

Energy
Networks
Australia



ELECTRICITY NETWORK TRANSFORMATION ROADMAP: FINAL REPORT

APRIL 2017

2017-27

A TRANSFORMED ELECTRICITY SYSTEM BY 2050

- » **Customers retain security and reliability essential to lifestyle and employment**

- » **Networks pay distributed energy resources customers over \$2.5 billion per annum for grid support services by 2050.**

- » **Electricity sector achieves zero net emissions by 2050**

- » **\$16 billion in network infrastructure investment is avoided by orchestration of distributed energy resources**

- » **Reduction in cumulative total expenditure of \$101 billion by 2050**

- » **Network charges 30% lower than 2016**

- » **\$414 annual saving in average household electricity bills (compared with the *Roadmap* counterfactual and business as usual scenarios)**

- » **A medium sized family who cannot take up distributed energy resources is over \$600 per annum better off through removal of cross subsidies**



A VISION TO 2027 AND BEYOND

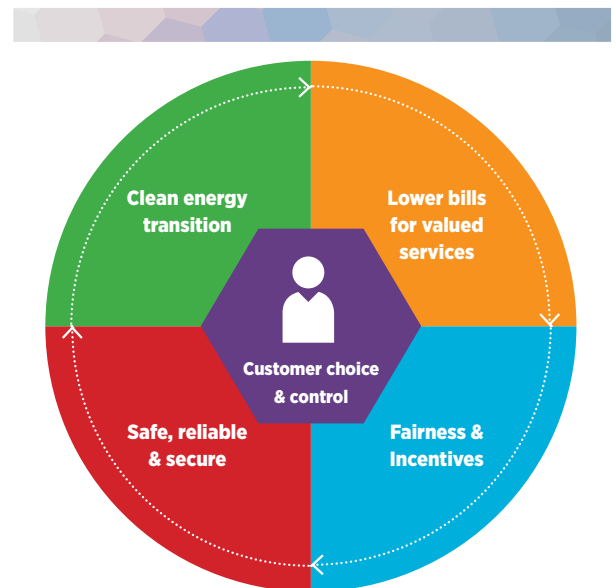
Australia's electricity system supports our economy and lifestyle and it is changing at an unprecedented scale. The transformation is driven by customers, as they embrace new technologies, take control of their energy use and support action on climate change.

Australians are installing rooftop solar at world leading rates. It is estimated customers - not utilities - will determine over \$200 billion in system expenditure by 2050. The full value of these customer installed energy resources can only be realised through a *connected future* enabling multilateral exchanges of energy, information and value. This co-optimisation allows future network investments in 'poles and wires', to be lower than otherwise anticipated, while also supporting the creation of more value for customers through the platform of smarter electricity networks.

A customer oriented transition must focus on carefully balancing key customer outcomes. The electricity system must achieve decarbonisation at least cost for customers without jeopardising power system security. Equally, it must also incentivise and enable new customer choice and control, while appropriately protecting consumers and avoiding unfair impacts on vulnerable customers.

The *Electricity Network Transformation Roadmap* has been developed to guide a structured transformation over the 2017-27 decade and to equip networks to deliver the five customer outcomes of the Balanced Scorecard below. It has been informed by CSIRO's energy system analysis and wide stakeholder collaboration.

