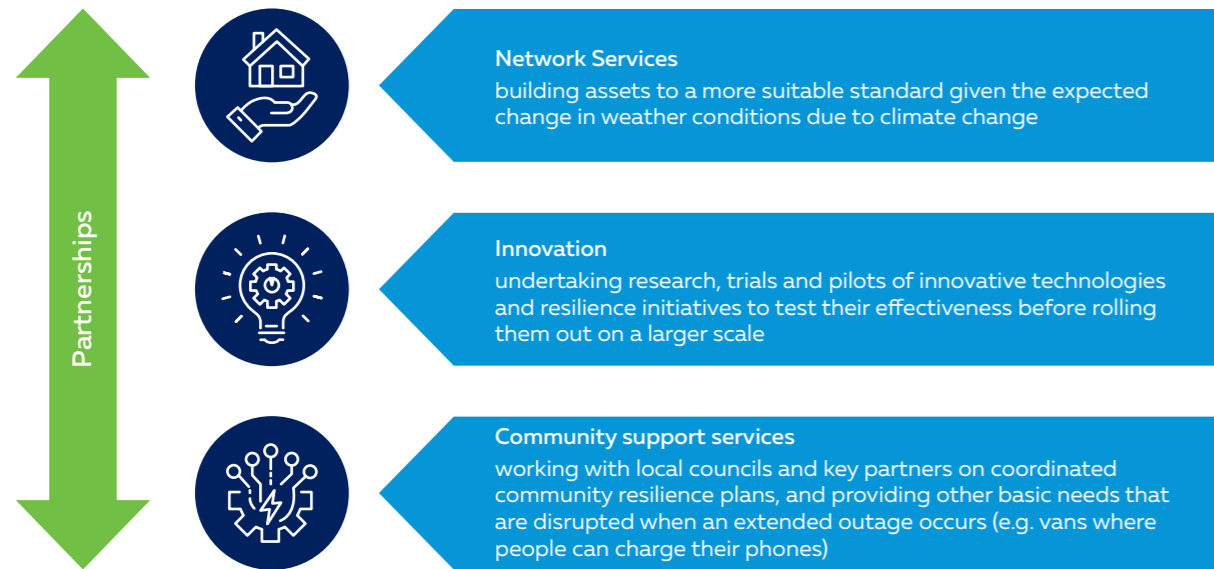


Figure 1-1 Changes in temperatures under 2 and 3 degrees Celsius in the long term. Based on Bureau of Meteorology data provided for the Intergenerational Report 2023 – Australia's future to 2063

Spectrum of Resilience

Building climate resilience involves reducing the risks associated with increasing severe weather events, including more network outages, as well as bolstering our capacity to aid communities during such outages whilst promptly restoring power. In crafting resilience strategies, Ausgrid intends to implement targeted solutions that address distinct resilience requirements.

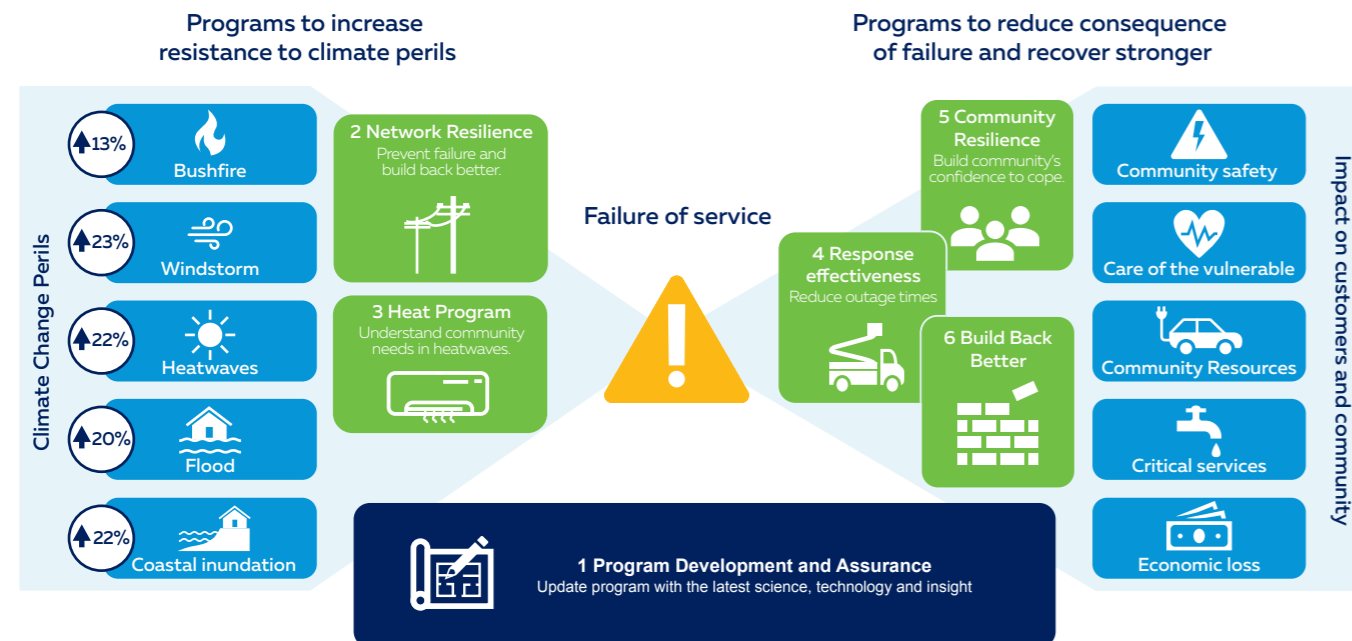


Climate Resilience Initiatives

Ausgrid already has programs for resilience and works with emergency service partners to prepare for these events. The Climate resilience program is about preparing for the future on top of what we already do. Ausgrid has codesigned this proposal with customers, including deep engagement with communities to understand the solutions they prefer.

Ausgrid has a holistic approach to preparing for the climate change risks including programs to:

- Improve our understanding of climate change risk;
- Improve resistance to climate perils;
- Reduce the consequence of failure, and to recover stronger.



Approaches to building resistance to climate perils include:

- Installing stronger powerlines in areas with large amounts of vegetation, by replacing bare conductors with covered conductor technology and introducing segmentation in the network via interrupters/reclosers.
- Considering of undergrounding segments of the network.

Approaches to reducing consequence of failure include:

- Improving the way we share data with Emergency Services for better multi agency response.
- Understanding the needs of our customers.

Approaches to build back stronger include:

- Investments in bushfire resistant poles.



SAPS & Microgrids

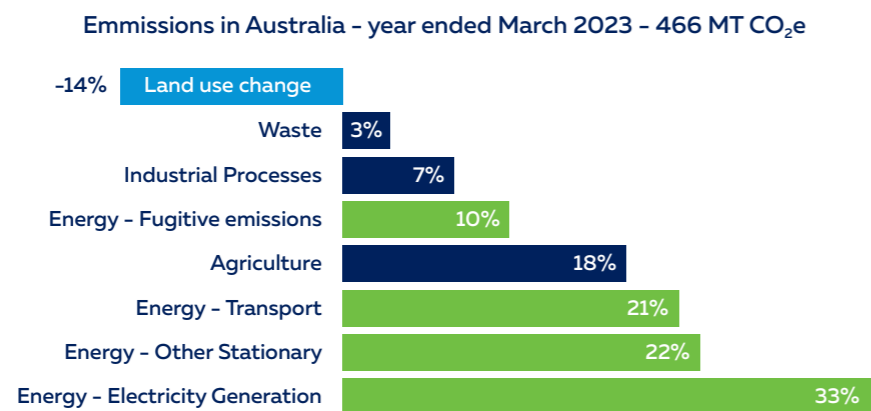
- Ausgrid is investing in stand-alone power systems (SAPS) or microgrids to reduce outage times for customers and communities as well as reducing risk of fires in bushfire prone areas.
- SAPS are off grid electricity systems, generally comprised of solar photovoltaic arrays, energy storage and backup diesel generators.
- 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.
- 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 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 and replace assets, allowing utilities to effectively provide the updated power solutions for our customers rather than replacing assets like for like.

We are proud to be working in collaboration with partners and the community to prepare for the future.

Transitioning to Net Zero

The energy sector is the main source of greenhouse gas emissions, making it imperative to transition to renewable energy sources to mitigate the impacts of climate change. Net zero is a state where the overall emissions balance is zero by 2050. Many sectors of the economy will have achieved zero emissions by that time.

Ausgrid is taking measures to support this transition. A net-zero future presents opportunities for Ausgrid, as greater electrification will be achieved by switching transport and household fuel consumption powered from fossil fuels to electricity from renewable sources. Significant efforts will also be made to support the connection of new renewable generation into the network.



