Energy Networks Australia

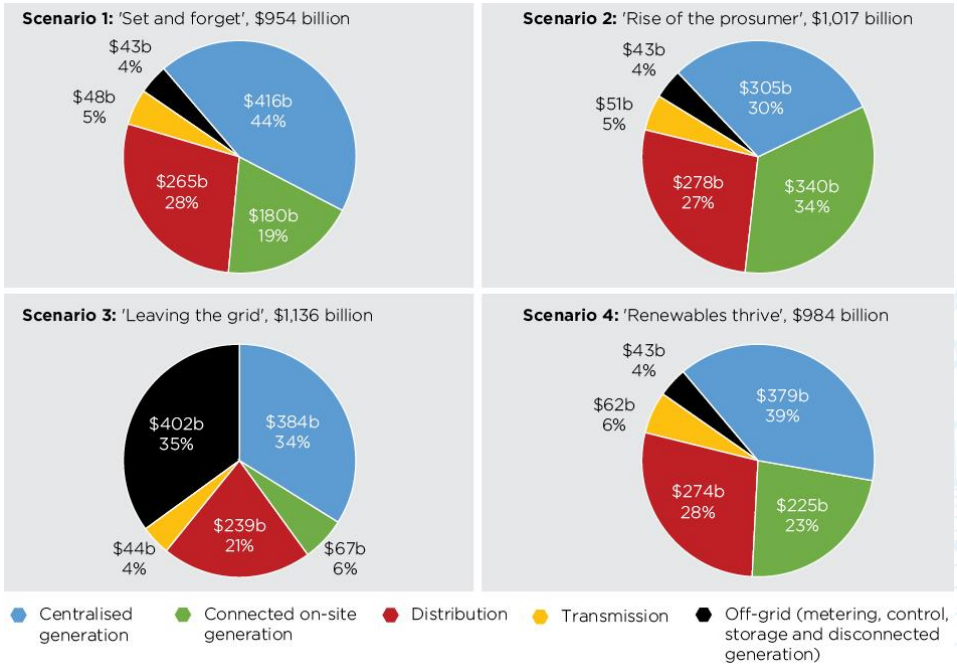
Solar Energy 2017
Energy Market Reform

John Bradley, Chief Executive Officer

4 May 2017

Why Australia needs a Transformation Roadmap – resilience to diverse futures

Customers or their agents will make **25% to 40% of all investment decisions** in the energy supply system out to 2050 - up to $400 billion.



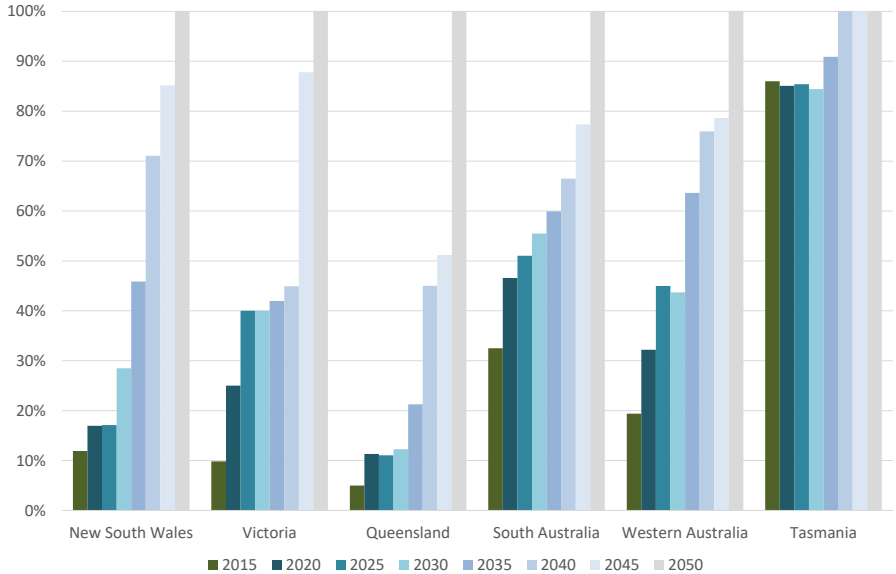
CSIRO & ENA – Network Transformation Roadmap Interim Program Report

Regional Modelling: Large Scale Renewable Generation

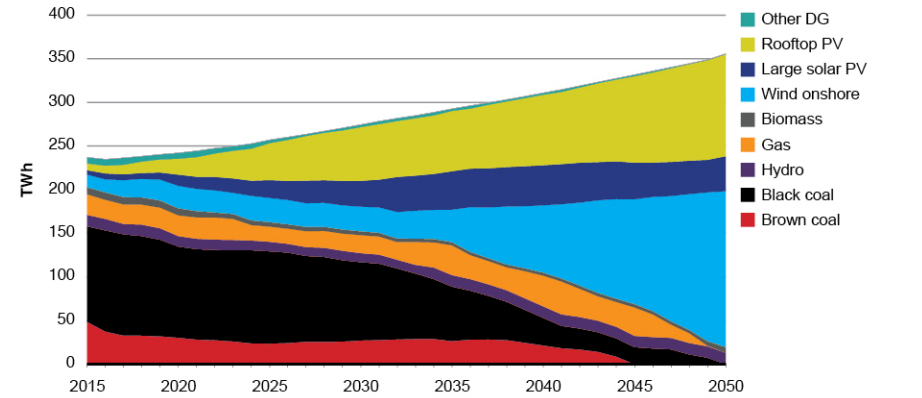
Finding 1: Some states will require earlier action to manage power system security.