Figure i: Balanced Scorecard of Customer Outcomes



The Critical Role of the Integrated Grid

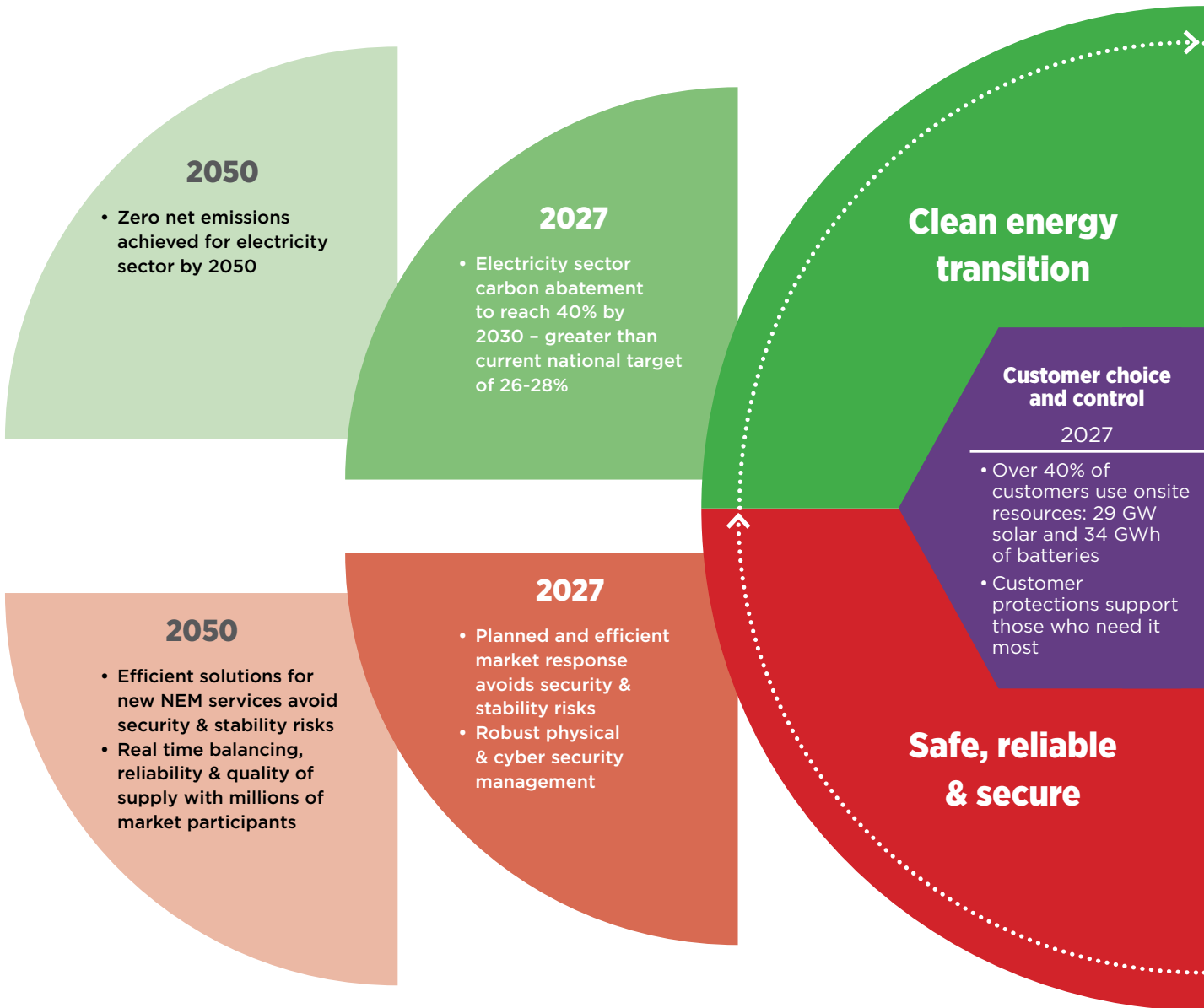
The next decade to 2027 is likely to see a step change in the rapid adoption of new energy technologies, driven by falling costs and global carbon abatement measures. This decade provides a limited window of opportunity to reposition Australia's electricity system to deliver efficient outcomes to customers.

The agility with which networks connect, integrate and incentivise new, lower carbon energy choices will directly influence the cost, fairness, security and reliability of the electricity system for customers. Urgent regulatory and policy changes will be required to maintain power system security, while reducing customer costs by enabling the efficient use of distributed energy resources, stand alone systems and micro-grids. Timely development of technical standards and new platforms will animate new distributed energy resource markets and permit more efficient customer services and participation.

