

# Business Narrative

Regulatory Reset 2024-2029

September 2022







## Welcome

Endeavour Energy connects over 2.5 million people and businesses across Sydney's Greater West, the Blue Mountains, Southern Highlands, the Illawarra and South Coast to the safe and reliable electricity they need to live, work and play. Our network services communities with some of the highest cultural and language diversity in Australia across the lands of the traditional custodians – the people of the Dharawal, Dharug, Gundungarra, Wiradjuri and Yuin nations. We recognise first peoples' continuing connection to Country, cultures and community. We pay our respect to Elders past and present.

Every five-years, we work closely with customers and stakeholders to prepare investment plans to build, operate and maintain a vast electricity network. That plan is reviewed by the Australian Energy Regulator (AER), which considers feedback, and then decides the final revenue Endeavour Energy can recover from customers to fund our operations. These cost make up about 30 percent of the average residential and small business electricity bill, so it's vitally important that every dollar we spend aligns with our customers' priorities.

The pace and complexity of change within the energy sector has increased in recent years as our customers increasingly become both providers and consumers of electricity services. We need to ensure that we are putting in place measures to adapt and be flexible within this changing environment.

Our customer engagement activities so far have shown that the core expectations for a safe, affordable and reliable network are the pillars on which our customers increasingly expect resilience, sustainability and customer choice through innovation to be delivered. This means we must take-stock of any short-term volatility in the economy and cost-of-living pressures while ensuring new services can be efficiently delivered in the medium to long-term.

To support this, our Business Narrative has been developed to provide a broader context to Endeavour Energy's 2024-29 developing Revenue Proposal, including our future operating context, challenges and opportunities and how we plan to deliver the best value for our customers. It details:

- 1. Introduction:** Endeavour Energy's current priorities and performance as one of the best performing networks in Australia and how we will expand on this strong foundation for our future.
- 2. External drivers:** Seven key trends that are shaping our future network needs and the expectations of our customers.
- 3. Customer insights:** Customers' service expectations are continuing to evolve in response to the seven external factors, shaping how we prioritise investments.
- 4. Investment themes:** Four priority investment themes will ensure we continue to meet our customer needs and respond to the changing operational environment.
- 5. Investment planning:** how we balance value for money services with plans that address customers' long-term interests

Our primary goal is fundamental and enduring; to ensure our customers have reliable access to an electricity network that is affordable, safe and sustainable, and that enables access to power in a way that suits them and their energy needs. We work together to adapt quickly to the needs of our customers, and continually strive to find better ways to power our communities for a brighter future.

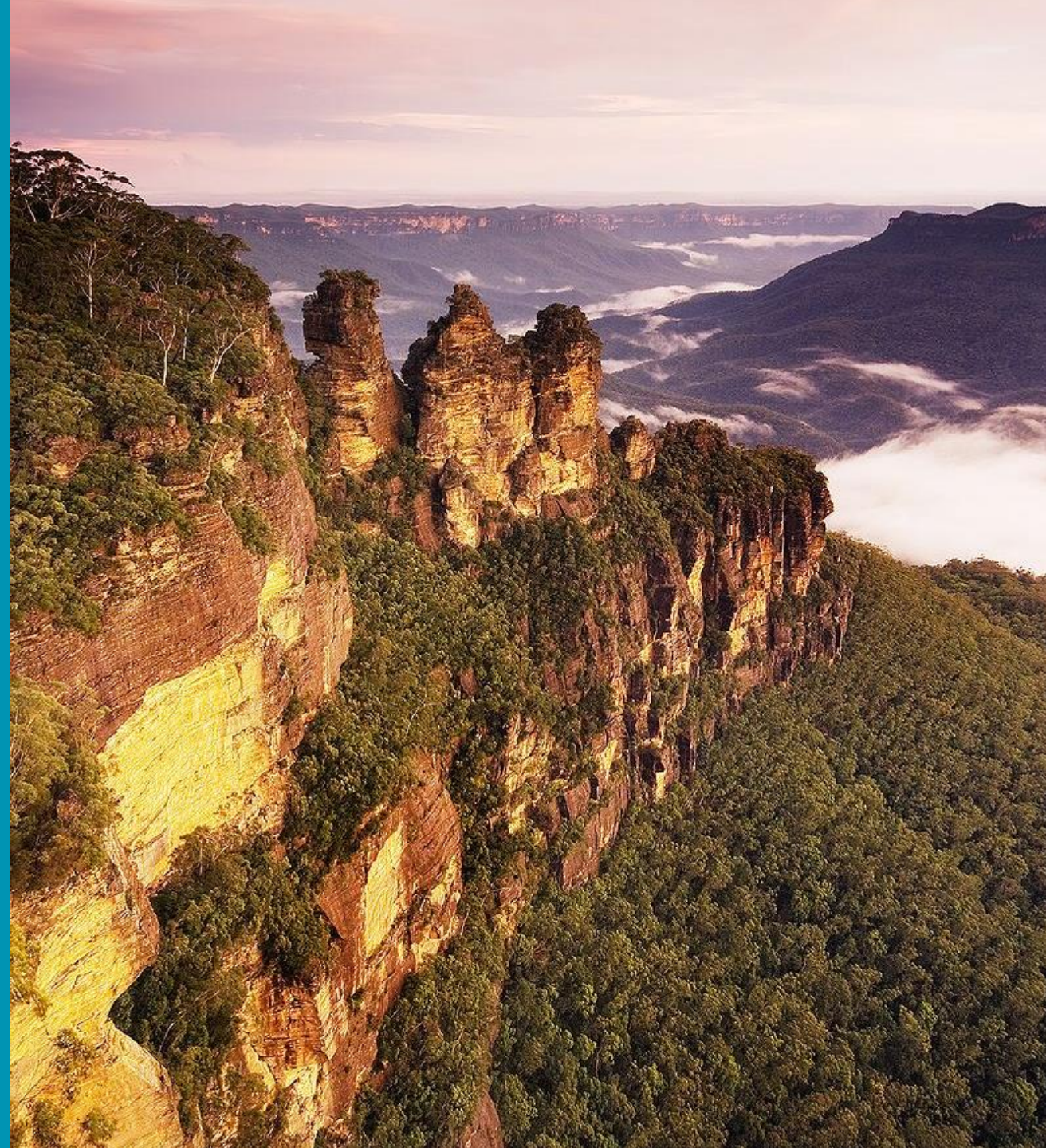
We look forward to engaging with you and invite you to have your say on how you want us to meet your electricity needs in the future.

**Guy Chalkley**  
Chief Executive Officer  
Endeavour Energy



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# Our 2024-29 investments will prudently address evolving customer expectations from a changing grid

Endeavour Energy services over 2.5 million people living and working across Sydney's Greater West, the Blue Mountains, the Southern Highlands, Illawarra and the South Coast of NSW. To do this, we manage a network that spans almost 25,000 square kilometres, from the Blue Mountains to the South Coast and through much of Sydney's Greater West and has a Regulated Asset Base value of \$6.8B.

Our primary goal is fundamental and enduring; to ensure our customers have reliable access to an electricity network that is affordable, safe and sustainable, and that enables access to power in a way that suits them and their energy needs. We work together to adapt quickly to the needs of our customers, and continually strive to find better ways to power our communities. In 2021, Endeavour Energy was proud to be recognised as one of Australia's best performing electricity distribution companies.<sup>1</sup>

As we look to the future, the nature of the energy system and our role within it is changing. The net zero ambitions of our community requires fundamental changes to the way we generate and use electricity. At all levels, this will need investment, innovation, new technology, additional infrastructure, and policy and regulatory reform.

For Endeavour Energy, the operation of a more intelligent, integrated and dynamic network means we are transitioning from being a traditional 'poles and wires' business to a central platform, coordinating a clean and equitable energy system, and enabling digital services for our customers. At the same time, we will be supporting unprecedented growth in Western Sydney and enhancing resilience to increasing risks from climate change, cyber security and a more variable and decentralised generation mix.



The next 5 years will be a crucial building block. Our prudent investments must deliver on immediate needs and use increased data and insights to set the pathway to the future. This will ensure Endeavour Energy continues to meet our customers' expectations while providing safe, sustainable and efficient services.

## Endeavour Energy's purpose and strategy

### Purpose

**POWERING COMMUNITIES FOR A BRIGHTER FUTURE**

### Vision

To be amongst the **best performing networks** in Australia as measured by **safety, customer engagement and financial performance metrics**

### Strategic goals

1 Health, safety & environment	2 Employee engagement	3 Customer & communities	4 Performance	5 Growth through innovation
<ul style="list-style-type: none"> <li>Establish an organisation-wide culture of safety</li> <li>Establish streamlined systems and processes</li> </ul>	<ul style="list-style-type: none"> <li>Lift Performance through clear expectations and performance-oriented mindsets</li> <li>Build leadership capability</li> </ul>	<ul style="list-style-type: none"> <li>Establish easy connection with customers</li> <li>Enhance recognition by customers through valued interactions and relationships</li> </ul>	<ul style="list-style-type: none"> <li>Optimise work program and risk allocation</li> <li>Improve quality, speed and cost to deliver</li> </ul>	<ul style="list-style-type: none"> <li>Leverage existing asset base to create value</li> <li>Augment network with smart investments and new technology</li> </ul>

### Investment Themes



# • We have built a strong foundation to manage a changing environment and evolving customer expectations

Endeavour Energy has been adapting its investment priorities to reflect our customers' evolving expectations, in light of the energy transition.