Source: Australia's National Greenhouse Accounts
Australian Government, Department of Climate Change, Energy, the Environment and Water

Greater Participation of CER in the Energy Market



The number of Customer Energy Resources (CER) in our Network will double, from 0.75 Million in 2023 to 1.50 Million in 2030.

Ausgrid expects that by 2030:

- Solar customers will increase from approximately 250,000 to more than 400,000.
- Household batteries will increase from approximately 17,000 to more than 130,000.
- Electric Vehicles (EVs) using our network will increase from 3,000 to more than 500,000.

The consequence of this is the decentralisation of supply. The original one-way energy flow design of our network must evolve to manage bi-directional energy flows. Whilst CER can provide significant benefits to customers in terms of participation in energy markets, it also brings technical challenges for Ausgrid's network in terms of hosting capacity, network overloads and curtailment.

Actions to support an efficient transition to net zero and greater CER integration are outlined below.

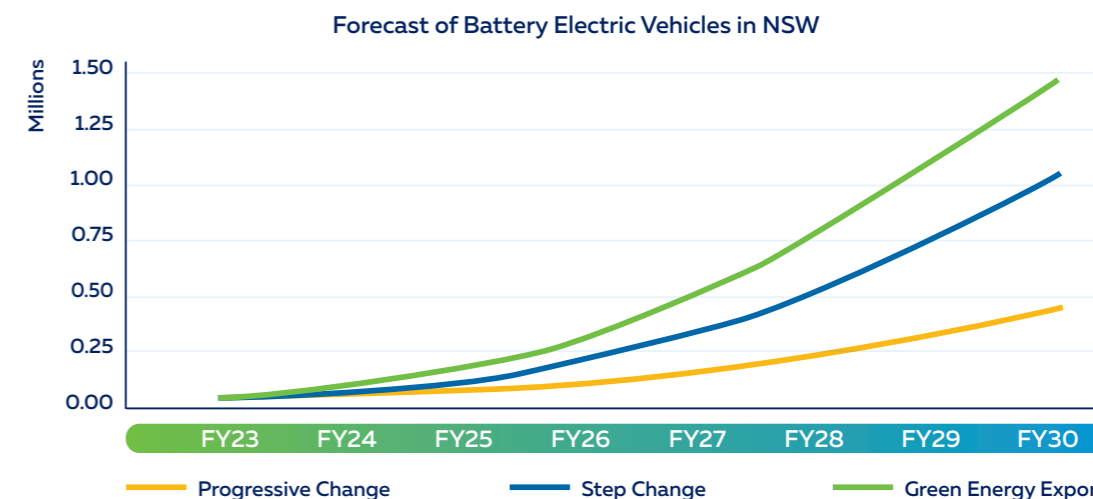
Encouraging Adoption of Electric Vehicles

- 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.
- EVs circulating in NSW are expected to increase from approximately 30,000 vehicles in 2023 to over 1 million vehicles by 2030 (based on AEMO's Step Change scenario). At least half of these vehicles will be using Ausgrid's network.



Ausgrid has the objectives of:

- Building and operating a fleet of 10,000 curb side EV chargers by 2030, in partnership with local city councils and
- Continuing the roll out of JOLT EV charging stations providing up to 7KWh of free, fast charging for drivers.



Source: Australian Energy Market Operator (AEMO)
2023 Inputs, Assumptions and Scenarios Report - July 2023

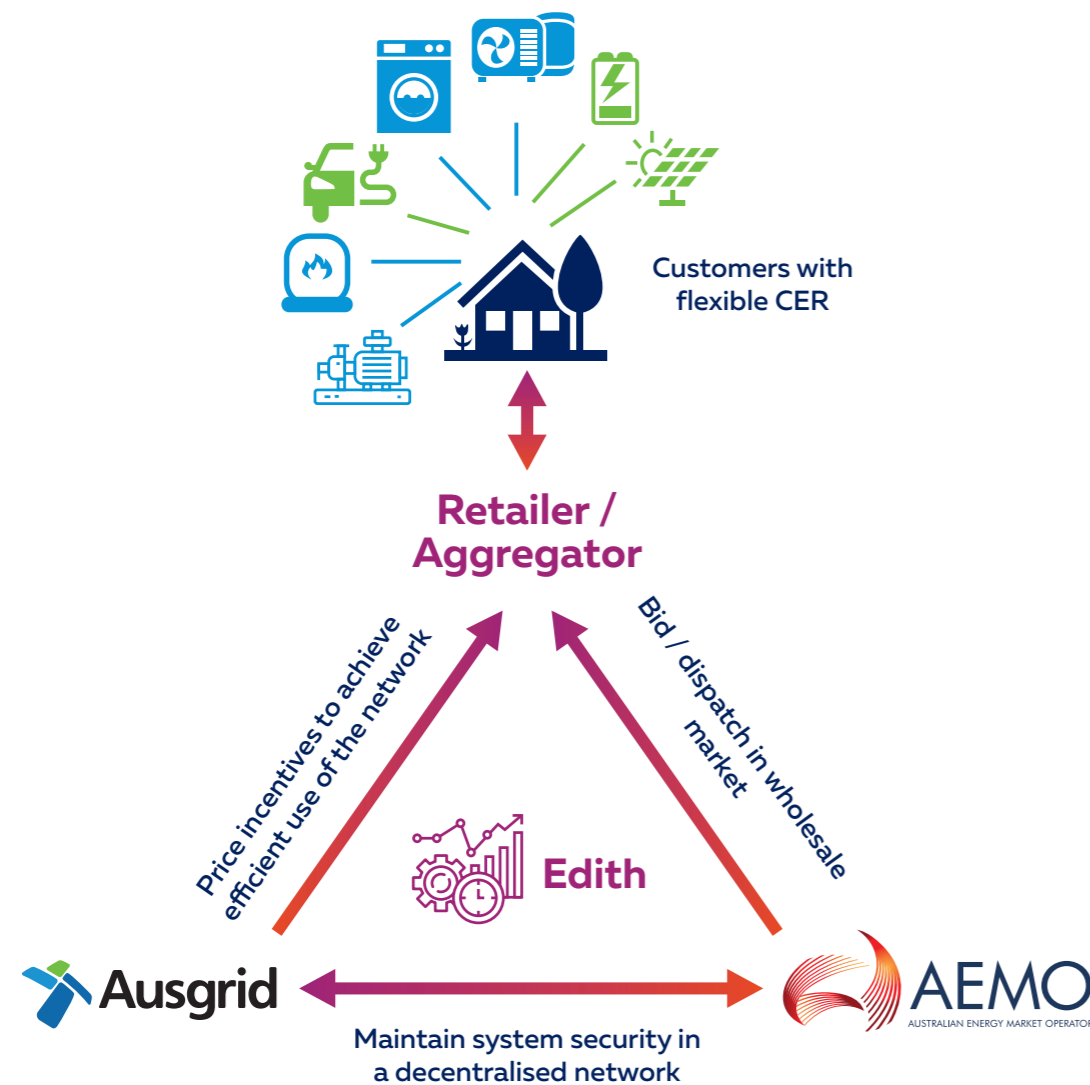
Accelerate Electrification

To help those households that cannot afford their own home batteries, Ausgrid has the objectives of:

- Installing community batteries up to 250KW / 500KWh in the low voltage network, and
- Installing 5MW /10MWh Battery Energy Storage Systems in the 11kV network near substations, to provide storage services to local residential and small business customers.

In addition to find ways to store energy, customers will be encouraged to participate in energy markets. Traditional network tariffs and static export limits can create barriers. To support the shift to a two-sided market, Ausgrid has the objective of:

- Improving network access and trade opportunities by using dynamic operating envelopes (changes in network limitations from variations in generation output and loads) instead of static limits defined at peak times only.
- Implementing dynamic pricing options for customers with flexible CER managed by an aggregator to encourage them to shift loads and provide support in case of constraints.
- Implementing a decentralised approach for managing network capacity at a local network level.
- Offering tailored connection agreements to customers with significant flexibility in how they use the network, to reward such efficient performance.
- Using network assets and CER to dynamically manage voltage across the network.



To help communities achieving greater electrification from sustainable sources, Ausgrid is expected to:

- Co-install solar arrays in places of interest for local communities, in coordination with councils.
- Increase LED rollout for public lighting.