The right balance can be achieved

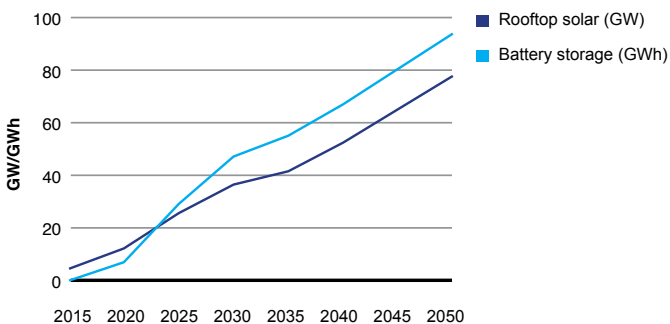
With a clear *Roadmap*, Australia's electricity sector can outperform current abatement targets, keep the lights on and deliver lower costs. Australia can increase the levels of both centralised and decentralised renewable and low emission generation sources enabled by transmission and distribution networks. Total system costs can be reduced by over \$101 billion through network service platforms enabling distributed energy resources to participate in increasingly dynamic electricity markets. Together, *the Roadmap* activities can achieve a positive energy future for Australian energy customers enabling choice, lower costs, high security and reliability and a clean electricity system to 2050.

A BALANCED SCORECARD FOR CUSTOMERS



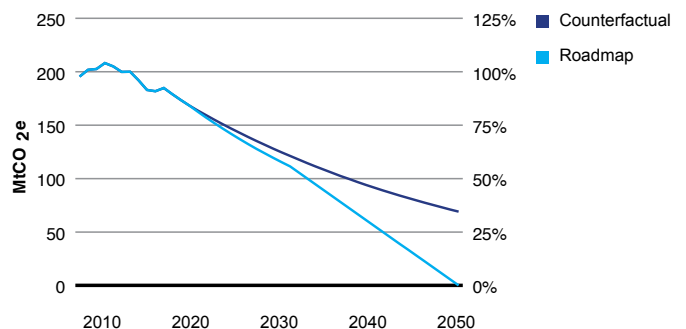
Rooftop solar and battery storage adoption