Our 2019-2024 regulatory review determination and performance over this period demonstrates our commitment to becoming one of the best performing electricity network businesses, while preparing for the future grid. Our improvements have accelerated since the 2017 Partial Privatisation of Endeavour Energy by the NSW Government. Between 2019 and 2024 we will achieve:

## Effectively and efficiently meeting needs

Real average distribution network bills for customers

↓ 16%

System capital investment

↓ 14%

on system allowance

Operating Costs

↓ 20%

on Operating cost allowance

New Customers Connected

↑ 100,999

## Meeting future expectations

Total Capital Expenditure spent

100%

of Capital expenditure allowance

transformation projects

↑ 132%

on non-system allowance

In addition, we intend to improve key customer metrics over this period:

Reliability performance improved from 78 to 69 mins per customer

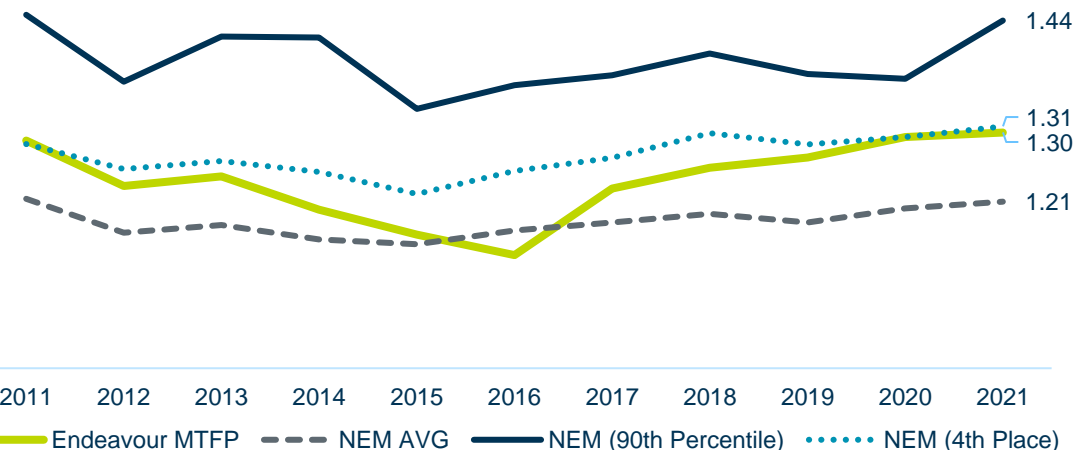
Real RAB per customer reduced from \$7,038 to \$6,796

Network utilisation improved from 52% to 54%

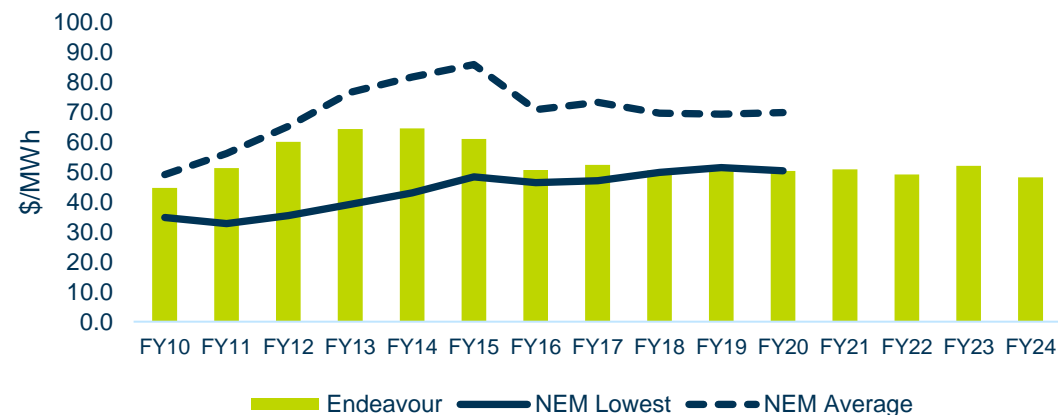
Global ESG Benchmark (GRESB) 5 Star Rating achieved in 2021

As we look to the 2024-29 regulatory period, we are committed to further improving on these achievements and will continue to work to remain amongst the best performing networks in the country.

## Productivity (outputs / inputs) under multilateral total factor productivity (MTFP) <sup>1</sup>



## Average network costs per unit of energy (\$/MWh) compared to NEM average and lowest<sup>2</sup>



# Endeavour Energy's role in the energy system is transitioning

By 2050, under the most likely 'step-change scenario', the National Electricity Market will need to cater for significant investment in generation capacity, storage, firming and augmentations as coal generation withdraws and customers exercise local choice. Market and technical reforms for system services and two-way electricity flow will need to be pursued. Importantly, key projects will need careful design to meet environmental, economic and social licence expectations.

Endeavour Energy recognises that our network will play a foundational role in the achievement of net zero emission targets within NSW and the country. This is a significant challenge, integrating 100% clean energy means more variable generation, significantly more energy storage to balance loads, and a much more dynamic and bi-directional load profile.

**To do this our network will become more intelligent and more dynamic.** It will connect new assets for the production, storage and consumption of energy, distributed across our communities and regions. In doing so, **our role will underpin new possibilities**; the uptake of clean and digital technology, the delivery of new energy services, and the **equitable sharing of benefits** across all.

We will play a leading role in optimising the use of the distributed resources on our network. To do this, we will link smart, responsive households and businesses, aggregated as active market participants, to balance loads and deliver essential network services. We will enable flexible demand to manage two-way energy flow across our suburbs, cities, and regions in real time. And we will need to enable considerable new load for decarbonisation of industry by providing additional capacity, for electrification or production of alternative clean fuels, where necessary.

In delivering these outcomes, Endeavour Energy will become **a central, intelligent orchestrator of a dynamic energy system**, integrating and sharing data across networks, customers and other market participants and platforms.



# Investments over the next five years will provide a crucial stepping stone to the future

Our 2024-29 regulatory proposal must move us in the direction of the future network, making prudent investments while retaining sufficient optionality over the long term. To inform priorities, our investment plan is being designed by Endeavour Energy and our key stakeholders. In developing a Revenue Proposal, Endeavour Energy aims to undertake meaningful engagement that delivers our vision of powering communities for a brighter future, to develop a proposal that balances:

- the priorities, preferences, diversity and current and future needs of our customers
- with sustainable returns to shareholders, and
- can be considered prudent and efficient by the Australian Energy Regulator.

This means providing fair access to the modern grid and ensuring customers pay no more than is necessary for a safe, reliable and secure electricity supply and quality service.

Through engagement with our customers and stakeholders along the way, we are striving to improve the efficiency and robustness of the engagement process, for Endeavour Energy, our customers, stakeholders and the Australian Energy Regulator.

We are aiming high. We are committed to listening, identifying better practice, learning from past experience, utilising international standards and building a culture of effective engagement recognised across the industry. Our goal is to embed effective business-as-usual engagement so that we strengthen a customer-centric culture, reflecting the changing needs of customers and our evolving ecosystem. This approach is also guided by:

- Endeavour Energy's Engagement Plan 2024-29 Regulatory Proposal
- Endeavour Energy's Stakeholder Engagement Framework
- The Energy Charter
- IAP2 Core Values for Public Participation

## We will balance value for money services with plans that address customers' long-term interests



Meeting core customer expectations for a safe, affordable and reliable electricity supply



Supporting the sustainable growth of our communities



Providing a resilient network for the community against increasing external hazards



Enabling customers future energy choices for a sustainable future



- A narrative to describe the alignment of our investment plan with
- our objectives, and a changing operational context

The business narrative is designed to provide line-of-sight between Endeavour Energy's corporate strategy, the changing operational context, changing customer expectations and our investment priorities for the coming regulatory period.

This will provide context to the methodologies that underpin the pursuit and timing of investments, and the decisions that will result from a co-designed development of our Revenue Proposal with our key stakeholders'.

It also provides a framework to guide Endeavour Energy's future initiatives as we adapt to the mounting external pressures on the sector, in a way that meets the priorities and expectations of our existing and future customers.

The business narrative comprises an analysis of external drivers and emerging customer preferences to inform four investment themes that are designed to fulfil our primary business objective of ensuring our customers have reliable access to an electricity network that is affordable, safe and sustainable, and that enables access to power in a way that suits them and their energy needs.

Achieving balance between affordability, value for money and investment is a core objective of both our business narrative and our regulatory engagement goal.

Customer centricity

Trust, reputation and purpose

Economic volatility and cost of living pressures

Western Sydney Regional Growth

Climate change & extreme weather

Changing grid in a low carbon economy

Efficient and effective service in the digital age

## External drivers

Value for money and efficient management of the network

Responding to a changing climate

Providing a reliable supply of electricity

Supporting customers lower carbon energy choices and innovation

Keeping customers informed

## Evolving customer priorities

Meeting core customer expectations for a safe, affordable and reliable electricity supply

Supporting the sustainable growth of our communities

Providing a resilient network for the community against increasing external hazards

Enabling customers' future energy choices for a sustainable

## Investment themes



- A narrative that balances value for money with plans that address
- customers' long-term interests

## Seven external drivers

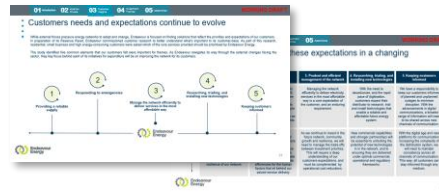
Seven key trends are shaping our future network needs and the expectations of our customers. Our investments must address the implications and manage the uncertainties that exist within them.



Pages 8 - 23

## Five evolving customer priorities

Customers' service expectations are continuing to evolve in response to the six external factors, shaping how we prioritise investments.



Pages 23 - 26

## Four investment themes

Four priority investment themes will ensure we continue to meet our customer needs and respond to our changing operational environment.



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# 02 External Drivers

Section contents:

## The 6 Drivers

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1. Customer Centricity
2. Trust, Reputation and Purpose
3. Cost of living pressures and economic volatility
4. Growth in Western Sydney
5. Climate change and extreme weather events
6. The changing grid in a low carbon economy
  - Uptake of solar PV
  - The role of batteries and storage
  - Electric Vehicles
  - Demand response and flexible load
  - Future fuels
  - SAPS and Microgrids
7. Efficient and effective service in the Digital Age  
managing uncertainties





# Our business must keep pace with seven key drivers shaping our future operational landscape



## Customer Centricity

A focus on customers' needs and experiences from high energy users to pensioners to empowered prosumers means customers play a more central role in the operation of the network as networks evolve to be platforms of energy services. Underpinned by new technologies, customer expectations and service needs will evolve. Customers will expect to help shape the direction of the business through deep engagement on regulatory proposals and beyond.



## Trust, reputation and purpose

The reliable delivery of an affordable crucial service underpins trust and is core to our purpose. Customers also increasingly expect organisations to align with personal and community values for environmental and social governance (ESG). Purposeful decision making, with an emphasis on ESG outcomes, will be essential to retain social licence, attract investment, and to establish and maintain a high-performance culture.



## Western Sydney regional growth

The NSW Government is driving the substantial and rapid growth of Western Sydney, at a rate nearly 40% higher than the rest of Metropolitan Sydney. By 2036, half of Sydney's population will reside within the city's west, supporting 200,000 new jobs, a new airport, rail, new industries and manufacturing, and become a high-skill jobs hub. This plan is akin to building a new and smart interconnected city, from scratch.



## Economic volatility and cost of living pressures

International and domestic developments have contributed to rapidly rising inflationary pressures, including in energy prices, with rising concerns about a possible slowdown in the Australian economy. Cost of living pressures are increasingly centre of mind now for all customers small and large. Transitioning the grid in the most efficient way to ensure long term value for customers as they become increasingly proactive in their energy choices requires a balance of short and long-term interests.



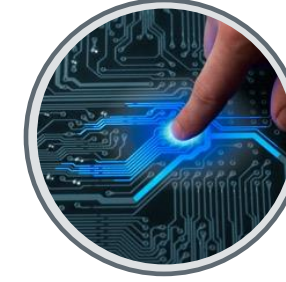
## Climate change and extreme weather events

Climate modelling suggests that extreme weather events will continue to increase in both frequency and intensity over the coming decades. Climate change-related events damage, destroy and/or compromise the performance of infrastructure, and increase risks to the reliable supply of electricity.



## The evolving grid within a low carbon economy

The pursuit of a net zero economy will transform the way we generate and consume energy. As customers take up technologies such as solar, batteries and electric vehicles, the network will need to evolve to allow for two-way flows and active participation from customers and third parties. Over time, more sophisticated digital platforms will seek to interact with a more dynamic, integrated network that orchestrates the low carbon energy system.