South Australia and Victoria will likely need to bring forward actions relating to managing power system security.

Finding 2: Some states could see very significant generator construction programs required in compressed timeframes.



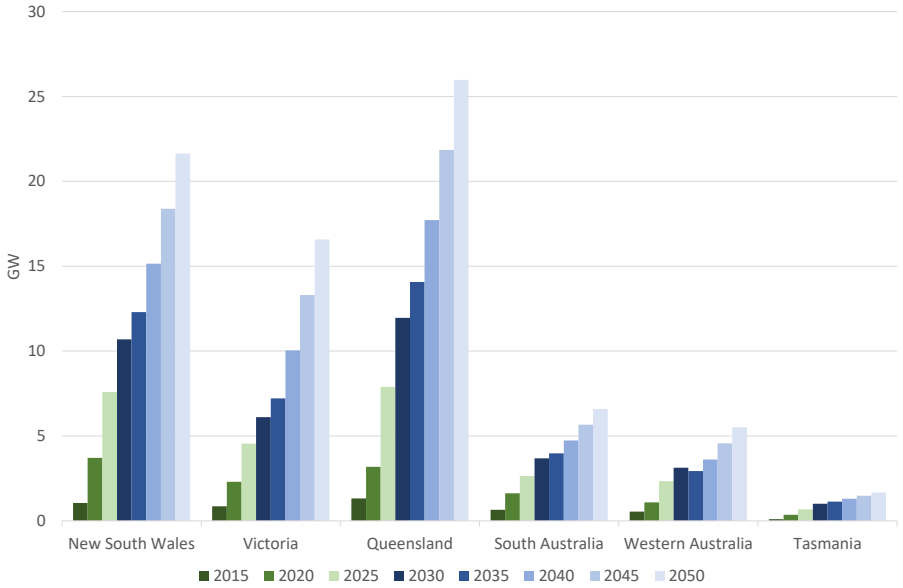
Projected renewable generation as a share of state generation under the Roadmap scenario



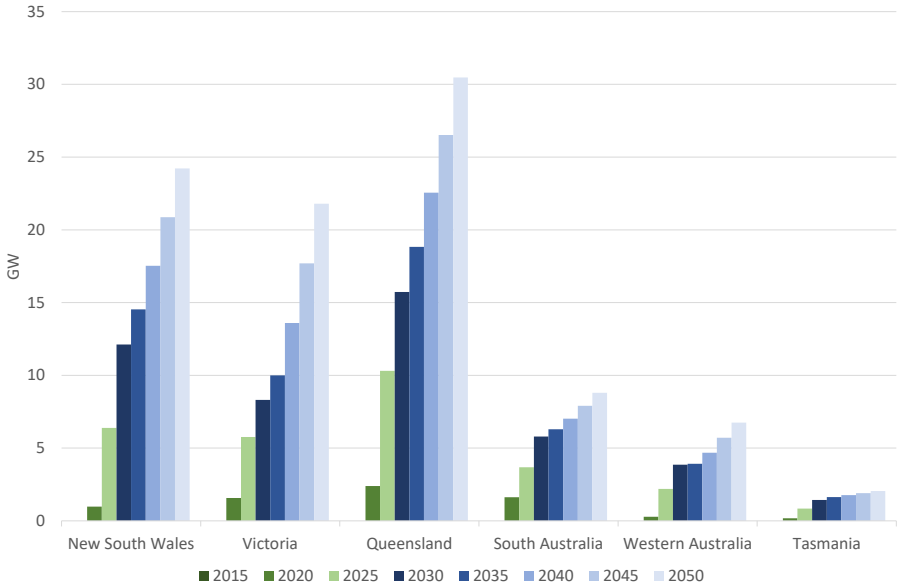
Regional Modelling: Distributed energy resources adoption

Finding 6: Projected higher rooftop solar capacity reflects both expected increasing customer adoption and larger average systems sizes

Finding 7: Bundling of battery and rooftop solar systems together is expected to be the primary driver of battery storage adoption