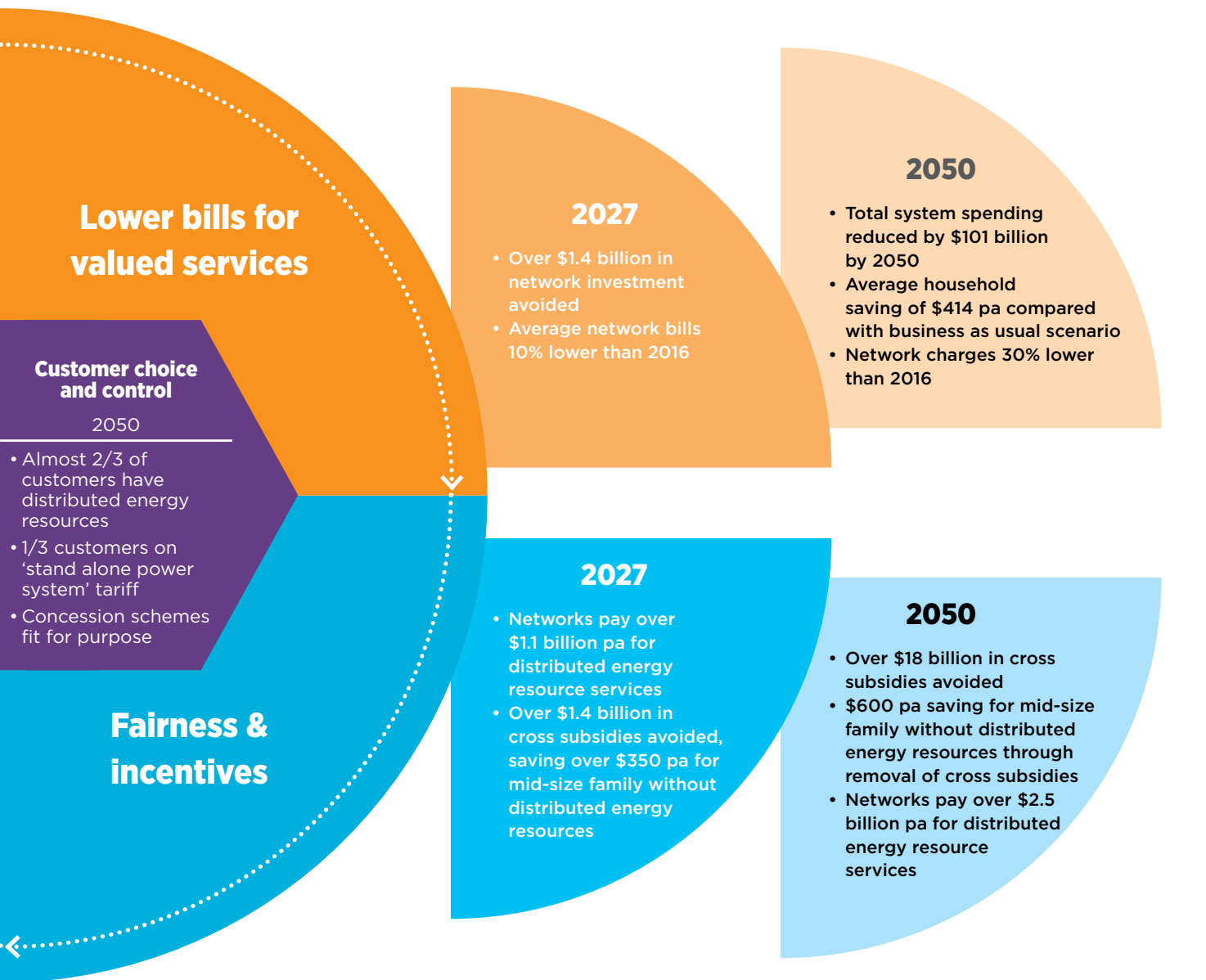
Projected uptake of solar PV and battery storage to 2050



Carbon abatement

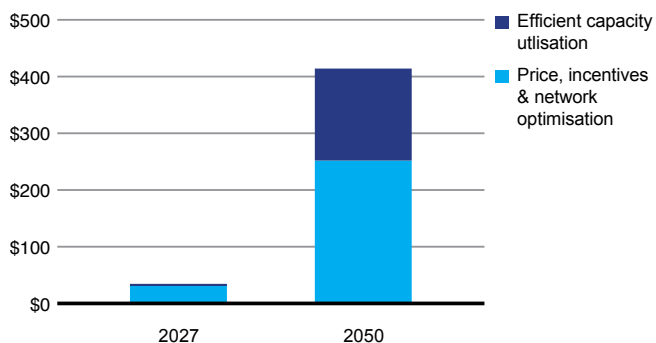
Assumed greenhouse gas pathways under *the Roadmap* and Counterfactual scenarios (Left axis: emissions, Right axis: percent abatement relative to 2005 emissions)





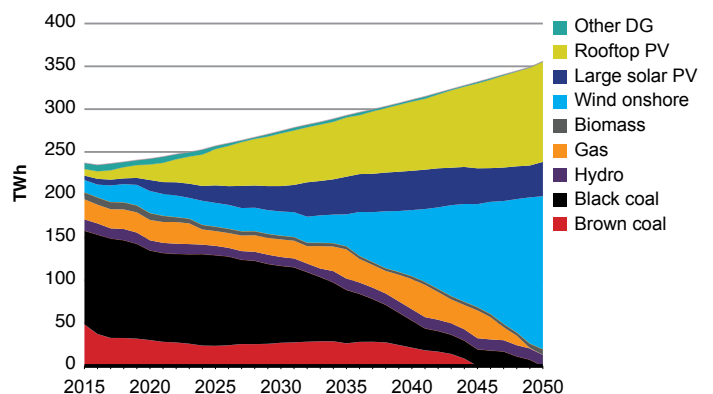
Savings for customers

Projected savings in average residential bills (in real terms) under the Roadmap scenario