## Efficient and effective service in the digital age

Introduction of digital technologies and enhanced data capabilities create significant operational efficiencies, while transforming the risk, roles, required skills and location of the future workforce. At the same time, cyber-attacks become more frequent and sophisticated, targeted at the disruption of energy supply.

## Customer centricity

- A focus on customers' needs and experiences, from high energy users to pensioners to empowered prosumers, means customers play a much more central role in the operation of the network as networks evolve to be platforms of energy services. Underpinned by new technologies, customer expectations and service needs will evolve. Customers will expect to help shape the direction of the business through deep engagement on regulatory proposals and beyond.

**Informing investments and approaches:** For networks and network regulators, understanding the evolving expectations and preferences of customers and their diverse needs will allow networks and regulators to find the best options and approaches for investment planning. This will include increased transparency and more open conversations with customers, and also focus on equity and the need to ensure no customer is left behind.

**Setting customer priorities and service levels:** Increasingly customers expect differing personalised and timely services, seamless transactions and accurate information. With an understanding of needs and expectations, the business can focus on higher-value services, and reduce effort and spend on services that are less of a priority.

**Creating operational efficiency:** The use of data to improve operational decision-making and deliver improved service will become the hallmark of the efficient network business. Supporting and working with third parties to support efficient services across the value chain is increasingly necessary.

Our understanding of these benefits is driving Endeavour Energy to provide genuine, early and regular consideration of the unique and evolving needs of our customers.



### Implications for Endeavour Energy



Where and how Endeavour Energy invest in the Future Network will be shaped by customer support for our role.



A deep and broad understanding of all customers' expectations and views is increasingly central to investment and operational improvement.



A continuous focus is needed to reflect the preferences of a significantly expanding customer base, including the customers of today and the customers of tomorrow.



# Trust, reputation and purpose

- The reliable delivery of an affordable crucial service underpins trust and is core to our purpose. Customers also increasingly expect organisations to align with personal and community values for environmental and social governance (ESG). Purposeful decision making, with an emphasis on ESG outcomes, will be essential to retain social licence, attract investment, and to establish and maintain a high-performance culture.

**Increasing focus on ESG:** Corporate social responsibility (CSR) and the analysis of ESG performance is already becoming a fundamental driver of investment (both by shareholders and customers into companies and services, and companies into actions). Involvement in social and sustainability endeavours, and a consistent demonstration that these principles are front-of-mind in decision making, will form a key component of social licence to operate, and the ability to attract and retain talent. Our customers will expect this, and our business customers will want to demonstrate to their customers that they are partnering with organisations that share these values.

**Ensuring we attract and retain our talented people:** Empowerment and flexibility has already become the 'battleground' for talent. People want meaningful work, they demand a say in the direction of the organisation, they are constantly checking the alignment of their values with their employers and are increasingly seeking more flexible ways of working.

Looking forward, the way that Endeavour Energy approaches its investment priorities, decision-making and how it engages around this, will need to be fundamentally values-driven. Importantly, it demands an "outside-in" and transparent approach to being involved in, listening to and acting on engagement with our community, customer and employees.

## 70%

of customers across multiple industries say they would pay more for a green product over a non-green alternative

"A strong ESG proposition can help companies attract and retain quality employees, enhance employee motivation by instilling a sense of purpose, and increase productivity overall."<sup>1</sup>

## Implications for Endeavour Energy



Active contribution to ESG goals and the community in which we operate is an important part of meeting our customers evolving expectations



Trust is considered the foundational driver. Without trust, initiatives to address the other drivers don't matter.



As part of our ESG commitment, we will ensure we facilitate our customers' aspirations for sustainable growth and for partnership in the delivery of ESG principles.

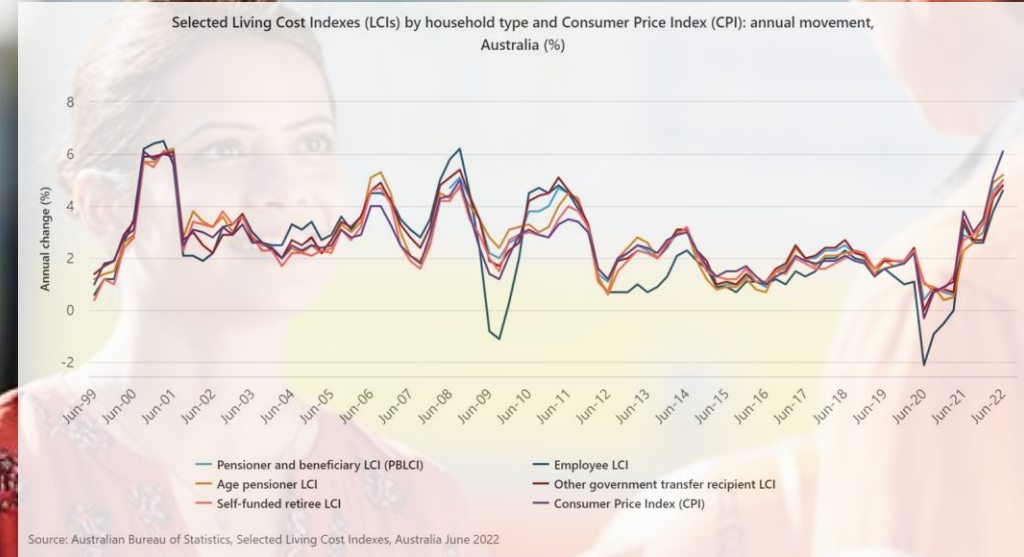
# Cost of living pressures

- International and domestic developments have contributed to rapidly rising inflationary pressures, central bank decisions to respond with interest rate rises and increased concern about a possible slowdown in the Australian economy. Events in Ukraine and local factors in the National Electricity Market (NEM) have contributed to significant rises in energy prices for Endeavour Energy customers. Cost of living pressures are increasingly centre of mind now for all customers small and large.

**Investment constraint:** Achieving an efficient balance between cost and service quality requires risk to be managed by the party best equipped to do so. For us, that means improving our service quality, especially in targeted areas most valued by customers, within a constrained budget through innovation ('finding a better way') and productivity improvements ('doing more with less').

**Financing costs:** A potential emerging challenge is the risk of sustained rises in Commonwealth bond yields over the next five years resulting in ongoing upward pressure in network charges for customers and increasing financing costs for networks to invest in new infrastructure.

**Volatile energy costs:** Customers are increasingly wary of increasing cost of living pressures, with stakeholders expressing particular concern about increases in energy costs that are outside Endeavour Energy's control, including the Rate of Return, Wholesale market volatility and the NSW Renewable Energy Zone (REZ) costs.



## Implications for Endeavour Energy



Increasing we must balance long-term service outcomes with the shorter term volatility in economic conditions. This includes a focus on key affordability metrics as a constraint on our overall plans and service outcomes.



Fairness and equity in pricing or tariffs for new as well as existing services is key, as well as appropriate transition rates to support the orderly empowerment of customers energy choices.



## Western Sydney development

- New South Wales population and high-skill jobs growth focuses on the urban expansion of Sydney's Greater West.

This strategic expansion will drive the unprecedented growth of the region, at a rate nearly 40% higher than the rest of Metropolitan Sydney. By 2036, half of Sydney's population will reside around the River City and Bradfield City. Projections support the need for an additional 725,000 dwellings and 200,000 new jobs, in a region that will cater for a new airport, new industries and transport. We will be part of the building of the high-skill jobs hub across aerospace and defence, manufacturing, healthcare, freight and logistics, agribusiness, education and research industries.

Endeavour Energy is responsible for the expansion of the distribution network to facilitate this growth, and to support the private sector and NSW Government's planning and development of liveable, productive and sustainable communities that thrive. To accommodate this 'step change' in growth, new networks must be planned and delivered in a way that both facilitates this vision and futureproofs the network. For residents, small and large business and emerging needs such as datacentres and hydrogen hubs.

**Planning for the future:** This predicted expansion of the asset base is occurring at the same time as the changing nature of the grid. Endeavour Energy will need to work with developers and Government to ensure greenfield developments are future-proofed, efficient and remain cost-effective.

**Ensuring network infrastructure is not a barrier to growth:** The roll-out of new infrastructure across Western Sydney will require significant investment, and the expansion cannot occur without this supporting infrastructure in place. Endeavour Energy will need to work with the Government and other infrastructure providers to ensure the infrastructure expansion meets the growth.



### Implications for Endeavour Energy



Expansion should be future proofed, taking up opportunity for new approaches and the network has the capacity to provide access to emerging technologies



Investment is needed to sustainably and equitably support the growth of Western Sydney, while continuing to deliver for our existing customers

# Climate change and extreme weather events

Extreme weather events will continue to increase in frequency and intensity.

Climate change events pose a risk to the reliability of the network. While Endeavour Energy has invested in solutions to address our impactable outage times<sup>1</sup> (Figure 1), customers will not experience the benefits due to the impact of major event-related outages (Figure 2).

**Bushfires:** The 2019/20 bushfire season was the most devastating in NSW history, interrupting electricity to more than 55,000 customers and threatening the safety of people and communities. The fires impacted 44% of Endeavour Energy's network area and caused significant damage to parts of the network at a cost of more than \$26.7 million.

**Heat Waves:** By 2030, NSW is expected to experience 10 more days in heatwave each year, with the yearly maximum intensity of heatwaves seeing an increase of ~5°C. As heatwaves become more common and more severe, customer safety will be at risk and the network will be threatened by asset deterioration and reduced system reliability, decreased system capacity and an increased load. With some of the hottest areas in NSW, our ability to reliably deliver electricity through these periods will be increasingly important for customers to protect their comfort and limit risk to life.

**Storms and Floods:** Like bushfires and heatwaves, severe storms and their associated floods are on the rise and are expected to become a common threat to our communities and the network that supplied them, particularly for non-submersible assets.

Figure 1: Endeavour Energy has driven (normalised) performance improvement to reduce outage times for customers

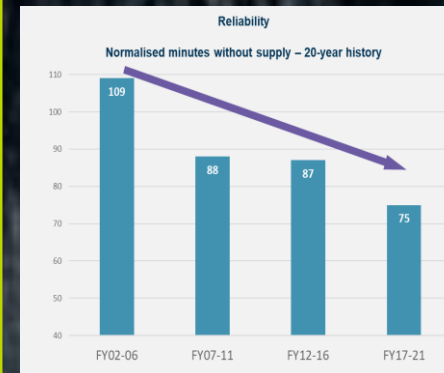


Figure 2: However, the (raw) customer experience is increasingly affected by extreme weather events and new risks



*"You don't really think about electricity until it's not there."*  
- Customer quote, SEC Newgate Research

## Implications for Endeavour Energy



To adapt to the changing climate, targeted solutions are required to ensure a safe, affordable and reliable network.



As extreme weather events become more common and more severe, the network will need to be more resilient.