To further reduce our carbon footprint, Ausgrid will continue to:

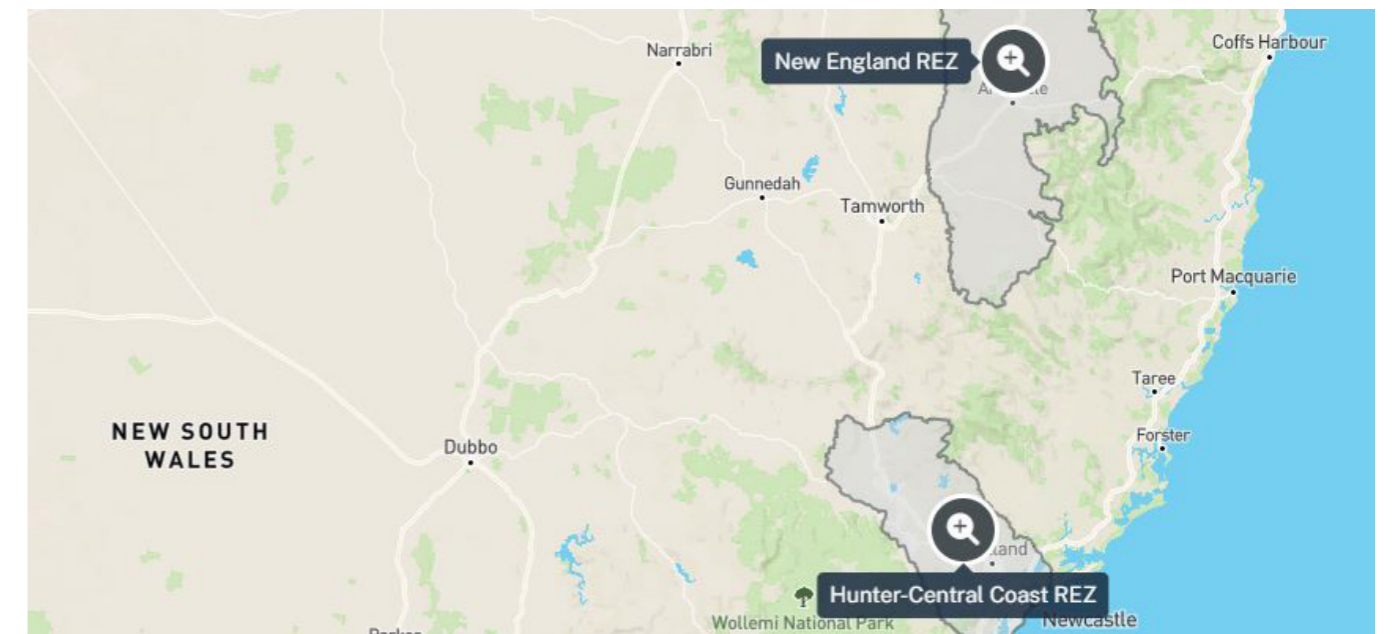
- Upgrade the fleet of passenger vehicles with EVs or hybrid vehicles to reduce fleet emissions by 40%.
- Expand EV trials to excavators, utility vehicles and trucks.

Support the Connection of New Renewable Generation

Ausgrid has made proposals to the Energy Corporation of NSW (EnergyCo) to upgrade the transmission network in the Hunter – Central Coast Renewable Energy Zone (HCC REZ), to enable the connection of up to 1GW of renewable generation capacity and large-scale battery storage systems.

Proposals will also be submitted to EnergyCo to participate in the New England REZ, with transmission network solutions to unlock opportunities to transport renewable energy to consumers locally and other regions across NSW.

Source: <https://www.energyco.nsw.gov.au/renewable-energy-zones>



Providing Efficient Infrastructure

Significant investments in the transmission and distribution network are required to connect large scale renewable generation and batteries to the grid.

Long timeframes are required to deliver such large investments. Land acquisition and easements, planning and environmental approvals, equipment procurement and installation works are expected to take multiple years or even decades. Most large-scale projects in the transmission network may not be commissioned before 2030.

Distribution networks are key to achieve a cost-effective transition to net zero. Upgrades and augmentations can be made in the short to medium term to host renewable sources and better exploit available capacity of distribution networks.

Ausgrid is proposing a combination of transmission and distribution infrastructure that supports renewables by storing capacity when renewables are generating and dispatching electricity otherwise.

There is considerable potential to firm up solar generation in urban areas given the high density of solar PV installations expected, by:

- Installing 50kW / 65kWh batteries on poles and 250kW / 500kWh batteries connected in the LV network.
- Installing 5MW / 10MWh batteries with small footprint in public spaces or within substations
- Installing 100MW / 200MWh batteries adjacent to large substations. This may avoid the need to acquire additional land and/or easements, which in turn reduces community impacts.



The distribution network can host and better exploit available capacity in the middle of the day. Ausgrid will seek opportunities to get the most of batteries located in distribution networks. Economies of scale can be achieved in this area.

The deployment of smart meters will also contribute to bring material benefits to residential and small business customers.

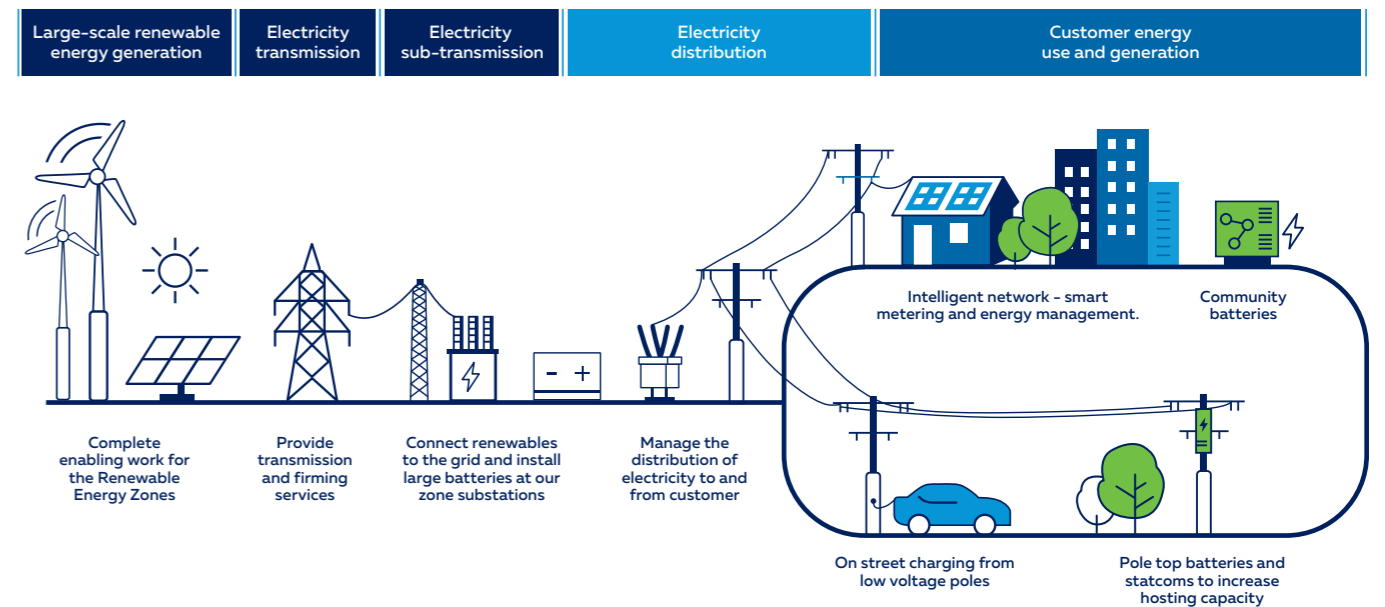
With the combination of this infrastructure and tariff incentives, a solar customer would be able to export surplus power to the community battery without paying transmission and distribution charges, and in exchange for that be able to import power from the battery without paying transmission and distribution charges.

This will make access to energy storage more equitable for customers who cannot afford behind-the-meter batteries, are renting, or live in an apartment building. They may also provide energy support for essential services during emergencies.

Significant progress can be made in providing these options to small customers within the next five years.



The Future Network



Providing an Affordable Service

Affordability is becoming an increasing challenge, primarily due to factors outside our control:

- Escalating expenses driven by inflation and surging interest rates;
- The potential effect of added investment in transmission and generation costs on energy bills; and
- Balancing the delivery of net zero with affordable electricity for all customers.

Our goal is to reduce network expenditure and enhance customer affordability, all while facilitating a smooth transition for customers towards cleaner energy alternatives. To achieve this, Ausgrid will work on:

- Equitable net-zero transition for all customers, by making investments that extend benefits to those who live in apartments, social housing or rented properties.
- Reducing the need for traditional network upgrades, by implementing coordinated management of CER, at a scale that can help reduce network constraints.

Value for our Community

Amplify Value	Powering Progress	Stakeholder Synergy
<ul style="list-style-type: none"> • Delivering value-for-money services to grow our asset base, meet stakeholder expectations and enhance our value proposition. 	<ul style="list-style-type: none"> • Increase grid capacity and improve asset management resilience strategies. • Drive technology advancements and operational efficiency for revenue growth. 	<ul style="list-style-type: none"> • Foster stakeholder engagement to secure investment for improving grid services while maintaining focus on high-value, aligned opportunities.