Electricity generation mix

Projection of Australia's changing electricity generation mix to 2050



THE KEY CONCEPTS ROADMAP: IMPLEMENTATION PATHWAY





INCENTIVES & NETWORK REGULATION



A fairer system through active implementation of tariff reform and modernised regulation and competition frameworks. More customer oriented outcomes are supported ensuring those without distributed energy resources are treated fairly, while those with distributed energy resources are able to receive incentives for providing network support services that improve the efficiency of the grid for all.

FOUNDATION BY 2022

Incentivising efficiency and innovation

- » Ensure extensive smart meter penetration
- » Assign customers to new range of fairer cost reflective network tariffs, with a choice to Opt Out
- » Enable stand alone systems and micro-grids as a substitute for traditional delivery models
- » New innovation incentives in Regulation and Competition frameworks



IMPLEMENTATION BY 2027

Unlocking value of distributed energy resource orchestration

- » Networks pay for distributed energy resource orchestration to provide system support in the 'right place at right time'
- » New network tariffs that provide beneficial incentives for stand alone systems and micro-grids to stay connected to the grid
- » New and more adaptive regulatory approaches that are customer focused

INTELLIGENT NETWORKS & MARKETS



An expanding range of new energy technologies and services are supported while continuing to efficiently provide a range of traditional electricity services. Advanced network planning, operation and intelligence systems ensure the safe and efficient integration of large scale renewable generation, hundreds of micro-grids and millions of customer distributed energy resources. Market based mechanisms reward customers with distributed energy resources for providing network support services, orchestrated either directly or through other market actors.

FOUNDATION BY 2022

Essential information for an integrated grid

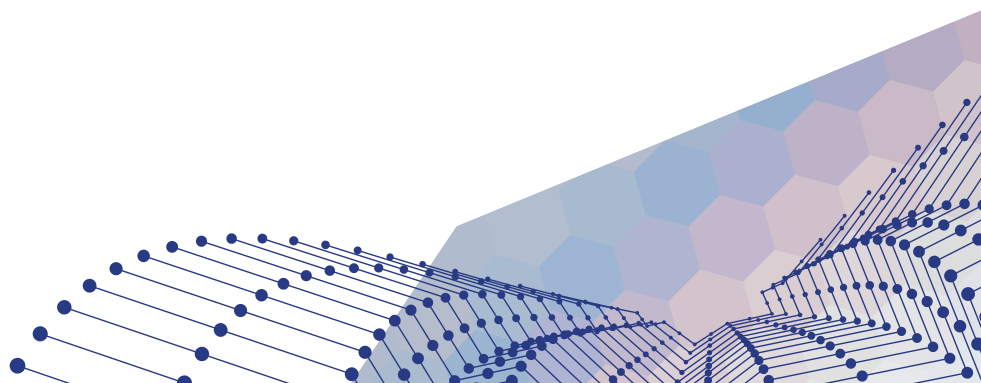
- » Establish open standards and protocols to enable secure system operation, management and exchange of information and interoperability with distributed energy resources
- » Networks enhance current system monitoring and models to inform advanced system planning
- » Build distributed energy resource maps and feeder hosting analysis to support locational valuation of distributed energy based services



IMPLEMENTATION BY 2027

Networks optimised with distributed energy resources

- » Active network management for technical stability, enabling distributed energy resource markets and efficient optimisation
- » Networks provide a suite of grid intelligence and control architectures to animate distributed energy resource markets, as well as providing system security
- » Establish a new network optimisation market to procure distributed energy resources services for network support
- » A flexible and agile workforce to support the new optimised energy system





CONTACT DETAILS

We value your input. Please contact us or raise any queries by emailing ntr@energynetworks.com.au

Electricity Network Transformation Roadmap publications can be downloaded from www.energynetworks.com.au/roadmap

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