Growth can be facilitated in new ways, with new designs, to enhance the resilience of the network



# • The evolving grid within a low carbon economy

Governments, businesses and communities are setting increasingly ambitious emissions reduction targets to limit the impacts of climate change.

The NSW government is targeting a 50% reduction in emissions, including 12GW of new low emissions generation and 2GW of storage by 2030. This requires fundamental changes to the way we produce and consume energy and changes the nature of the energy system. Our electricity networks will underpin this evolution, and we must keep pace with the change.

In the coming years, growing customer uptake of clean and distributed energy resources such as **solar PV**, **battery storage**, and **electric vehicles** will fundamentally change the network. As our customers take up these technologies they will participate more actively in the market and unlock more value from their investments. Sophisticated digital platforms will increasingly underpin and automate more responsive users, coordinated by energy 'aggregators' such as **virtual power plants**. These changes form part of the solution to limit the impacts of climate change, and the augmentation of our network must reliably and affordably deliver the capability to balance **dynamic, responsive, bi-directional flows**.

These new technologies, and the changes to the way our communities will choose to use and share electricity, will change the role of the network. Open, real-time data sharing will become critical to the successful operation of a network, allowing and incentivising customers and third-parties to use their technologies to help balance the system. The network will become a platform of energy trade, and underpin the modern, low carbon way of living. We will shift from being operating as a distributor by enhancing our capabilities as the **Distribution System Operator**.



## Implications for Endeavour Energy



As emerging technologies become more prevalent, our customers trust us to enable their future energy choices.



We must find ways to equitably deliver customer choice, innovating to maintain the affordability and reliability of our network and ensuring no one is left behind.



New technologies and government policy enable us to support growth in new and varied ways.

# • The increasing uptake of solar will reduce daytime demand

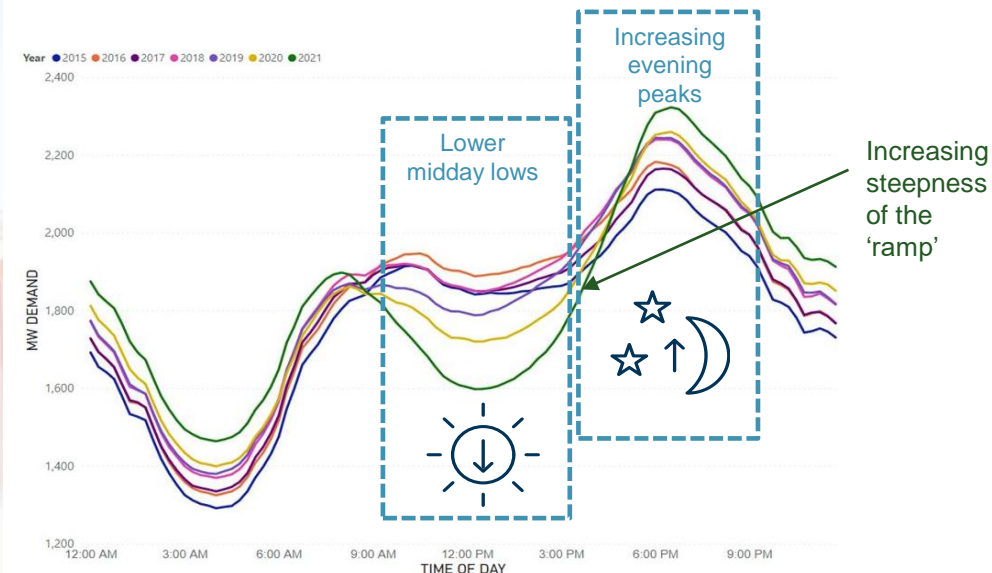
The uptake of Solar Photovoltaic (Solar PV) systems by households and businesses on Endeavour Energy's network is forecast to increase rapidly in the coming years. Currently, more than 20% of Endeavour Energy's customers have installed Solar PV systems to supplement their energy requirements. By 2030, this figure is projected to reach 55%.

The changing profile and volatility of supply and demand as a result of the high penetration of solar PV, creates network wide and localised issues which will need to be addressed. At the network scale, this includes the **“duck curve”** whereby solar input reduces the demand for electricity during the day at the same time as growth in electricity use increases night time peaks. This also increases the ramp-up required to meet evening demand (Figure 1). Local volatility, including **voltage surges**, can damage equipment, cause ‘trips’ or ‘faults’, and result in the temporary shut down of solar inverters to restore voltages to safe limits.

Network augmentation and new operational rules can successfully address these issues. However, any solution must minimise limitations on household market participation (e.g., localised curtailment), and address **equity** concerns that will become more prevalent as localised saturation levels are reached. Equity is needed both around new ‘entrants’ being able to access benefits and ensuring the cost of the system is equitably shared between those who receive benefit and minimised for those who don't.

Lessons can be drawn from distribution networks already managing a high penetration of solar in other states, such as the setting of appropriate solar export limits to reduce grid congestion and upgrading voltage management systems across substations. This allows Endeavour Energy to better develop proactive and equitable measures to address the operational and reliability issues that have emerged elsewhere.

Endeavour Energy average network demand “duck curve”



*“We have to educate people on how to manage their electricity and teach them about the new technologies.”*  
- Customer quote, SEC Newgate Research



# Storage will play a more important role as the penetration of variable renewable energy increases

As more variable renewable energy sources feed into the grid, such as solar PV, energy storage will play an increasing and crucial role to balance supply and demand. As costs of storage technology decline (e.g., batteries) and market and/or tariff based incentives grow, the installation of storage is expected to increase rapidly across the network.

Storage will be delivered at the household, local and grid-scale, and will be a vital contributor to the management of seasonal, daily and micro variations in supply and demand. These services can only be delivered via the active participation of customers and third parties, which requires a dynamic and digital capability and necessitates the more central role of the grid.

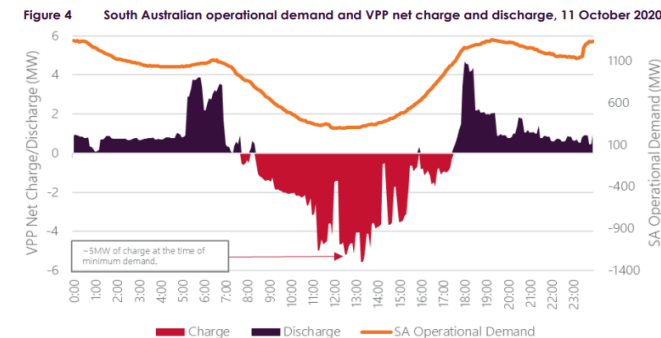
**Household:** As the costs of battery storage decline, more customers are choosing to install privately-owned, behind the meter storage systems. In its simplest use, battery storage allows customers to store the solar energy otherwise fed into the grid during the day and consume that energy at night when its needed (load shifting). This has the benefit of ‘flattening the “duck curve” created by solar.

**Grid-scale:** There are several energy storage solutions that are becoming increasingly viable at the system level, from traditional Battery Energy Storage Systems (BESS) to the Seasonal Hydrogen Storage Systems. These technologies enable distributors to more accurately manage the demand and supply of energy across the network.

**Aggregation and Virtual Power Plants (VPPs):** Sophisticated digital platforms and energy ‘aggregators’ (such as VPPs) unlock value for households by accessing wholesale markets. This transforms households into market participants, responding to price signals and delivering market services. However, this can create local network capacity issues, as households become orchestrated in their supply and demand from networks

**Shoalhaven pumped-hydro:** Large-scale energy storages and ‘base-load’ generation from pumped-hydro such as Shoalhaven will play an important role in addressing peak and seasonal demand changes, allowing more reliable integration of variable renewable energy.

## Virtual power plant load sifting (SA VPP trial)



## Virtual Power Plant market services

Trial Service Group	Services	VPP capability
Market Services	Energy	✓
	Regulation FCAS	✓
	Contingency FCAS – 6 Second	✓
	Contingency FCAS – 60 Second	✓
	Contingency FCAS – 5 minute	✓
SA VPP trial demonstration	Inertia	✓
	Voltage Support	✓
	Fast Frequency Response	✓



Current VPP rules



VPP demonstrated capability



# Electric Vehicles will play a crucial role in the flexibility architecture of the future network

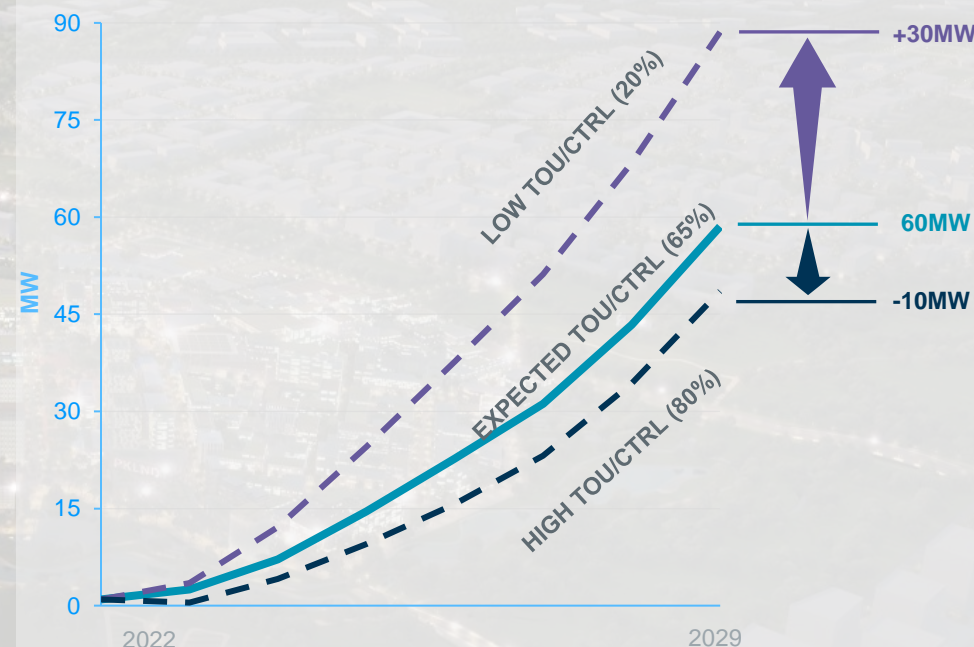
While the projected uptake of electric vehicles (EVs) in Australia is still wildly uncertain, market indicators are pointing towards increasing penetration at the back-end of the decade. While price, model and charging infrastructure barriers are currently in place, experience from Europe indicates that once these constraints are addressed, the market can shift rapidly<sup>1</sup>. By 2029, 200,000 EVs are expected in households on the Endeavour Energy network, up from 2,000 currently.

EVs are an emerging consumption on the network, and a changing profile of demand. The contribution of 200,000 EVs to peak load increase from 1MW now to ~60MW by 2029. This will result in requests for new connection points and will likely require some network reinforcements, and necessitate an efficient tariff structure that encourages the efficient management of demand.