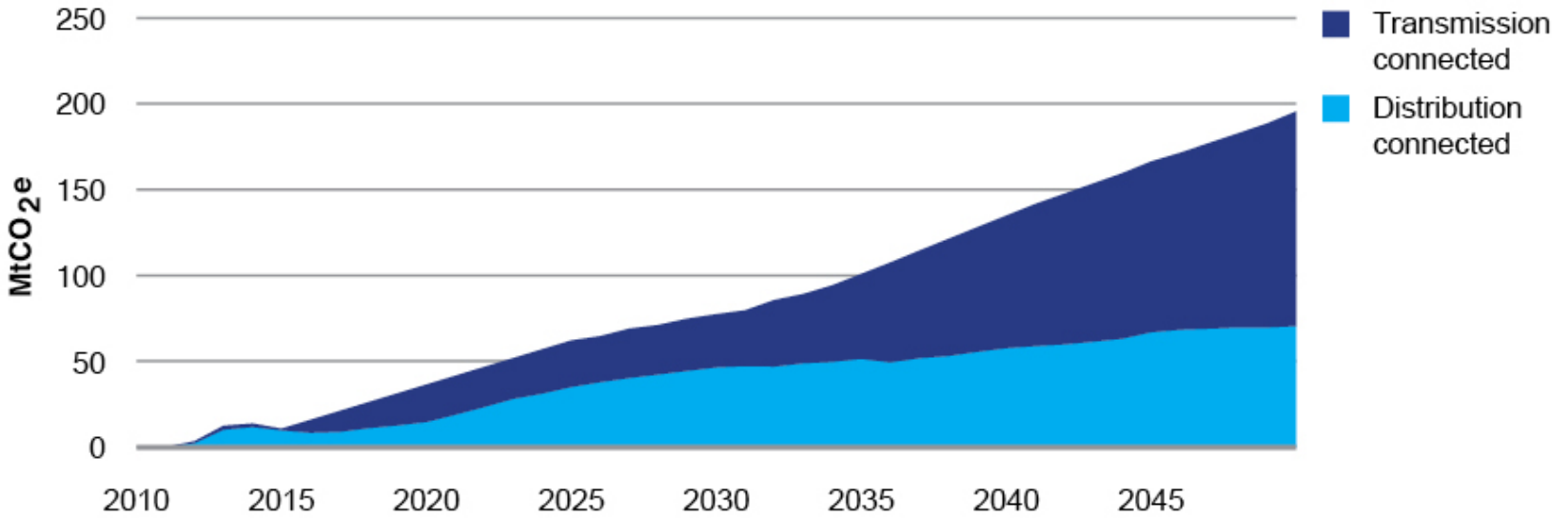
Projected installations of rooftop solar by state



Projected installations of onsite battery storage by state

Realising Zero Net Emissions by 2050

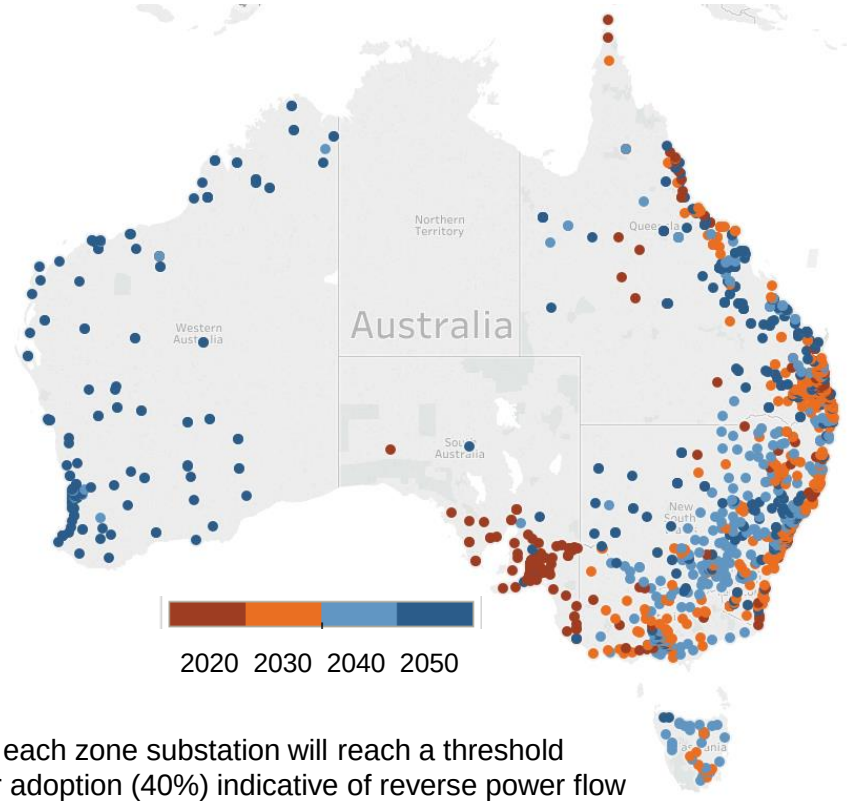
Figure 4: Historical and projected quantity of electricity sector abatement by location on the network (*Roadmap* Scenario)



Significant new Operational Capabilities required

.