Ways to Improve Affordability

Ausgrid is committed to:

- Reduce operating expenditure utilising a productivity target in our proposed operating cost allowance.
- Apply risk management to make prudent investment decisions on our network assets.
- Reduce Regulatory Asset Base (RAB) value per customer over the coming years in real terms. This includes the capital expenditure required to deliver a safe/reliable supply, better customer experience and net zero, as well as the operating expenditure to support our operations.

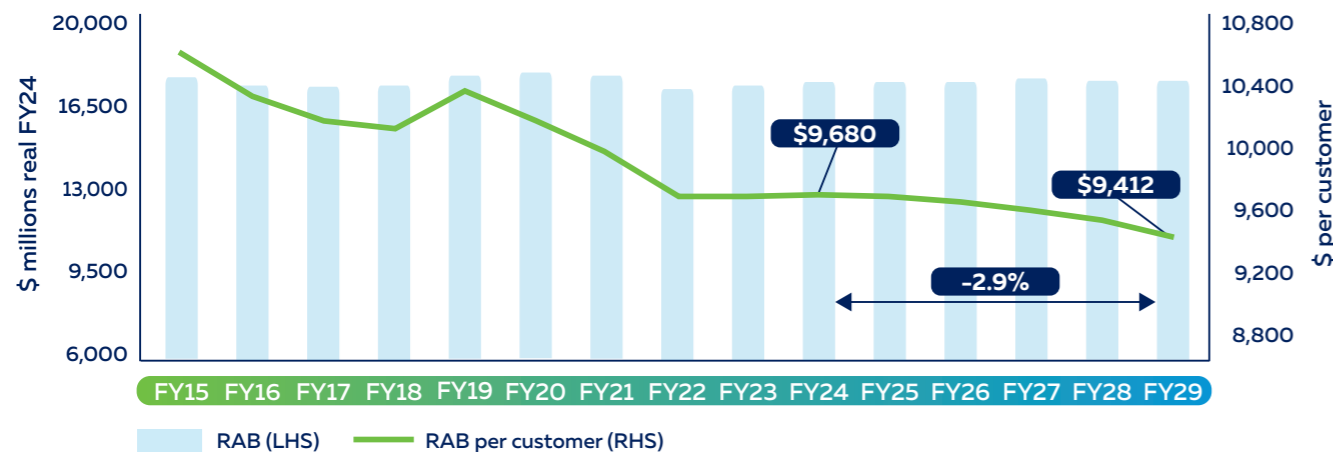
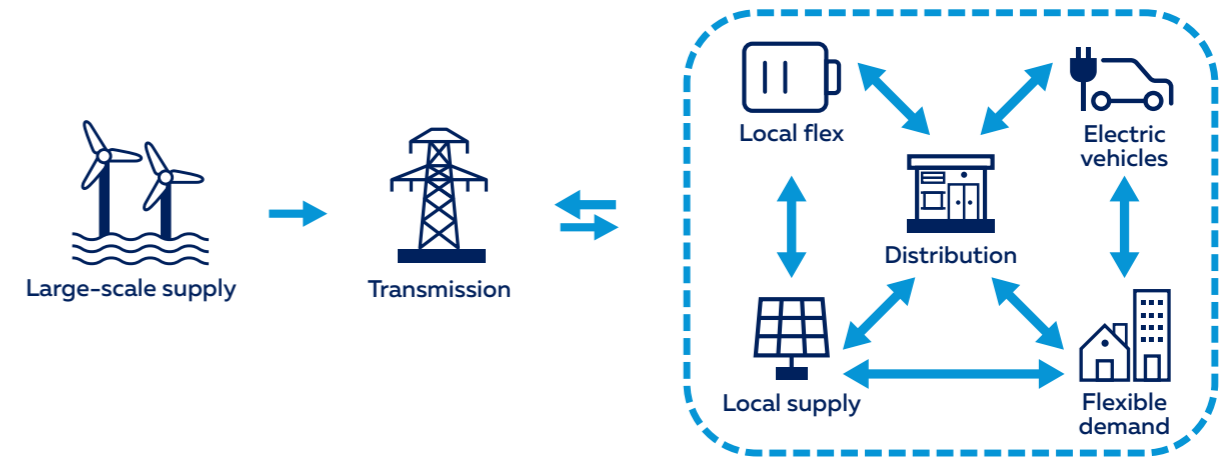


Figure 1-2 - Asset Value and Asset Value per customer

In terms of tariffs:

- Since July 2022, Ausgrid has been trialling innovative tariffs for 2-way energy flows, flexible loads and community batteries.
- From July 2024, Ausgrid will introduce export pricing with both a charge and a reward component, giving CER customers incentives to adjust the timing of their energy exports to reduce costs and increase the benefits of their exports for themselves, as well as for the whole energy system.



Risk-Based Approach Investments to Support our Governance Processes

Our evaluation and governance approaches are industry best practice to deliver an efficient and reliable operation, meeting regulatory obligations and the needs of customers.

- We have tools capable of analysing network assets performance, to support optimised decisions from a life cycle perspective.
- We apply a sustainable level of investment that prevents current and future customers facing materially different levels of costs and risk.
- Post-implementation reviews are conducted to continually learn and improve our asset management strategies.



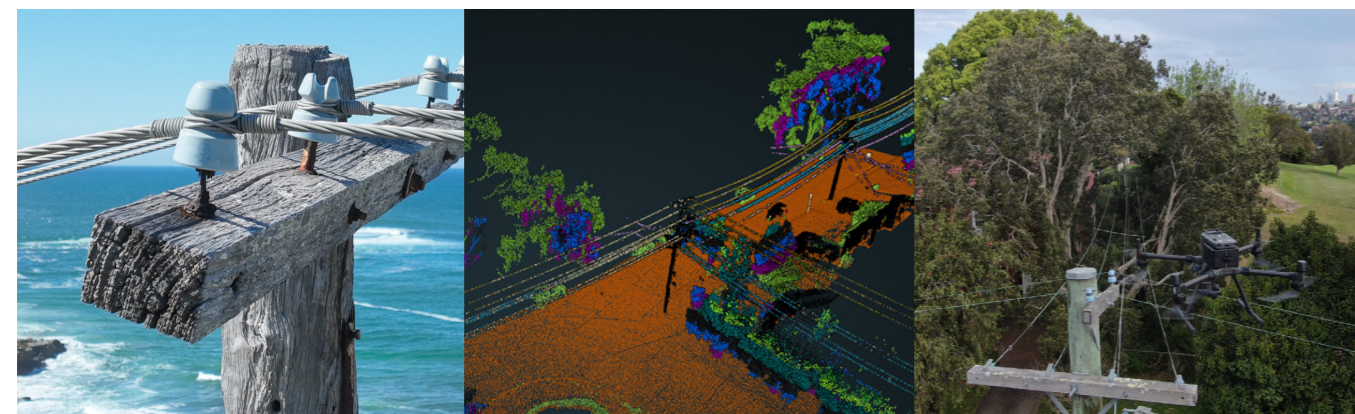


Continuing the Path to Digitisation

Streamlining our core Information Communications and Technology (ICT) platforms is crucial for delivering faster and more efficient services. Digital advancements offer opportunities to enhance service delivery, provide innovative service offerings, and simplify customer interactions. Our aim is to improve customer experience, including enhancing outage information, simplifying connection processes, and supporting delivery partnerships.

To achieve this, we plan to:

- Empower customers with more choice and ability to manage their energy costs;
- Offer high quality personalised support;
- Enhance how we share data with our delivery partners, to enable more seamless interactions and smoother service delivery to our mutual customers, and in turn develop a coordinated approach for building consumer trust in the energy sector; and
- Automate manual processes to reduce errors, save time and resolve customer issues more quickly.
- Smart meter data – Used to assess solar hosting capacity, monitor and resolve power quality issues and identify network issues.
- Drone technology – Employing drones alongside helicopters to conduct bushfire safety checks on the network.



A Cyber-Safe Digital Transformation is Critical to Keep Pace with Customers' Evolving Service Expectations while Delivering Efficiently for Customers.

Cyber resilience

- Increasing frequency and sophistication of cyber-attacks pose.
- Risks to network reliability and customer data. In 2021, Australia experienced a cyber-attack every eight minutes (source: ACSC).
- Growing digital footprint and device connectivity amplify potential consequences of cyber threats.
- A catastrophic cyber-attack on our network (which includes Sydney CBD) would have social, economic, health and even geopolitical ramifications for Australia.
- Balancing advanced customer experience with a secure network and robust cybersecurity measures is a priority.
- To manage cyber threats, NSW regulations mandate 'best industry practice' for limiting network and ICT systems to be accessed, operated and controlled from within Australia.
- Ausgrid is actively aligning safeguards with industry standards and complying with amended Commonwealth Security of Critical Infrastructure Act 2018 requirements.