However, EVs will also represent the opportunity for mobile (battery) storage. The rise in EVs will rapidly enhance the flexibility of consumption and will form a crucial component of the dynamic architecture of the future network. They will become a very useful tool to balance loads, but will require sophisticated, transparent, digital capabilities operating with a proliferation of third-parties to optimise this value.

With the Australian and NSW Governments announcing their intentions to invest in EV infrastructure, and global manufacturers declaring the cessation of production for most Internal Combustion Vehicles by 2030-35, Endeavour Energy needs to ready its network, operational and digital planning for the fairly rapid, yet unpredictable, rise in EVs once the settings are right.

Electrification of transport impact on the network





# • Demand response and flexible load will provide value in a more dynamic and variable system

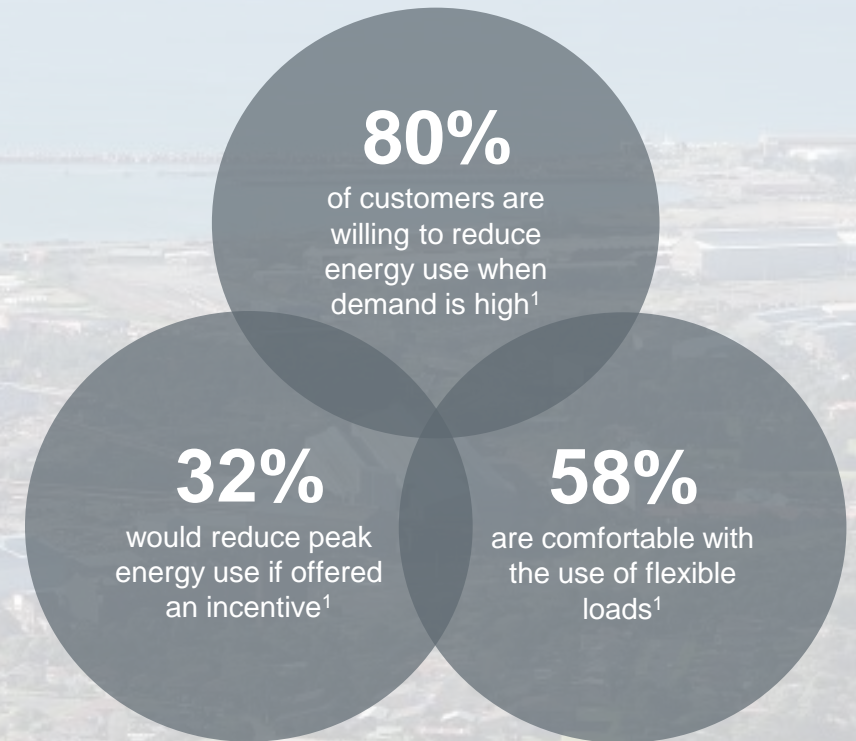
When managing the capacity of the grid, the focus has historically fallen on the energy generators to ensure the supply to the grid matches demand. But with changes in consumer behaviour affecting when, where and how people access the grid, there's a growing opportunity to manage capacity by tackling the demand for energy.

A shift to a more dynamic and transparent tariff regime will further incentivise these behaviours. In a system with abundant, but variable, renewable energy, households and businesses will benefit from the ability to reduce demand or transition to more flexible operations. This is part of the solution to balancing the low carbon, variable energy system.

**Demand response** is the voluntary reduction or shift in the customer's use of electricity. This is typically achieved by financially incentivising consumers to switch their use of power to off-peak periods to ease the demand on the network.

**Flexible load** refers to the coordination of electricity consumption used for existing loads. For households this includes water heaters, air-conditioning systems and pool pumps. For business and industry, this includes flexible production or data centre usage which can lower individual production costs and balance loads on the network.

The role of the network is to facilitate the ability of customers to participate in such a way. In this light, the value of the network shifts more in favour of its capacity to allow participation, rather than the electricity demanded. This change requires re-consideration of tariff structures to reflect the alternative value of the network (such as capacity charges).



Source: (1) ECA Energy Consumer Behaviour Survey, October 2021

*"I would like to take a little bit more control of my electricity. I want it broken down so I can be a little more in control. In an app [so I know] fridge uses this, washing machine uses that."*  
- Customer quote, SEC Newgate Research



# Decarbonisation requires clean alternative fuels such as hydrogen, supported by Renewable Energy Zones

The NSW Government through its Electricity Infrastructure Roadmap and Hydrogen Strategy is aggressively pursuing the activation of new Renewable Energy Zones (REZ) to drive decarbonisation of its electricity generation and establishment of a hydrogen industry, for both domestic and export markets. This will drive significantly more variable renewables into the generation mix, and may add considerable load to the distribution network.

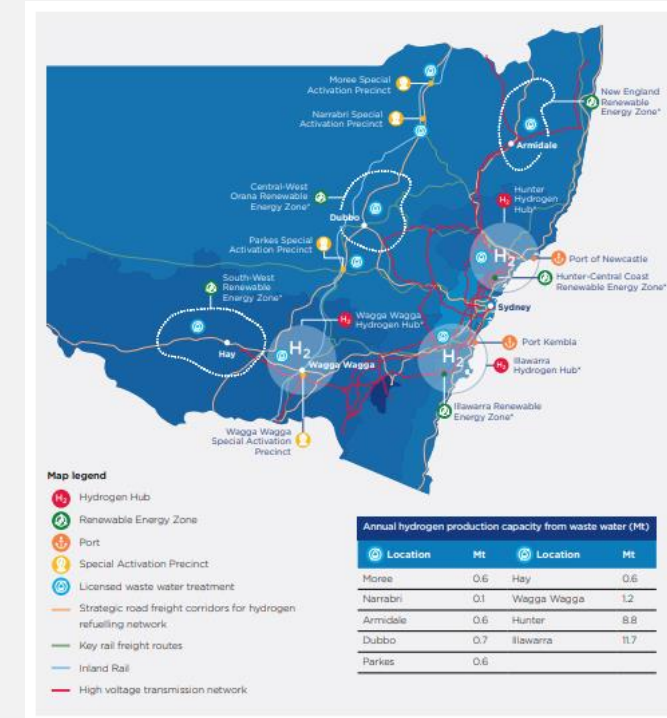
Decarbonising Australia's economy will be challenging, involve a variety of alternative fuels and energy sources developed through multiple pathways, and approaches will vary within and across industries and use cases based on needs and opportunities. Hydrogen, which is very similar to natural gas and can be produced from renewable electricity, represents one such option. Renewable energy security and firming in the Illawarra will support this industry and the broader NSW decarbonising economy.

The scale of electricity generation associated with large-scale hydrogen production dwarfs that of Australia's current demand. NSW is targeting 12GW of renewables to deliver 110,000 tonnes per annum of hydrogen by 2030. It is focusing on production in two key hubs, Illawarra and the Hunter Valley (with Wagga Wagga considered a strategic location mainly for transport).

The wave of renewables will create system challenges, but also new opportunities. Hydrogen may act as a flexible way to lift minimum demand and store excess energy. It may also play a role in decarbonising gas networks, with localised production, storage and potentially generation, supporting grid stability.

However, with the commercial pathway to hydrogen production still some way off, we will need to prepare for scenarios where we see large scale electrification, a hydrogen economy emerge, or something in between.

## NSW Hydrogen Strategy



### NSW Stretch Targets include

<b>H<sub>2</sub></b>	<b>Green hydrogen produced</b> 110,000 tonnes per annum		<b>Renewable energy capacity</b> 12 GW
	<b>Gas network blending</b> 10% (by volume)		<b>Refuelling stations</b> 100



# Microgrids and SAPS offer new options in the way we deliver affordable and reliable electricity

Microgrids and Stand-Alone Power Systems (SAPS) are essentially a group of localised energy sources and loads that are capable of functioning autonomously in times of need. Thus, they require less or no connection to the traditional electricity network, mitigating the need for new, or significant augmentation or replacement of existing connections to communities. The transformation of the grid will lead to a more 'compartmentalised' network, with many localised networks functioning like microgrids, and interacting in a broader system.

The increasing value that can be derived from microgrids and SAPS is two fold. Firstly, with the decreasing cost of distributed generation and storage technologies, as well as the increasing costs of providing traditional network connection, SAPS are becoming more commercially feasible. Secondly, and in addition to the potential commercial value, SAPS can avoid the need for long, stringy connections. In the face of increasing extreme weather events, this will reduce the risks to the safety and reliability of the network.

In addition to these two benefits, microgrids can offer communities a chance to help co-design their energy system, specifically creating elements for their unique values and needs.

For Endeavour Energy, microgrids, in particular, present new opportunities to deliver growth and replace assets more affordably, with lower risks. With a huge range of different areas for our network to cover, and that creates many different challenges for both existing locations and newly developing areas, designing and maintaining a network that is safe and reliable, but also makes best use of all locally generated renewable energy is what we are striving to achieve with microgrids.

However, any use of SAPS and microgrids will need to align with the guidance from the AEMC and AER regarding appropriate distributor-led use.

**Case study:** Western Sydney's greenfield development presents a unique opportunity to build the network of tomorrow, today



## The Area

- One of the fastest growing areas in the country
- \$40bn of infrastructure committed to the region
- 725,000 extra dwellings across Sydney by 2036 to cater for population growth



## Proposed microgrid solution

- Co-design with developers and build a community microgrid consisting of local customer solar and battery systems, combined with larger scale in-front of the meter energy storage
- Endeavour Energy DER (generation, storage, loads) will optimise use of local assets, both behind and in front of the meter
- Operates as an island when upstream connection is lost



## Effective and efficient service in the digital age

The future network, with its dynamic integration of new technologies and platforms, is a digitised network. This digitisation must occur from the primary substation all the way through to the customer and integrate with other parts of the energy system.

While this requires investment it also enables us can do much more with less; affordably, safely and reliably integrating more dynamic services through our existing infrastructure.

Leveraging the use of digital sensors, automation, artificial intelligence and quantum computing will transform our capability to manage the network's operation. **Evolving digital capabilities will underpin our role** as the energy system orchestrator, and facilitate seamless, dynamic, real-time interactions between the network and the third-party platforms driving VPPs, Charging stations, and active behind the meter participants.

But at the same time, we will be seeking to facilitate open data sharing with third-parties, we will need to protect against an **increasing frequency and sophistication of cyber-attacks**. Endeavour Energy, like all networks, will need to enhance our cyber defences to protect the integrity of the network and our customers' data.

While the network's management becomes more automated, our workforce will also evolve. Virtual reality, robotics, driverless vehicles and other innovations implemented alongside our human workforce will allow us to service our customers' needs more safely and efficiently. For example, drones (or UAV's) have enabled distributors to quickly locate and diagnose network disruptions, without risking the safety of employees.

### Implications for Endeavour Energy



The continual evolution of digital capability is needed to facilitate customer choice



We must demonstrate how digitisation helps us to deliver new services with less investment



Technology allows growth to be delivered most efficiently and effectively



Enhanced cyber capability will underpin reliable networks in the future.