- **Grid design and operation**
- **Distribution Interface with AEMO**
  - Visibility of DER
  - DER ancillary services
- **Forecasting energy and demand**
- **Increased data transparency to animate markets**

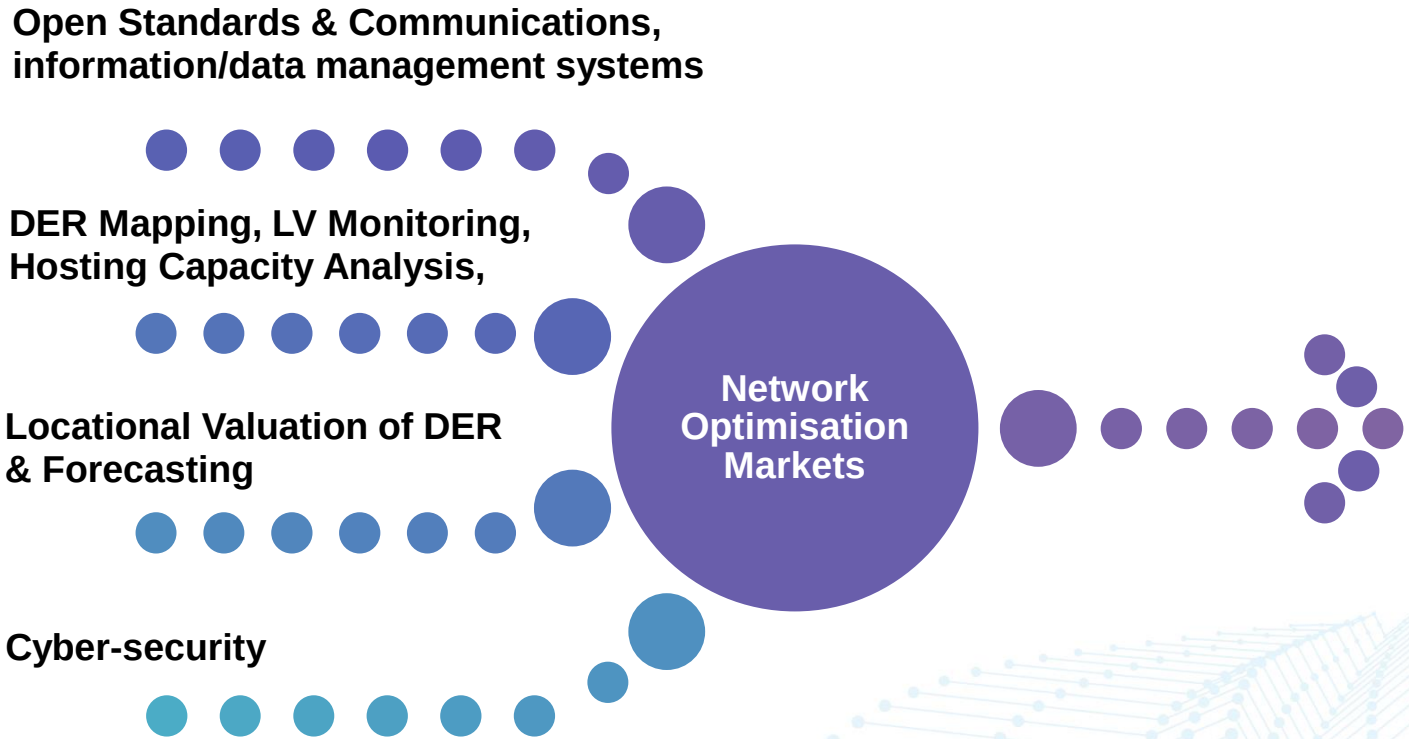


Projected decade in which each zone substation will reach a threshold penetration of rooftop solar adoption (40%) indicative of reverse power flow