How we manage cyber security

- Our Control System Security Strategy safeguards the operational technology of our electricity network and is regularly refined for best practice alignment.
- Ausgrid strengthens cyber resilience through staff education, a rigorous vulnerability management program and implementing multiple layers of defence.
- We delivered upgrades of Electronic Access Control Management Systems and video surveillance system technology at Ausgrid substation, depot and corporate sites to bolster physical and personnel safety.
- We conducted 'see something, say something' and 'site secure habit' awareness sessions across the business.

Network Investments

This section outlines activities related to the application of the Regulatory Investment Test for Distribution (RIT-D) to network investments.

RIT-D assessments completed in the preceding year

Region	Constraint	Project Name	Expected Project Completion	Estimated Cost (\$m)	RIT-D completion date
Sydney	Load Growth	11kV augmentation in the Circular Quay load area	Dec-24	15.0	20/08/2023
	Asset Condition	132kV feeders 9SA 8 92P replacement 8 Loop Zetland ZS into feeder 92P	Sep-25	37.1	12/01/2023
	Asset Condition	132kV feeders 923 & 924 Strathfield TP - Burwood ZS replacement	Sep-25	13.2	24/02/2023
	Load Growth	New Macquarie STS Transformer 3	Dec-25	7.4	30/04/2023
	Asset Condition	Milperra ZS 11kV switch gear replacement	Jun-26	13.2	31/05/2023
	Asset Condition	Mascot ZS 11kV switchgear replacement	Jun-26	12.3	05/11/2023

No RIT-D assessments are currently in progress.

RIT-D assessments to be completed in the forward planning period

Region	Constraint	Project Name	Expected Project Completion	Estimated Cost (\$m)	Indicative RIT-D initiation
Distribution Assets					
Sydney	Asset Condition	Blakehurst ZS 33kV feeders rearrangement	Mar-27	14.5	FY25
Sydney	Asset Condition	Pymble ZS 11kV switchgear replacement	Sep-27	15.6	FY25
Sydney	Asset Condition	Willoughby STS 33kV switchgear replacement	Sep-27	22.7	FY25
Sydney	Power Quality	Installation of new Static Compensation at Waratah STS	Sep-27	8.1	FY26
Hunter	Asset Condition	Darlinghurst ZS decommissioning	Mar-28	16.6	FY25
Sydney	Asset Condition	Botany ZS 11kV switchgear replacement	Sep-29	8.7	FY26
Sydney	Asset Condition	132kV feeder 202 Rozelle STS - Drummoyne ZS replacement	Sep-29	17.7	FY26
Sydney	Asset Condition	132kV feeders 203 & 204 Mason Pk STSS - Drummoyne ZS replacement	Sep-29	49.7	FY26
Sydney	Asset Condition	Drummoyne ZS 132kV switchgear replacement	Sep-29	17.6	FY26
Sydney	Asset Condition	Lidcombe ZS 11kV switchgear replacement (Group 1)	Sep-30	15.1	FY27
Sydney	Asset Condition	Paddington ZS 33kV feeders replacement	Mar-31	10.3	FY28
Dual Function Assets					
Sydney	Asset Condition	132kV Feeders 92X and 92C Chullora STSS-St Peters ZS, 91X/2 and 91Y/2	Sep-28	6.7	FY28
	Load Growth	New Wallumatta STS & 132kV Feeders	Dec-28	131.4	FY26
	Asset Condition	132kV Feeders 91A & 91B Beaconsfield BSP to St Peters ZS	Sep-29	20.2	FY28

Indicative RIT-D assessments to be completed beyond the planning period

Region	Constraint	Project Name	Expected Project Completion	Estimated Cost (\$m)	Indicative RIT-D initiation
Distribution Assets					
Sydney	Asset Condition	Leightonfield ZS 11kV switchgear replacement	Sep-32	8.8	2030
	Asset Condition	Campsie ZS 11kV switchgear replacement	Sep-32	35.0	2030
	Asset Condition	132kV Feeder 283/2 Milperra ZS - Revesby ZS	Sep-32	13.8	2030
Dual Function Assets					
Sydney	Asset Condition	132kV Feeder 9FF Beaconsfield BSP - Bunnerong STSS oil section replacement	Jun-34	19.8	2031

RIT-D assessments not proceeding

Region	Constraint	Project Name	Expected Completion	Reason for RIT-D not proceeding
Distribution Assets				
Sydney	Asset Condition	132kV Feeders 9E1 & 9E2 Sydney East-Kuringai STS oil sections replacement	FY25	Only one credible option < \$6m

Completed or cancelled investments during the preceding year

Load Area	Completed Network Investments	Investment Status
Distribution Assets		
Eastern Suburbs	Matraville ZS 11kV switchgear Groups 1, 2 and 4 replacement	Completed
Various	Community Battery Trial	Completed
Terrey Hills and Pittwater	Uprate 33kV feeders S20 & S21 overhead sections	Completed
Upper Hunter	Muswellbrook ZS refurbishment	Completed
Dual Function Assets		
Eastern Suburbs	132kV feeder 265 Bunnerong STSS-Maroubra ZS replacement	Completed

Network investments committed in 2023

Load Area	Committed Refurbishment, Replacement or Augmentation Investments	Expected Completion	Estimated Cost (\$m, nominal)
Distribution Assets			
Maitland	Tarro ZS 11kV switchgear replacement	Jan-25	10.7
Inner West	132kV Feeders 923 & 924 Strathfield TP-Burwood ZS replacement	Sep-25	13.4
Dual Function Assets			
Eastern Suburbs	132kV feeder 264 Beaconsfield BSP-Kingsford ZS replacement	Mar-25	23.3
	132kV feeders 9SA & 92P replacement & Loop Zetland ZS into feeder 92P	Sep-25	25.6

Values excluding contingency

Urgent and unforeseen investments

No distribution or dual function network projects required to address an urgent or unforeseen network issue.

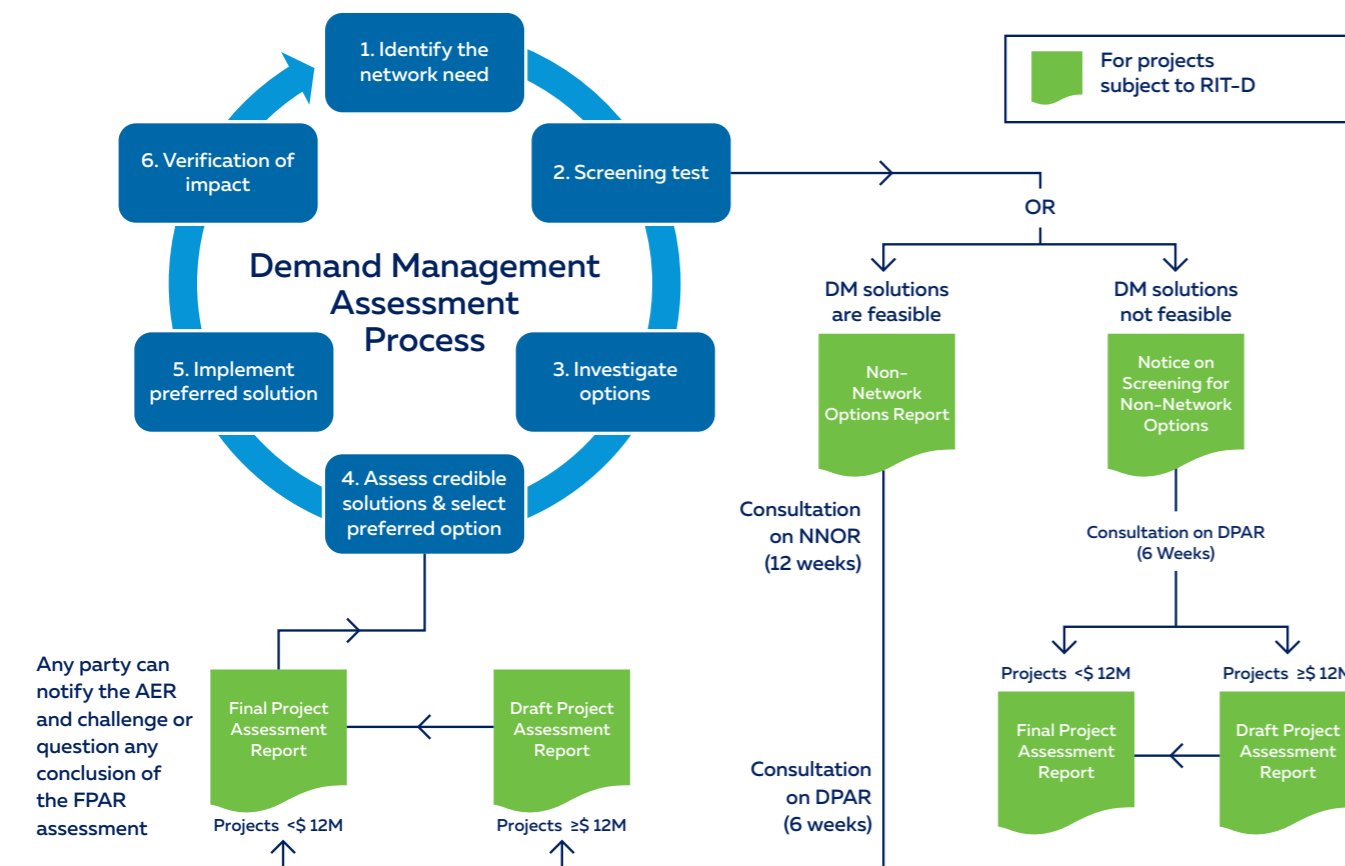
Non-Network Opportunities

When Ausgrid identifies a network limitation, stand-alone power systems (SAPS) and non-network options are considered as an alternative to address the limitation with a network option. The implementation of a non-network option is commonly referred to as demand management.