The global AI market will be worth  
**US\$169.41**  
billion by 2025<sup>1</sup>

**62%**  
of businesses expect to hire a chief Artificial Intelligence officer in the future<sup>1</sup>

AI will drive  
**95%**  
of all customer interactions 2025<sup>1</sup>

Source: (1) KPMG 20 predictions for the next 20 years



# • New approaches are required to appropriately manage the • uncertainties within the seven external trends

While the general direction of the external drivers are largely understood, there are uncertainties around specific outcomes, their timing and Endeavour Energy's role in the response. This drives an imperative to define and deliver our strategy in new ways.

## The Outcome

Uncertainty of how the trend or factor will ultimately play out

## The Timing

Uncertainty in the timeframe in which the trend or the uptake will occur

## Our Role

Uncertainty in the role for networks in responding to the trend

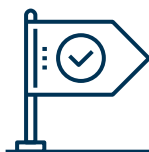
In the face of uncertainty, different strategic approaches are required to ensure our investments are prudent and provide best value for customers over the long term

Where we need to understand perspectives and preferences



We will **openly share data and discuss options** where we need to understand the community's preference for investment.

Where we are best placed to deliver optimal customer outcomes



We will **actively position** through clear communication and investment strategies the role customers want us to play.

Where others form part of optimal customer outcomes



We will build **stronger partnerships** to deliver new, better services. Partnerships will include third-party solution providers, users, consumer groups, councils.

Where pace or direction of the trend is yet to play out



We will **ensure optionalty** that allows us to respond to changing pace and direction of trends.

# 03 Customer Insights

## Section contents:

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- Changing needs and expectations
- The need to evolve to meet expectations





# Customers' needs and expectations continue to evolve in response to the seven external drivers

While external forces pressure energy networks to adapt and change, Endeavour Energy is focused on finding solutions that reflect the priorities and expectations of our customers.

In preparation of its 2024-29 Revenue Reset, Endeavour Energy and its Regulatory Reference Group commissioned SEC Newgate Research to conduct exploratory focus groups of mixed customer segments to gain insight into what's important to them. As part of this research, residential, small business and high energy-consuming customers were asked which of the core services provided should be prioritised by Endeavour Energy. Their insights led to the release of a Preliminary Proposal for public engagement in April 2022.

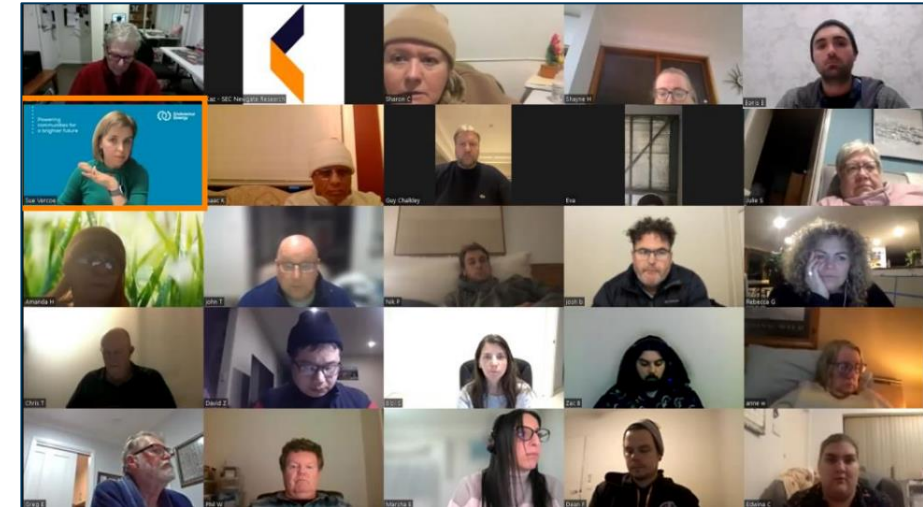
When asked what they believe Endeavour Energy should prioritise in the delivery of its current core services, customers identified five themes they felt were of the most importance. Similarly, when asked what services they felt Endeavour Energy should focus on delivering in the future, there were four considerations they most closely identified with.

We have since engaged more deeply with customers and stakeholders through a series of deep-dives, deliberative forums (in English and in language), customer segment workshops and quantitative surveying. Their additional customer insights have further refined our understanding of customer priorities for current and future services, which are represented in this Business Narrative.

We are refining our plans and direction using the latest available information and considering developments in the broader context in which we operate, which include a change in Federal Government, economic challenges, and several regulatory and policy developments.

How we respond to our environment must also be beneficial to the long-term interests of customers to deliver value. Customer insights and priorities remain the key source of direction for our developing investment plans. Our evolving operating environment is the context within which we must interpret and apply the feedback we have received.

As Endeavour Energy navigates its way through the external changes facing the sector, the key focus behind each of its initiatives for expenditure will be focused on broadening and improving the services available to our customers while maintaining our continuing commitment to affordability.



Customer Deliberative Forum



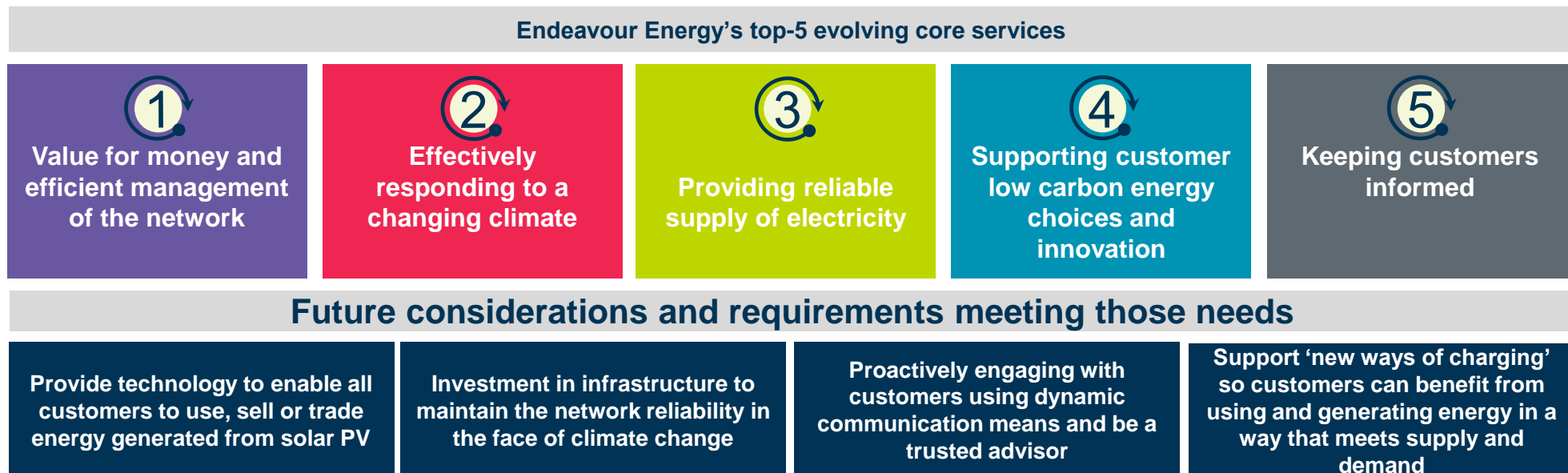
Stakeholder deep-dive

# Our evolving core services and future expectations

- Our research indicates, when asked what they believe Endeavour Energy should prioritise in the delivery of its current core services, customers identified five themes they felt were of the most importance.

Similarly, when asked what services they felt Endeavour Energy should focus on delivering in the future, there were four considerations they most closely identified with.

As Endeavour Energy navigates its way through the external changes facing the sector, the key focus behind each of its initiatives for expenditure will be focused on broadening and improving the services available to our customers while maintaining our continuing commitment to affordability.





# Delivering on evolving customer needs and expectations

	The customer's priority	What we heard	How we are responding	
1	<b>Value for money and efficient management of the network</b>	Customers want to see a safe and reliable supply of electricity at an affordable price. They were also interested in understanding what they could do to manage and reduce their bills.	Managing the network efficiently to deliver electricity services in the most affordable way is a core expectation of the customer, and an enduring requirement. Affordability became an increasingly important issue for customers over the course of our engagement activities.	We must balance actioning feedback for increasing service with affordability. As we continue to invest in the future network, community growth and resilience, we will need to balance the trade-offs between investment priorities, and offset investment with operational efficiencies.
2	<b>Responding to a changing climate</b>	Customers and stakeholders were keenly aware of the growing risk of climate change induced weather events pose to network security and reliability. In particular, the impacts of extreme heat, bushfires and flood events.	There was a strong sense of community-mindedness and a desire to take steps to help others. Customers suggested taking action to improve network resilience should be the second most important priority for Endeavour Energy as they develop their regulatory proposal.	With current modelling indicating climate-related events are likely to occur more frequently and with greater intensity, we will invest to improve community resilience against these threats, and ensure operational processes optimise our response as part of our trusted and reliable service.
3	<b>Providing reliable supply</b>	Providing a reliable supply of electricity to all customers by building, maintaining and managing the substations, poles and wires, underground cables and other equipment.	Customers want to be confident they can turn on their lights, use their heating and cooling, stay connected with family and friends, and have the choice to work and learn from home.	We will seek efficiency and technological improvements within our preliminary forecast to manage the increasingly challenging task of maintaining reliability rather than seeking additional expenditure to improve reliability.
4	<b>Supporting customer low carbon energy choices and innovation</b>	Researching, trialling, and installing new technologies such as batteries to improve efficiency of infrastructure investment where possible, helping contribute to long-term affordability of electricity bills.	Customers and stakeholders are very supportive of the transition to a low carbon economy and want Endeavour Energy to take steps to prepare for a more rapid transition, with significant customer take-up of Solar Panels, Electric Vehicles and Batteries.	New commercial capabilities, modelling and stronger partnerships will be essential to unlocking the potential of new technologies and services on the network. An innovation fund will trial new technologies, while we will work with partners and the regulator to optimise outcomes for customers.
5	<b>Keeping customers informed</b>	Keeping customers informed (via SMS for all customers plus mailbox drops for life-support customers) of planned and unplanned outages to minimise disruption. Expectations around data access are important.	We have a responsibility to keep our customers informed of planned and unplanned outages to minimise disruption. As we change the ways we communicate, a broader range of information will need to be shared across new mediums. Customers also want improved access to data in general in order to manage their electricity actively.	With the digital age and new platforms for communication increasing the complexity of the distribution system, we will need to provide customers with access to the tools and information they need, so they can manage their usage and stay informed through any medium.