Opportunities for DER Orchestration

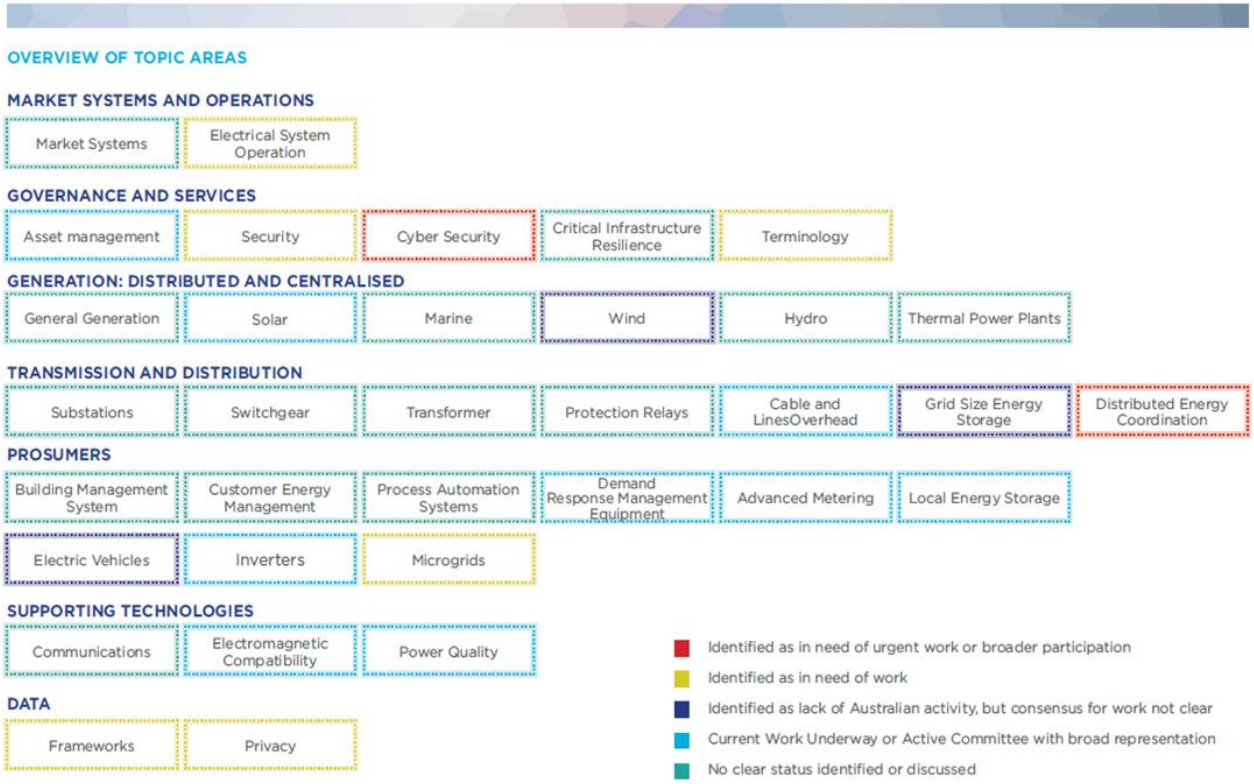
- Customers (or agents) could choose to ‘opt in’ to rewards for grid support in the ***right place*** at the ***right time***:
  - **Incentive Payments for ‘orchestration’ of DER** (eg. battery discharge; smart inverters; load control; HEMs platforms);
  - **Advanced Network Tariffs for Behavioural Response** *(eg. Critical Peak Price; Peak Time Rebates; Nodal Pricing)*;
  - **Transactive Energy:** (eg. real time pricing in future in distributed markets).

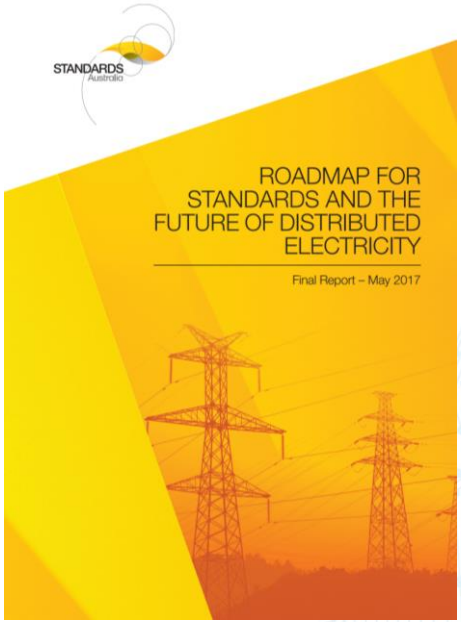
Market transformation requires advanced network planning and DER valuation capabilities