There are a range of demand management solutions available for use by electricity networks:

- LED lighting upgrade for greater energy efficiency
- Operating appliances at lower power settings for short periods
- Operating embedded generators
- Using battery systems for energy storage
- Power factor correction
- Shifting equipment use from peak to non-peak periods
- Operating customer inverters in voltage support modes

Network options, SAPS, non-network options or their combinations are considered to address network limitations. The goal is to identify the solution which offers the highest net benefit and meets required reliability standards. Ausgrid consults with the community on larger projects about network requirements and potential non-network options. For projects where the cost of any credible options is greater than \$6 million, the Regulatory Investment Test for Distribution (RIT-D) process is followed. The demand management process is illustrated in the figure below.



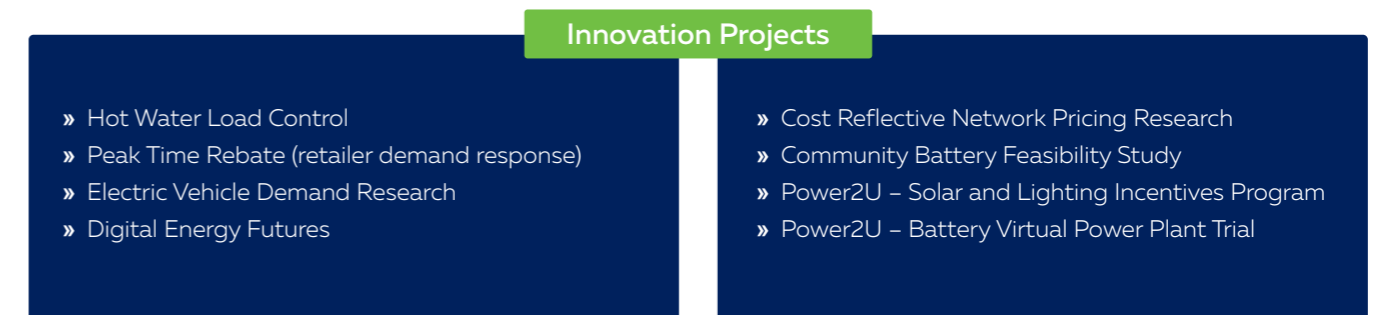
Demand Management Considerations

There are 14 projects in the forward planning period which met Ausgrid's criteria for demand management consideration. A high-level assessment for non-network solutions has determined that no major projects were identified where it was considered likely that demand management would form part of the least cost solution.

It should be noted that the level of analysis is of a high-level nature. A full assessment will be conducted as part of the RIT-D process, including a request for submissions via the Non-Network Options Report or equivalent, for each of the projects listed in the Network Investments section at the relevant time.

Demand Management Activities in 2022-23

There were no demand management projects initiated or implemented in this period that were linked to a network investment need.



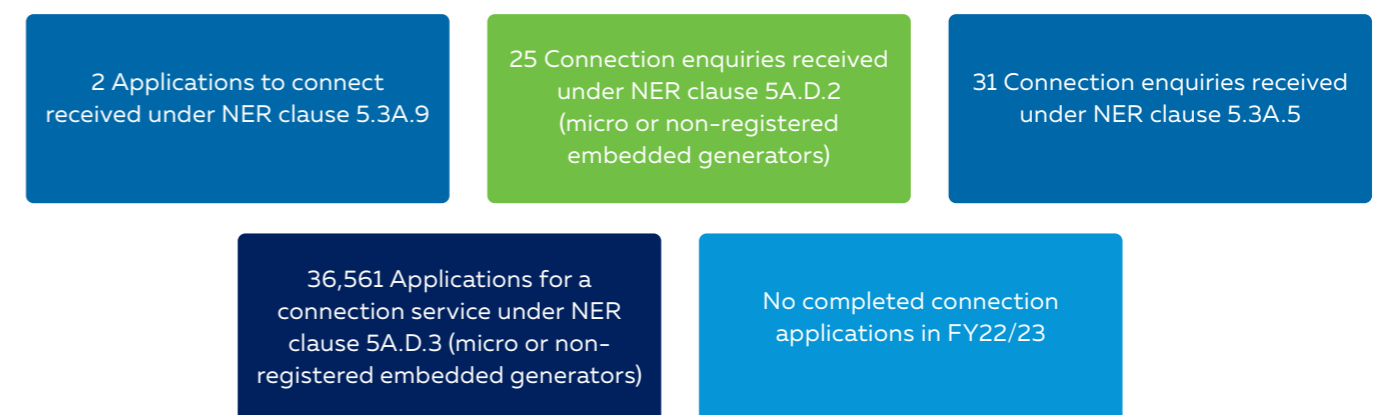
Demand Side Engagement

Our main channel of engagement is the quarterly e-newsletters to inform about demand management initiatives. Past e-newsletters can be viewed on our Keep Informed page at <https://www.ausgrid.com.au/Industry/Demand-Management/Demand-management-news>.

Members of our demand management engagement register were notified about our RIT-D projects and invited to submit comments/proposals. Notifications can be viewed at <https://www.ausgrid.com.au/Industry/Regulation/Network-planning/Regulatory-investment-test-projects>

For further information on our demand management activities please contact us at demandmanagement@ausgrid.com.au

Embedded Generation Enquiries and Connection Applications in 2022-23



Asset Management

Asset Management

Ausgrid has in place an effective Asset Management System and practices applied across all levels of the organisation to align and deliver Ausgrid’s vision. Ausgrid’s Asset Management Objectives consist of:



This approach also ensures we comply with the National Electricity Objective and our regulatory and legal requirements, such as WHS Act 2011 and associated regulations, the Electricity Supply (Safety and Network Management) Regulation 2014 (NSW), the National Electricity Law (NEL) and the Electricity Supply Act 1995 (NSW).

Our asset management system, aligned with AS ISO 55001:2014 adheres to 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.

Risk Management

Ausgrid employs structured risk assessments in accordance with the Risk Management Board Policy and Risk Management Framework. Ausgrid’s asset management approach utilises risk management techniques to support decision making, within the organisation’s Risk Appetite Statement.

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.

A brief overview of significant asset class investment strategies is outlined below:

Subtransmission Cable Strategy

- » Ausgrid has a large amount of sub-transmission cables with the majority operating at either 33kV or 132kV and a small number at 66kV
- » There are four cable technology types used including self-contained fluid filled (SCFF), gas pressure, paper lead insulated and cross-linked polyethylene (XLPE)
- » XLPE cables are the current technology being installed for 33kV, 66kV and 132kV circuits.
- » SCFF, Gas pressure and paper lead cables undergo an extensive cost-benefit analysis to determine retirement/replacement date, based on age, technology, unavailability, condition, restoration/repair time, environmental risks and unserved energy.

11kV Switchgear Strategy

- » Ausgrid has a large number of compound and air insulated switchboards with bulk oil circuit breakers (OCB) in place.
- » To enhance safety, reliability, and prevent secondary asset damage, 11kV oil-filled circuit breakers in zone substations have been replaced with vacuum equivalents where feasible.
- » Application of cost benefit analysis to the age and condition issues associated with 11kV compound switchboards, confirm that these are approaching end of life.
- » Currently internal arc classified switchgear is being installed in substations as the industry standard.

Additional Replacement Programs

- » Condition based replacement of poles,
- » Replacement of higher risk overhead conductor types,
- » Reconfiguration of low voltage dedicated circuits (conversion to regular mains supply),
- » Replacement of low voltage underground cable types with conditions/reliability issues, and
- » Replacement of poor condition switchgear, transformers and protection systems.

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 2021/22 financial year was 3.46%¹.

¹ The distribution network losses are reported at the end of each calendar year, using the previous financial year’s accumulated loss data.