# 04 Investment Themes

## Section contents:

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Four investment themes that meet our changing context

1. Meeting changing customer expectations for a safe, affordable and reliable electricity supply
2. Supporting the sustainable growth of our communities
3. Providing a resilient network for the community against increasing external hazards
4. Enabling customers' future energy choices



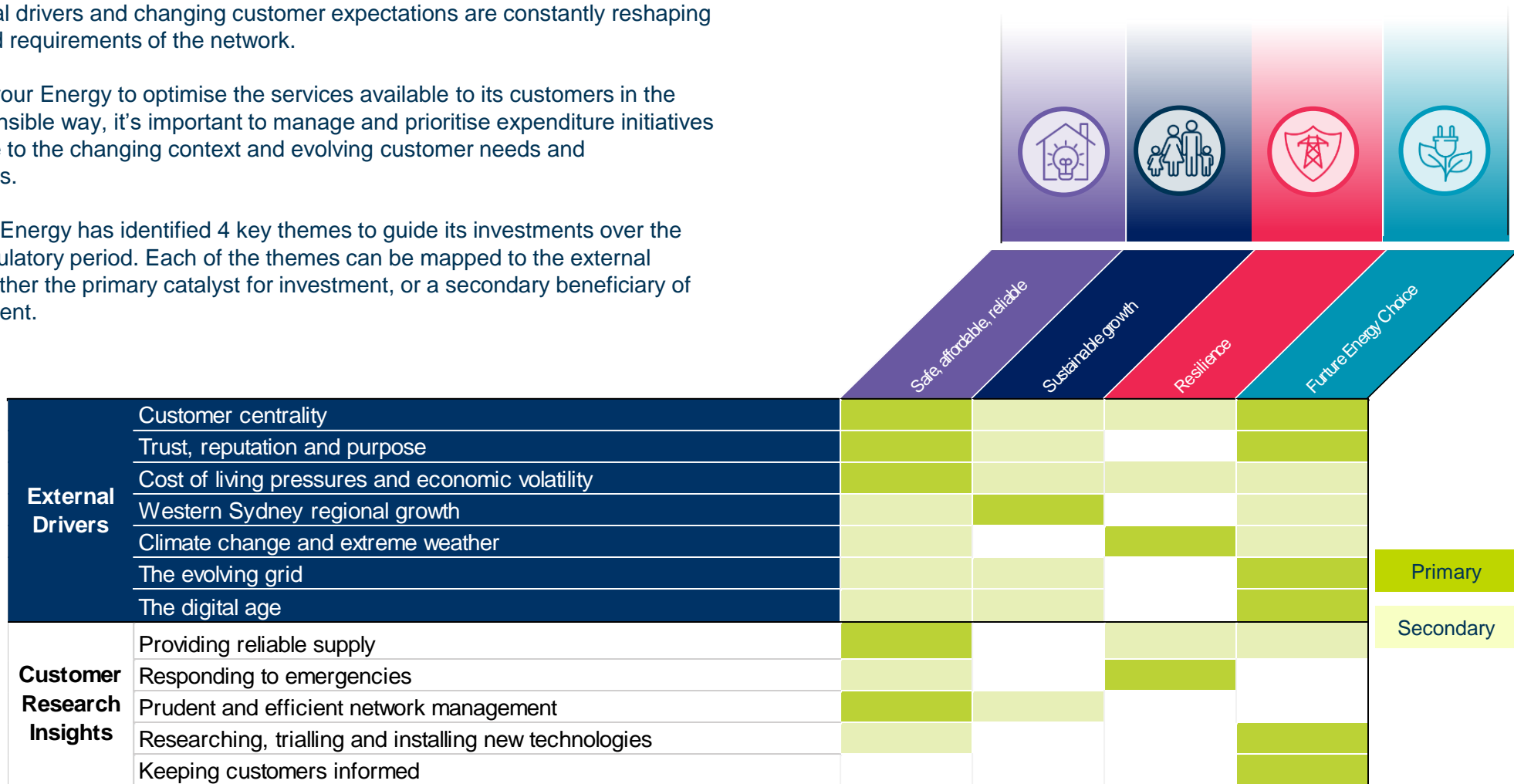


# Four investment themes that meet our changing context

- The external drivers and changing customer expectations are constantly reshaping the role and requirements of the network.

For Endeavour Energy to optimise the services available to its customers in the most responsible way, it's important to manage and prioritise expenditure initiatives in response to the changing context and evolving customer needs and expectations.

Endeavour Energy has identified 4 key themes to guide its investments over the coming regulatory period. Each of the themes can be mapped to the external forces as either the primary catalyst for investment, or a secondary beneficiary of the investment.



- Four priority investment themes will ensure we continue to meet our
- customer needs and respond to our changing environment
- 

To guide investment activities in response to the external influences, and in line with the expectations and requirements of customers, Endeavour Energy has identified 4 key themes:

### **We will balance value for money with plans that address customers' long-term interests**



Meeting core customer expectations for a safe, affordable and reliable electricity supply



Supporting the sustainable growth of our communities



Providing a resilient network for the community against increasing external hazards



Enabling customers future energy choices for a sustainable future



# Meeting core customer expectations for a safe, affordable and reliable electricity supply

At Endeavour Energy we invest in the replacement and renewal of assets across our network to ensure they continue to meet our customers' expectations for a network that is safe for our workers and the community, provides a reliable electricity supply to our customers and doesn't cost the earth.

Our customer research shows that expectations for network reliability have increased, with affordability remaining an important concern. This is likely to require smarter, more efficient investment to meet our customers' core expectations.

We've developed a value framework that puts the needs of our customers first and is embedded into all our investment decisions. It considers public and worker safety, network reliability, bushfire and environmental impacts to help us understand where investments will have the greatest value for our customers. Once we know where we need to invest, we consider the degradation of asset performance over time to understand *when* to deliver investments. To minimise the lifecycle cost of our assets we optimise the delivery of these investments within our network constraints and schedule project delivery to minimise the impact on our customers.

At Endeavour Energy, we have been using risk based investments to safely defer investments across our network for many years, now we are applying this thinking at scale to a wider range of assets. Our Repex program considers the need to reactively replace assets with known defects before they fail, and to proactively replace assets that are no longer economically viable to operate on our network.

## Key Projects:

### Ongoing investments across the distribution network

**HV Switchgear Replacement (MD4)** planned program across five years to address an increasing customer reliability, collateral damage and public safety risk across parts of the network.

**LV CONSAC Replacement** planned and reactive program (utilising smart metres) to identify failed paper insulated LV cables.

**Poles** reactive program over five years to reinforce or replace poles that no longer have a suitable safety factor.

### Major Substation Investments

**Power Transformer Replacements** replace targeted high risk transformers based on individual asset health and risk data

**Circuit Breaker Replacements** targeting predominately oil filled circuit breakers within zone substations to manage the reliability and safety risk posed by these units.

**Switchboard Truck Replacements** retrofitting existing oil filled switchboards with modern vacuum technology, to extend the life of the switchboard and defer the need for traditional asset replacements.

# Supporting the sustainable growth of our communities

- As the ongoing transformation of Greater Sydney continues to drive growth across the Endeavour Energy network, we need to align our investments with other lead infrastructure provisions by facilitating grid technologies that will be adaptable to the evolving needs of businesses and communities.

The growth will require substantial network investment that will support a wider suite of Government plans and initiatives for promoting affordable housing, industries, employment opportunities and economic growth in our network area.

In response to requests from various Government and private planning bodies, and those responsible for land development, we are shifting our investment approach within greenfield areas from being 'Just in Time' to 'Just in Advance'. With this approach we are aiming to address the challenges arising from both the shortening of development time cycles as well as reducing overall community costs by installing infrastructure in conjunction with other utility providers. In the Western Sydney context, large connection requests are common with short lead times so we will invest in 'no regrets investment' areas such as precincts rezoned by state government that have other major infrastructure investment (such as roads and water) committed.

The investment will maximise the utility of existing infrastructure assets and include strategies to stage investment. In addition, investment timing will be optimised to prevent delays in development due to unavailability of assets, carefully positioning Endeavour Energy sufficiently ahead of the growth.

The investment has an optimal mix of traditional and grid transformation technologies to ensure that the new network installed in greenfield areas is adaptable to technological transformations such as distributed energy resources (DER). Investment will be supported by a tariff structure that encourages the efficient use of new and existing infrastructure.

## Key Projects:

### Western Sydney Aerotropolis

6000Ha of land has been rezoned for employment land and mixed use including a new city centre at Bradfield

**Bradfield City** : An investment of \$23m for the Bradfield North substation development.

**Northern Gateway**: \$20m for the installation of a new zone substation in the Northern Gateway precinct.

**Completion of in flight projects**: Investment of circa \$30 to \$40m to complete establishment of up to 5 new substations anticipated to commence within current period

### Western Parkland City including South West Sector and Greater Macarthur South

**Austral Zone Substation**: \$21m for the installation of a zone substation in Austral.

**Mt Gilead Zone Substation**: \$18m for the development of a new substation.

### South Coast

**North Bomaderry Zone Substation**: \$23m for the installation of a zone substation in North Bomaderry.



# - Providing a resilient network for the community adapting to changing climate and external hazards

Endeavour Energy defines resilience as the ability to anticipate, withstand, quickly recover and learn from disruptive events. As the effects of climate change become real, our infrastructure needs to meet our high levels of service in an increasingly hostile environment. Our organisation needs to be prepared, enabling our trained personnel to respond to incidents and provide support services to those in need.

A network can be reliable, without being resilient. The move to 'electrify everything' means that customers are increasingly reliant on power for transport, finance, water, communications and flexible working. This increasing reliance on power to support modern living, coupled with the impacts of climate change and increasing cyber security threats, heightens the need for complementary investment in measures that specifically deliver resilience, minimising the impacts of disruptive events on customers who rely on power more than ever before.

To meet these expectations and in the case of cybersecurity, legislative requirements, we are applying a value-based approach to identify ways to harden the existing infrastructure, improve fault detection and automate the network to reduce the size of outages and improve restoration times for customers. Across our organisation we are optimising our response to fault and emergencies and have committed to sharing those learnings across the industry.

With over 85 percent of our network in bushfire prone areas<sup>2</sup> Endeavour Energy devotes a significant proportion of our projects and programs to mitigating bushfire risk for the community, including a rigorous pre-summer bushfire program.

## Key Projects:

### Harden existing infrastructure

**Covered Conductors.** The installation of covered conductors in high bushfire risk areas.

**Spreaders.** Installation of spreaders in high bushfire areas to reduce conductor clashing during high wind conditions.

**Undergrounding.** Preference for UG mains for new developments.

**Cyber Security.** Upgrades to core system to meet increasing cyber resilience including through the SOCI Act.

### Automation to isolate faults

**Feeder Automation.** Installation of 1500-2000 automatic switches prioritised to areas that need it the most.

**FLISR.** Automated fault switching to isolate faults quickly and reduce the number of customers impacted by outages

### Fault Detection

**Early Fault Detection.** Line monitoring devices to detect imminent failures address the issue before it triggers an outage/fire.

**Line Fault Indicators (LFI).** Investment in LFIs to help field staff respond to outages and improve restoration times.

## • Enabling customers' future energy choices

- As customers seek to connect more distributed energy resources and increasingly use sophisticated digital platforms, the network and its management must evolve. Our objective is to **enable customers' future energy choices for a sustainable future**, moving use towards the future integrated and low carbon energy system.