Open Standards will play a critical role in DER integration

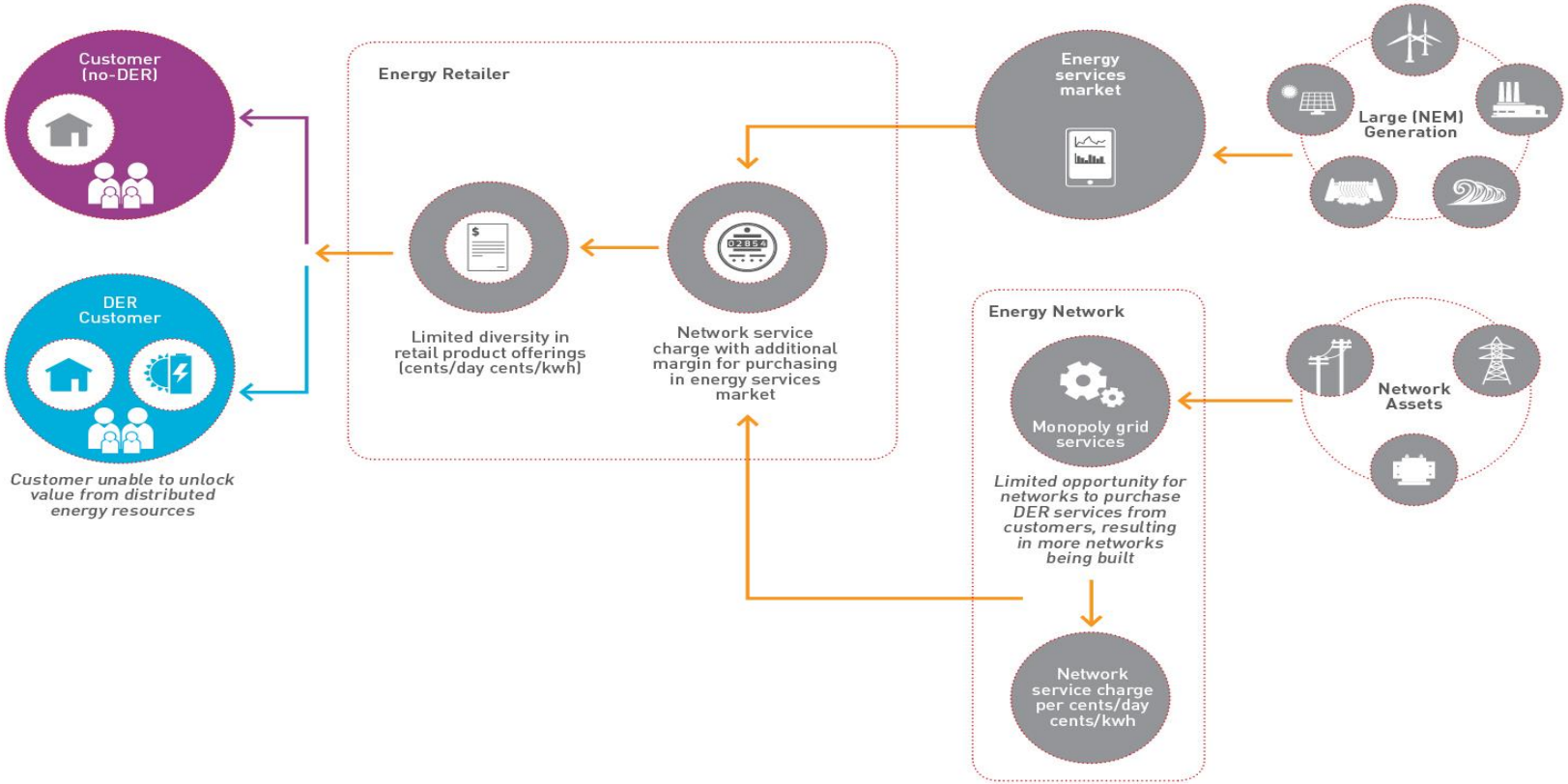
Figure 28: Snapshot of the current state of Australian standardisation