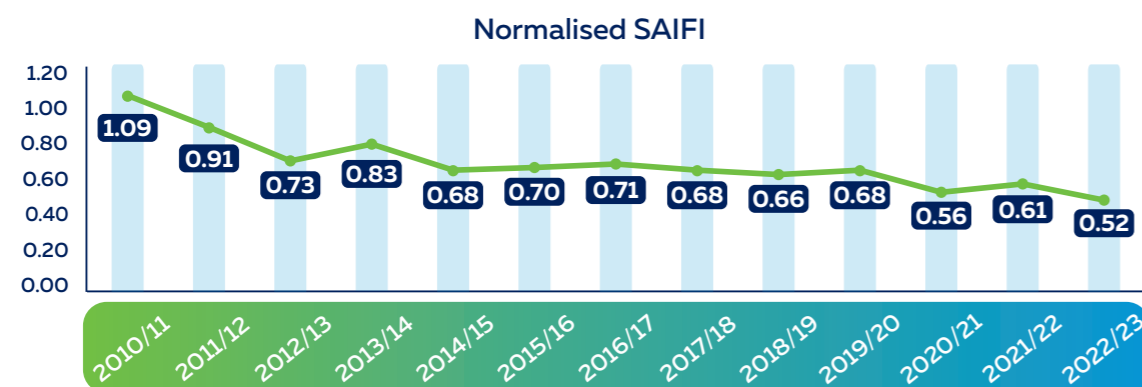
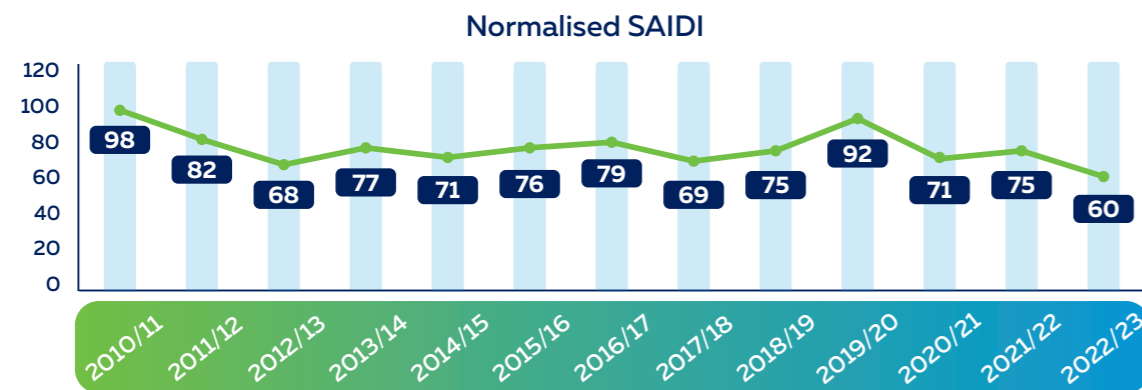
Network Performance

Network Supply Reliability Performance in the Preceding Year

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.

SAIDI & SAIFI Performance

The following graphs depict the normalised (i.e. Major Event Days data excluded) SAIDI and SAIFI trends over the period 2010/11 to 2022/23.



Major Event Days

Ausgrid uses the methodology described in IEEE 1366 standard for defining Major Event Days, as outlined in the R&P licence conditions and AER STPIS Definitions. There were four Major Event Days for 2022/23.

Major Event Days During 2022/23		
Date	Excluded SAIDI	Cause of Major Event Day
3/07/2022	5.49	Storm
5/07/2022	10.21	Storm
9/02/2023	3.69	Storm
18/02/2023	6.18	Storm

Quality of Supply Standards

Ausgrid makes best endeavours to provide a service that meets quality of supply standards of our electricity network within available funding, asset conditions and utilisation. Ausgrid's network standard NS 238 Supply Quality² sets out Ausgrid's standards for Quality of Supply which customers can expect from the network. Ausgrid does not control the frequency supplied through its network. The Australian Energy Market Commission (AEMC) establishes standards and regulates the frequency of supply³ on the national grid.

Corrective Action Planned to Meet Quality of Supply Standards

Supply Voltage

Measurements on the LV network indicate that several sites exceed the V99% target voltage as per AS 61000.3.100. Ausgrid has Smart Meter voltage measurements, focusing mainly on solar installations.

As part of the 230 Volt transition, Ausgrid is currently taking numerous activities to improve voltage issues and ensure network compliance. These include:

- Developing analytical tools combining network models with measurements to address voltage challenges due to increasing CER capacity.
- Lowering of the zone substation 11kV float voltages.
- Adjusting distribution transformer tap settings and phase balancing to deliver the correct 99th percentile voltage (to AS 61000.3.100) as part of the voltage management initiative including network investments, digital capabilities and incentives.

Flicker, Harmonic and Unbalance

Ausgrid monitors customer complaints and resolves any supply quality issues as they arise.

² <https://www.ausgrid.com.au/-/media/Documents/Technical-Documentation/NS/ns238.pdf>

³ <https://www.aemc.gov.au/australias-energy-market/market-legislation/electricity-guidelines-and-standards/frequency-0>



Network Demand & Limitations

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 of the main DTAPR.

Dual Function Assets

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 the system configuration as at the beginning of the regulatory period.

Changes in dual function asset status

There have been no changes in dual function asset status since the publication of the December 2022 DTAPR.

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.

Completed new dual function connection points

Ausgrid 132kV feeder 265 Bunnerong STSS to Maroubra ZS has been completed.

Proposed augmentation of existing dual function connection points

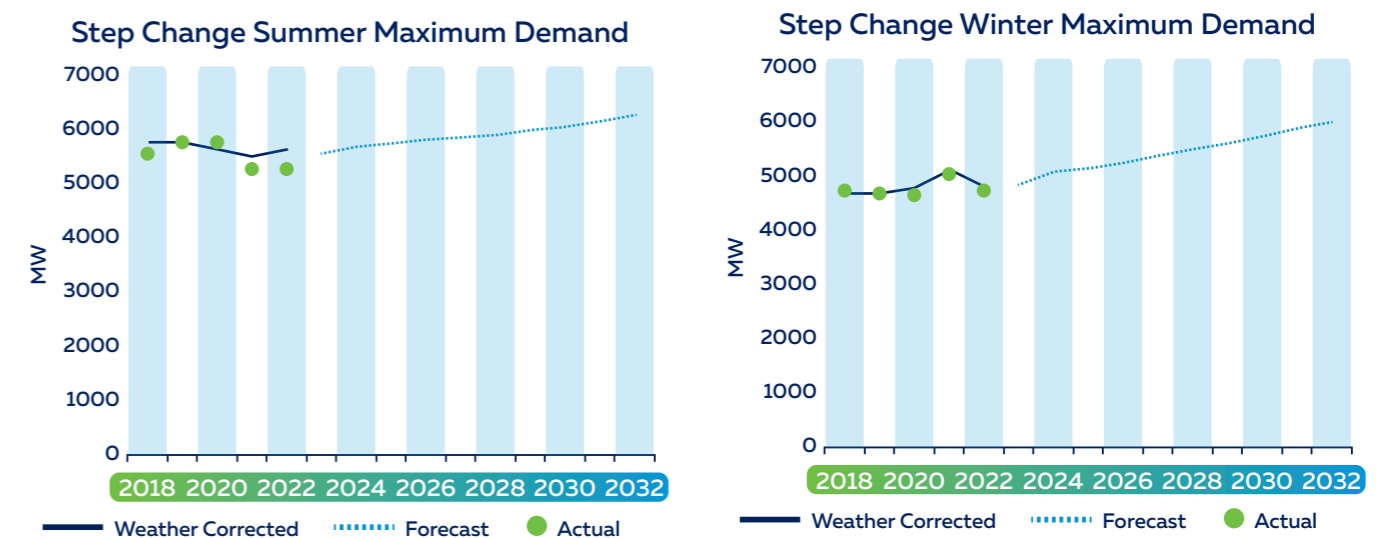
Ausgrid has identified the need to install a third 132/33kV transformer at Macquarie 132/33kV STS due to load growth.

Proposed new dual function connection point

Due to concurrent formal connection enquiries from multiple data centre customers with significant load requirements, Ausgrid has identified the need to install a new shared asset in the form of a 132/33kV STS in the Macquarie Park area.

Ausgrid System Total Maximum Demand Forecasts

The forecast system total summer maximum demand and the system total winter maximum demand is shown below. Each chart displays the actual and weather corrected actual maximum demand to 2021/22 and the 50% Probability of Exceedance (PoE) forecast maximum demand Step Change scenario from 2022/23 in megawatts (MW).





Planning Coordination

Joint Planning is carried out with other Network Service providers, in particular Transgrid, Endeavour Energy and Essential Energy. Three-way joint planning exists between EnergyCo, Transgrid and Ausgrid. It was established to jointly develop the NSW Electricity Infrastructure Roadmap in the Hunter-Central Coast Renewable Energy Zone (HCC REZ).