Endeavour Energy has already positioned itself well for these changes. The (\$350 million) investment into a new Advanced Distribution Management System, enhanced cyber-security and upgraded SAP system are requisite initial steps. Through our innovation program, we have been conducting Dynamic Voltage Management System, Conservative Voltage Optimisation, DER Management system trials (such as Bawley Point).

From 2024-2029, Endeavour Energy will be making prudent investments that incrementally build the capability to meet these evolving requirements. This includes:

- upgrades that increase DER hosting capacity,
- increase our visibility of the low voltage network (to manage emerging issues on that network such as: voltage issues, incipient faults, hazards and pinpointing faults)
- creation of allowance to invest into trial technologies where the best responses are still emerging.

These investments are necessary to prevent the need for curtailment as a tool to manage reliability issues and ensure customers that choose to take up technologies are able to maximise the value derived. Our customers may then, via these investments, enjoy greater access to new energy market opportunities, by households and third parties, to maximise value from the networks in a more dynamic system.

A well-designed tariff structure that reflects new technology options should realise fair and equitable access to choice and maximise the benefit of these investments to customers.

## Key Projects:

### Future Networks

Technology is evolving rapidly in order to meet the energy transition and Endeavour Energy will continue to trial these technologies and from the lessons learnt from those trials, apply these within our business context

### LV Visibility and Analytics

There is significant benefit to be gained by accessing smart-meter data. It assists us in identifying emerging issues on the low voltage network, which complements the existing visibility of the high-voltage network

### DER hosting capacity

We are investing in creating the enablers for consumers to derive the maximum utility from their DER, whatever their energy choices are likely to be. This encompasses support for additional participation models such as: Virtual Power Plants, SAPS and micro-grids.



# 05 Investment Planning

## Section contents:

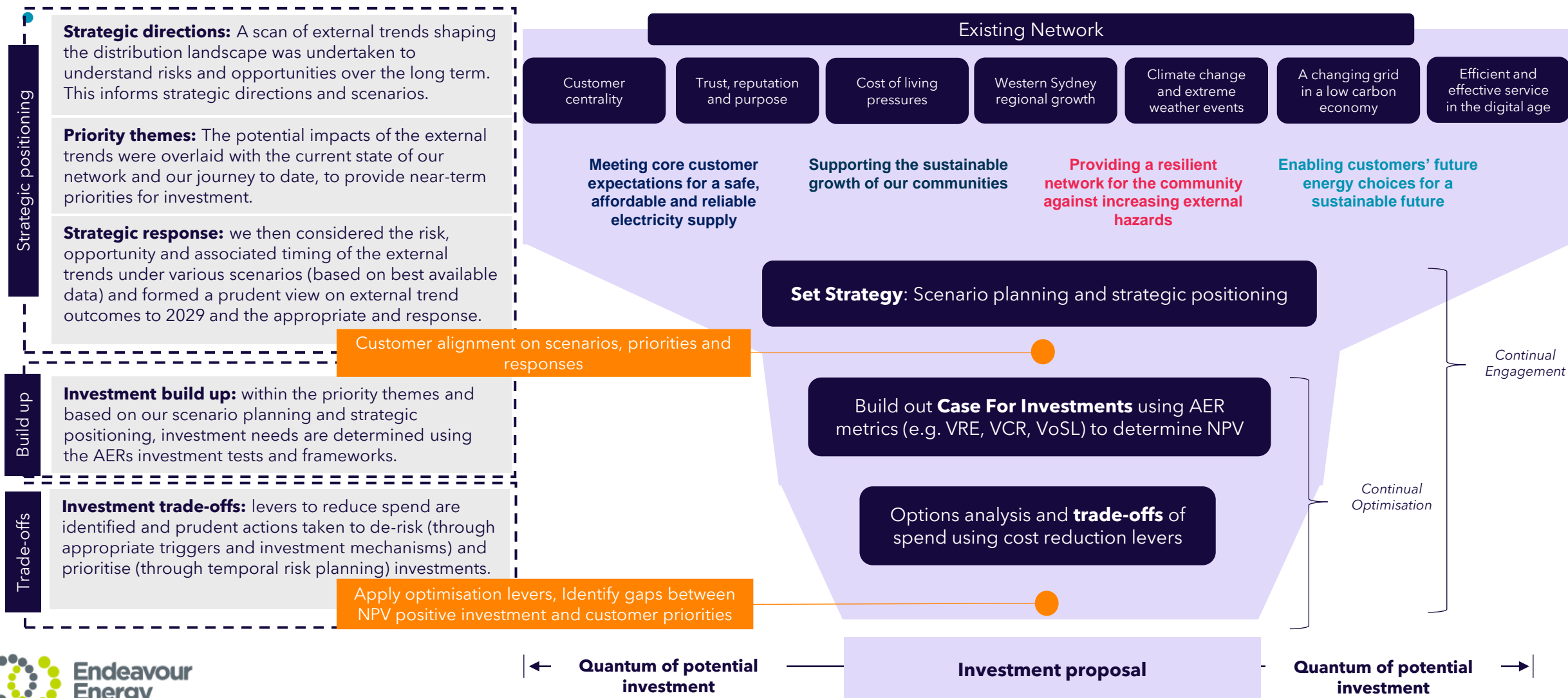
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Endeavour's framework for ensuring prudent and efficient spend

Scenario planning for the future



# Endeavour's framework for ensuring prudent and efficient spend



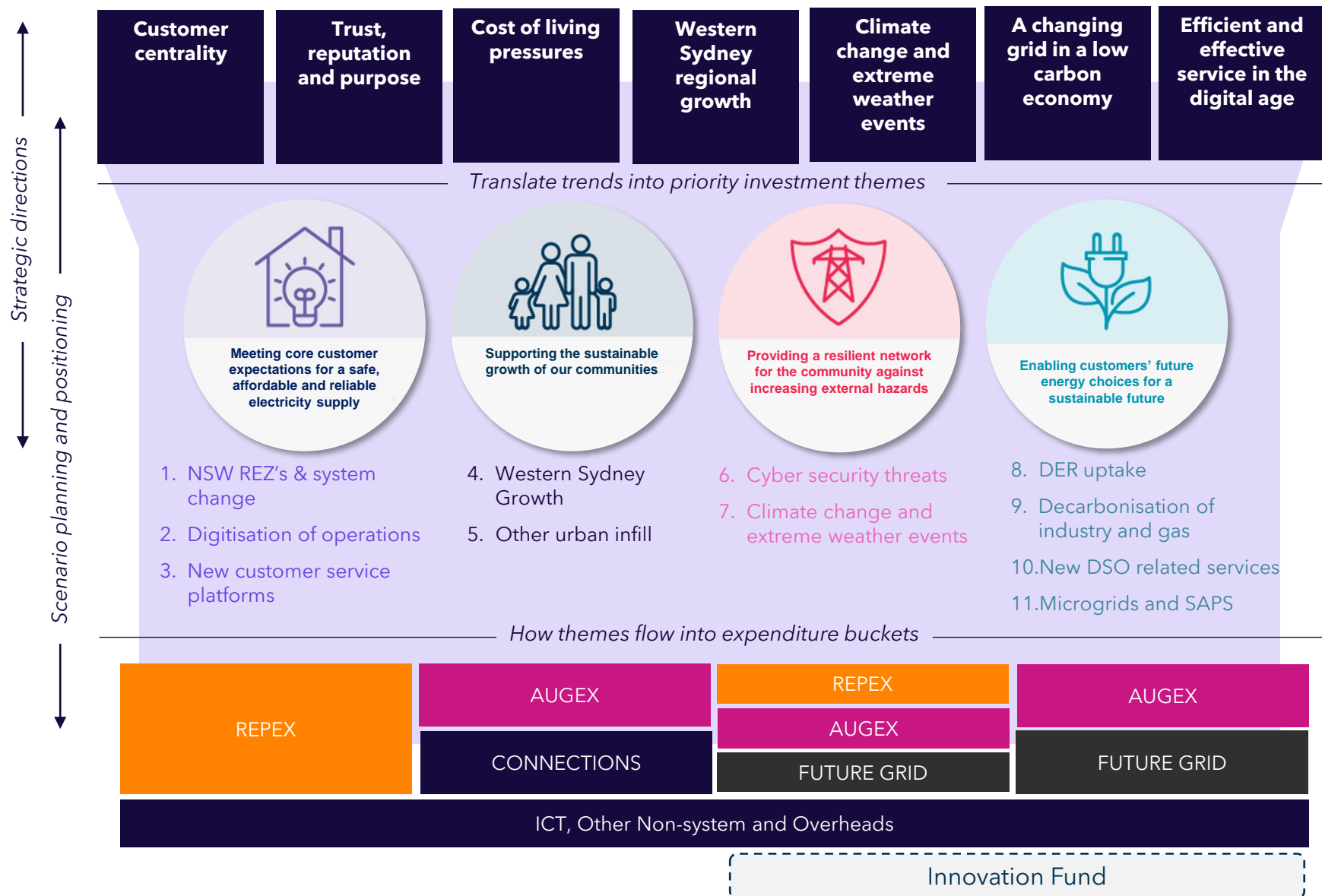


# Scenario planning for the future

As a first step in its reset process, Endeavour Energy undertook a market scan exercise identifying six key external trends shaping the future operational landscape of our network through to 2035.

The six trends comprise of a number of societal and energy related issues which have varying impact on the electricity network, and that will require a varying level of investment in response.

Potential impacts of the external trends were overlaid with the existing network design and capacity, and also our journey to date to provide near-term priorities for investment. These investments flow into the typical categories of capital expenditure (new connections, augmentation and replacement) as well as future network.



# A balanced view on the emerging trends

Endeavour Energy has taken a balanced view of emerging trends in the near term

**Implications to 2029:** Under each investment theme we broke-down the (sub) trends that could drive potential expenditure and considered the impact on the network and the likelihood of that impact occurring over the regulatory period.

There is uncertainty within each trend. Our approach seeks to (1) gain alignment on the forecast as best as possible and (2) apply mitigations and/or triggers for investment that deal with uncertainty.

**Long term projections:** capital outlay for trends like Western Sydney Growth, the changing energy system, and climate change are likely to be reflected in an increase in repex and operational expenditure in future periods.

Significant trends such as DSO and EVs are likely to feature in future reset periods, with some of the costs offset by emerging non-network solutions and demand response capability.

**Meeting core customer expectations for a safe, affordable and reliable electricity supply**

1. NSW REZ's & system change
2. Digitisation of operations
3. New customer service platforms

**Supporting the sustainable growth of our communities**

4. Western Sydney Growth
5. Other urban infill

**Providing a resilient network for the community that protects against increasing external hazards**

6. Cyber Security Threats
7. Climate change and extreme weather events

**Enabling customers' future energy choices for a sustainable future**

8. DER Uptake: Solar PV
9. DER Uptake: Customer energy storage and demand response
10. DER Uptake: Electric vehicle
11. Decarbonisation of industry and gas
12. New DSO related services
13. Microgrids and SAPS

## How the trends will impact Endeavour by 2029