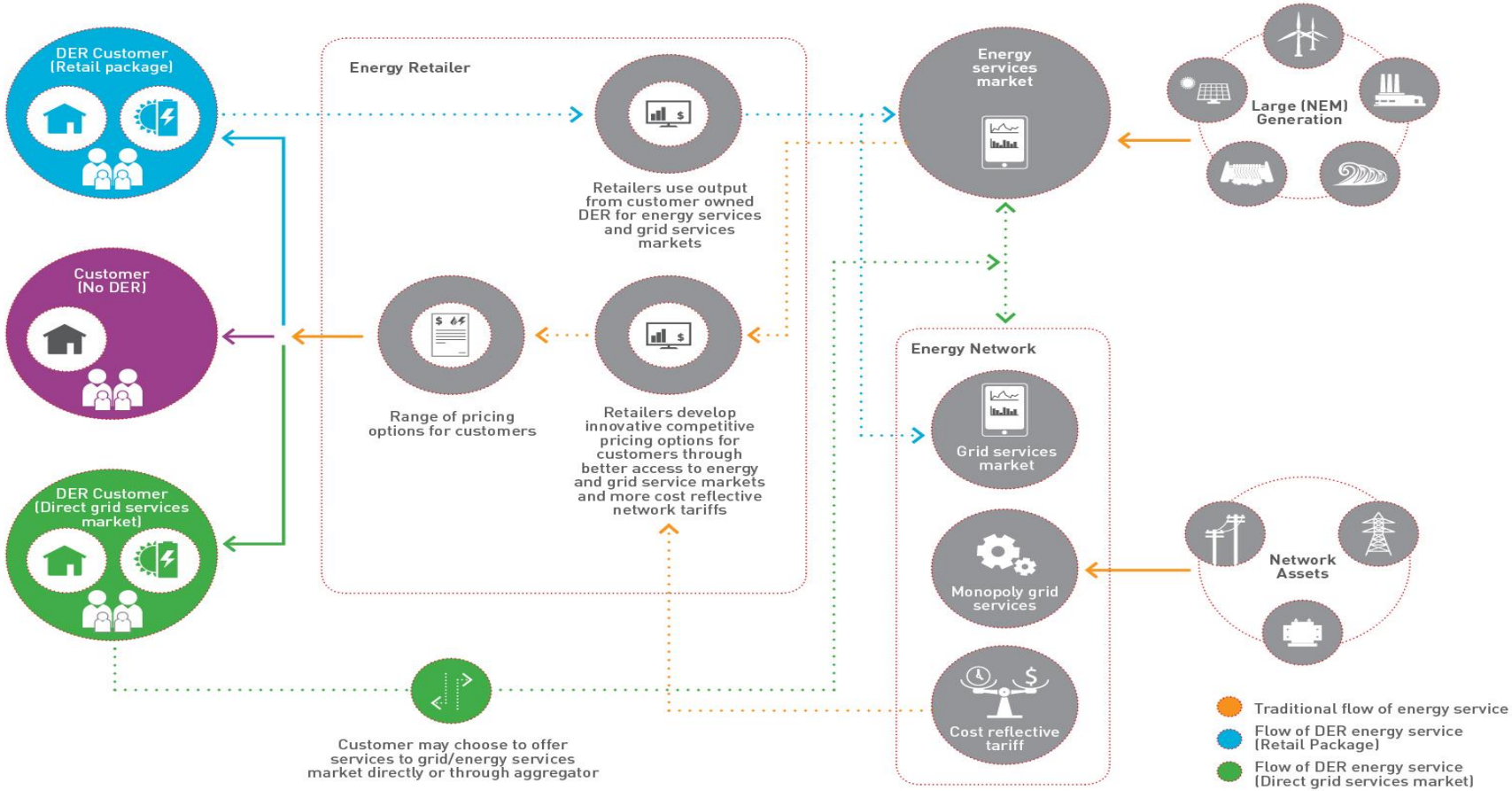
Current state of pricing frameworks

Limited choice and flexibility for customers and network businesses



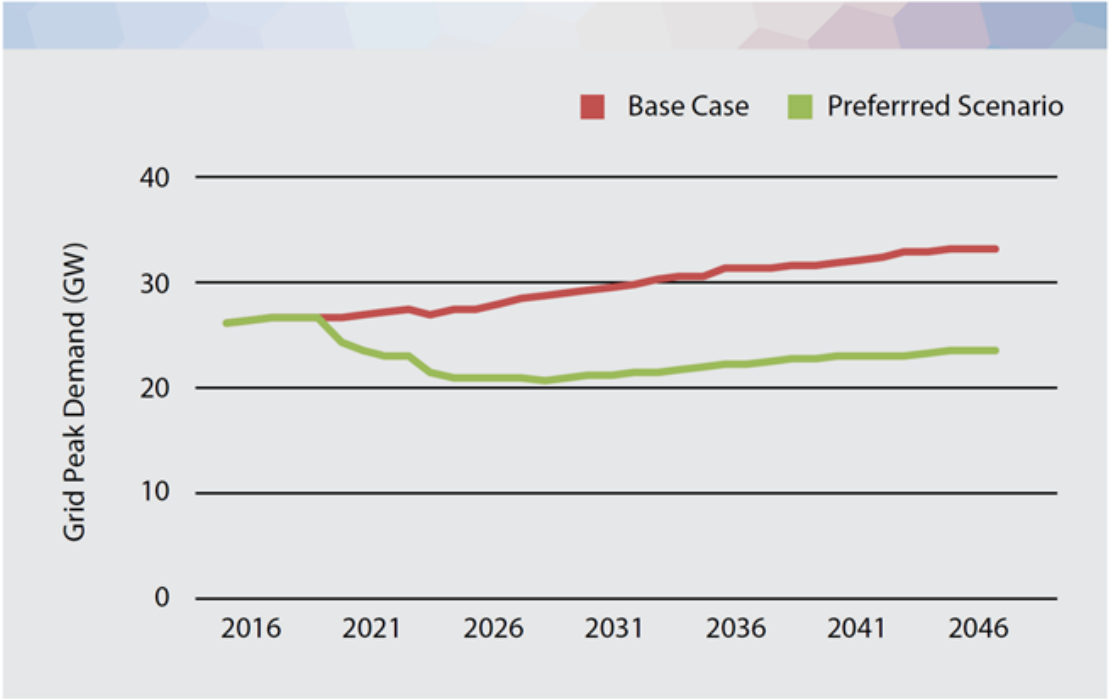
Unlocking value through better prices and better access to new markets

Instead of building networks "buy" output from DER (through retailers, aggregators or directly from customers) for locational, dynamic benefits