Joint Planning Completed in 2023	
Transgrid	<p>Sydney Inner Metropolitan Transmission Load Area</p> <p>The Sydney Inner Metropolitan transmission network faces constraints in two critical areas:</p> <ol style="list-style-type: none"> 1. Transmission Corridor 1 ('TC1') - Transmission supply into Beaconsfield BSP from Bulk Supply Points at the edge of the city, Sydney South, Sydney North, and Rookwood Rd BSP. 2. Transmission Corridor 2 ('TC2') - 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. <p>Both corridors have limitations due to the age and condition of existing circuits, including reduction in capacity of cables. The preferred strategy after consultation is the Powering Sydney's Future strategy. Commissioning of the first stage was completed in June 2022. This includes the first 330kV cable and operating 330kV cable 41 at 132kV. The first stage of decommissioning Ausgrid's cables has been completed.</p>
	<p>Other Transmission Load Areas</p> <ul style="list-style-type: none"> • Three out of the four the transformers at Sydney East BSP were nearing the end of their serviceable life. As a result, one transformer was replaced with a new transformer, the second transformer was replaced with an existing transformer from Rookwood Road BSP this year, and the third transformer was retired. • Minor upgrades on the 132kV busbar at Transgrid's 330/132kV BSP will be performed to manage system fault level increase from the connection of Hunter Power Station. • Ausgrid shall reconfigure the 132kV network at Merewether STS to remove the network parallel between Newcastle and Waratah West 330/132kV Bulk Supply Points.
	<p>Voltage Planning</p> <p>Voltage specific joint planning stream has continued this year. This concept provides for a BSP to LV customer planning approach for our whole network whilst aligning with the upstream Transgrid voltage requirements, resulting in improved voltage issues and DER hosting capacity.</p>

Joint Planning Completed in 2023	
Transgrid	<p>Embedded Generation Planning</p> <p>The following large embedded generator and Battery Energy Storage System (BESS) connections to the Ausgrid network has and will require joint planning and assessment with Transgrid:</p> <ul style="list-style-type: none"> • Muswellbrook 150MW BESS • Muswellbrook Coal 135MW Solar Farm
Endeavour Energy	No network issues were identified that affect either Endeavour Energy or Ausgrid.
Essential Energy	<ul style="list-style-type: none"> • Ongoing discussion to clarify ownership of assets near network boundaries, identify assets correctly and report them to IPART. • Increasing levels of solar penetration within both networks needs to be monitored, including the emergence of BESS to be connected within Ausgrid's network over the next year (at Brandy Hill Zone Substation) that also supply Essential Energy customers.
Planned Joint Network Investments	
Transgrid	<ul style="list-style-type: none"> • Replacement of the shunt reactor at Sydney East BSP due to condition issues. Voltage and power factors need to be managed at Sydney East BSP. • Potential installation of a new shunt reactor at Beaconsfield BSP due to Ausgrid experiencing high voltages and leading power factor. Investigations will continue in 2024.
Endeavour Energy	<ul style="list-style-type: none"> • Supply to Ausgrid's Auburn and Lidcombe Zone Substations from Endeavour Energy's Camellia Transmission Substation.
Essential Energy	<ul style="list-style-type: none"> • A project to rectify the 33kV supply to Essential Energy from Ausgrid's Tanilba Bay zone substation to meet the capacity requirements specified in the connection agreement was completed in 2023.

Information and Communications Technology Systems Investments

Information, Communication and Technology

Ausgrid relies on Information, Communication, and Technology (ICT) for crucial network operations, enabling effective asset management planning, regulatory compliance, and statutory reporting obligations.

ICT systems play an integral role in 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 crucial for monitoring and managing the electrical network.

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



Advanced Distribution Management System

Ausgrid relies on the Advanced Distribution Management System (ADMS) to manage its distribution network. The ADMS platform allows for remote monitoring, control, outage management, improve planned and emergency event management, and fault location optimisation. Core monitoring and control functions were integrated in November 2022, with further enhancements planned to replace older technologies.

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 1 2019 - 2022

Replacement of legacy distribution management system

Phase 2 2019 - 2024

Modernisation of operations for planned and unplanned work, additional distribution management applications and Low Voltage Network model

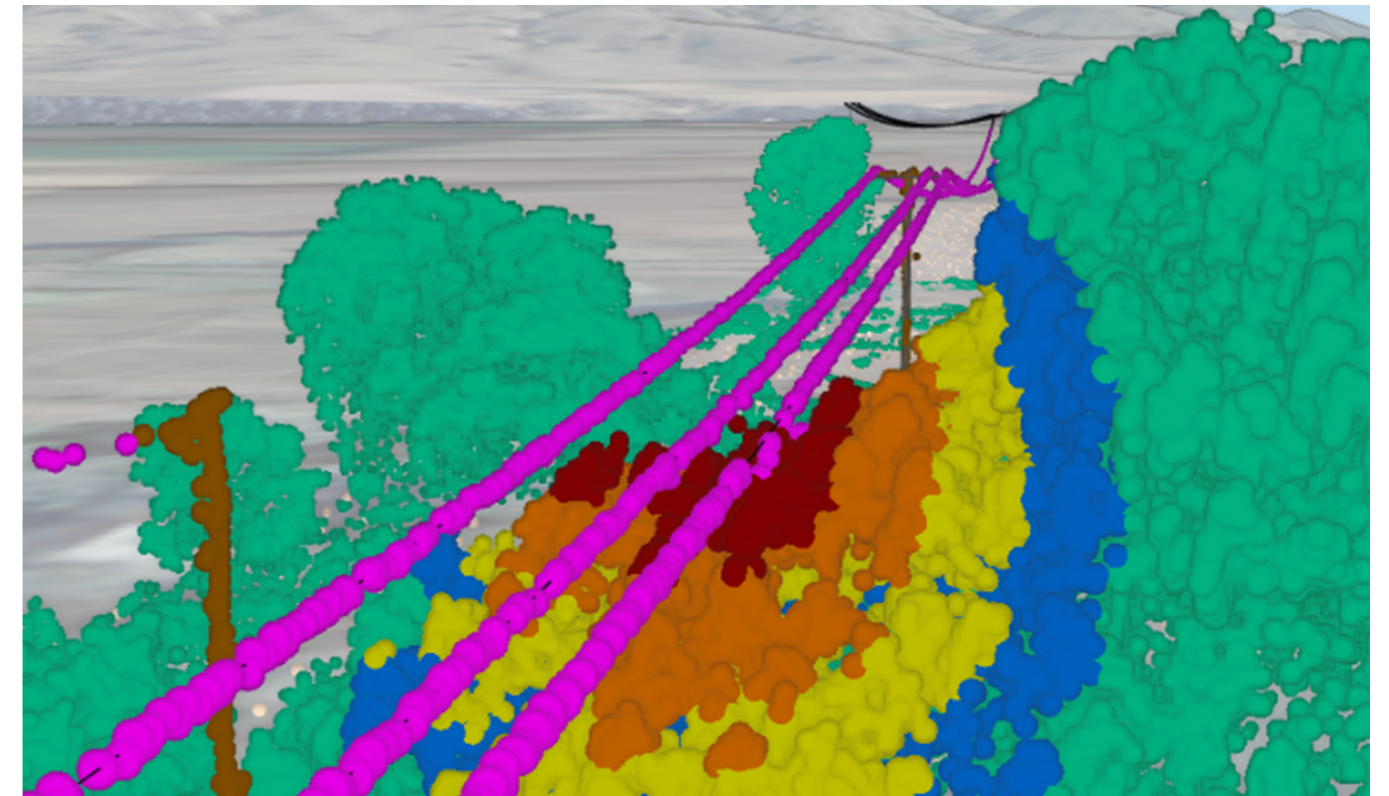
Phase 3 2022 - 2025

Advanced Applications – Automated Fault Detection, Isolation Restoration and optimisation of the network, e.g. Distribution Energy Resource Management

Network Asset Digitisation

The Network Digitisation Program is delivering a digital twin of Ausgrid's overhead network that will enable a range of cost efficiencies within planning, design and works delivery.

Information from assets and inspections is collected through both automated and manual processes. The use of Light Detection and Ranging (LiDAR), panoramic imagery and processing, 3D modelling, and machine learning algorithms enhance data accuracy at reduced costs.



The benefits of implementation of the Network Digitisation program include:

- Improving capital efficiency;
- Enhanced network reliability and reducing network risk;
- Reduced expenditure with vegetation encroachments;
- Optimised vegetation management cycles; and
- Improved collaboration with other utilities and local councils.

Stage 1 FY21 - FY22

Initial network asset acquisition, data management and platform development

Stage 2 FY23 - FY24

Second cycle of asset acquisition, processing and comparative analytics; and

Stage 3 FY25+

Ongoing asset acquisition and data maintenance.

Correspondence

www.ausgrid.com.au

For all enquiries regarding the Distribution and Transmission Annual Planning Report 2023 and for making written submissions contact:

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