Benefits of DER orchestration

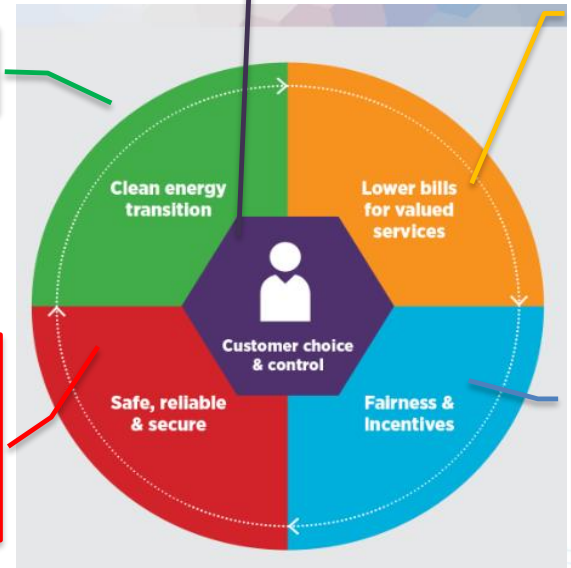
Figure 3: Total Network Non-Coincident Peak Demand (GW)



Benefits of a National Roadmap for Energy Transformation

- Almost 2/3 of customers have DER
- 1/3 customers on ‘stand alone power system’ tariff
- Customer protection and concession schemes fit for purpose.

- COP 21 aspiration of Zero Net Emissions by 2050 is met



- Reduce total system spend by $101 BN by 2050
- Save Households $414 pa
- Network charges 30% lower than 2016

- Efficient solutions for new NEM services avoid security & stability risks.
- Real time balancing, reliability & quality of supply with millions of DER participants

- Avoid over $18 BN in cross subsidies
- Means $600 pa. for mid size family without DER
- Networks pay over $2.5 BN pa for DER services

Overview of the Electricity Network Transformation Roadmap

	FOUNDATION 2017–2022	IMPLEMENTATION 2023–2027+
CUSTOMER ORIENTED ELECTRICITY	**Improve Trust with Customers** » Enhanced customer engagement and collaboration » Customised choices, better information on services and new connection and advisory services » Demonstrate investment reflects customer value while improving service performance and response times » Review of Consumer Protection and concessions	**Networks provide a service platform** » Open network platforms embrace diverse customer needs and aspirations » Collaborate with customers and market actors to create new value with streamlined connections » Leverage network information and digital services for personalised innovation in a dynamic market
POWER SYSTEM SECURITY	**New systems to support diverse generation** » Update Transmission Interconnection test » Review frameworks for protection systems, efficient capacity and balancing services » New market frameworks for ancillary services » Develop new power system forecasting and planning approaches to anticipate system constraints » Enhanced intelligence and decision making tools » Close focus on physical & cyber security	**Harmonised System Operations at all levels** » Transmission networks support system stability with new services. » Distribution networks provide visibility of DER and potentially Frequency Control Ancillary Services (FCAS) and delegated balancing services. » Real-time communication and controls
CARBON ABATEMENT	**A stable Carbon Policy for higher targets** » Develop nationally integrated carbon policy framework » Implement emissions Baseline & Credit Scheme » Set Light Vehicle emissions standard policy to provide incentives for electric vehicle uptake, supporting climate goals » Review Australia's emissions reduction target » Agile network connections and integration of large and small scale renewable technologies	**Reviewing scope for greater efficiency** » Review technology specific incentive schemes to focus on least cost abatement » Review scope for more efficient economy wide carbon pricing where consensus » Review Australia's emissions reduction target (2027)
INCENTIVES & NETWORK REGULATION	**Incentivising efficiency and innovation** » Ensure extensive smart meter penetration » Assign customers to new range of fairer demand-based network tariffs, with a choice to Opt Out » Enable standalone systems and micro-grids as a substitute for traditional delivery models » New innovation incentives in Regulation and Competition frameworks	**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 standalone systems and micro-grids to stay connected to the grid » New and more adaptive regulatory approaches that are customer focused
INTELLIGENT NETWORKS & MARKETS	**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	**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 DER services for network support. » A flexible and agile workforce to support the new optimised energy system.

Overall Customer outcomes by	2027	2050
CUSTOMER CHOICE AND CONTROL	» Over 40% customers use onsite resources: 29 GW solar and 34 GWh of batteries. » Concessions to support those who need it most.	» Almost 2/3 customers use onsite resources, including 1/3 customers on a new stand alone system tariff.
LOWER BILLS FOR VALUED SERVICES	» Avoid over $1.4 BN in network investment. » Average network bills 10% lower than 2016.	» Total system spend is $101BN lower to 2050. » Save households $414 pa by 2050. » Network charges 30% lower than 2016.
FAIRNESS & INCENTIVES	» Networks pay over $1.1 BN pa for DER services. » Over $1.4 BN in cross subsidies avoided, saving $350 pa for med size family without DER.	» Networks pay over $2.5 BN pa for DER services. » Over $18 BN in cross subsidies avoided, saving $600 pa for med size family without DER.
SAFETY, SECURITY, RELIABILITY	» Planned and efficient market response avoids security & stability risks. » Robust physical & cyber security management.	» Real time balancing, reliability and quality of supply at small and large scale, with millions of market participants.
CLEAN ENERGY TRANSITION	» Electricity sector carbon abatement to reach 40% by 2030 – greater than current national target of 26-28%.	» Electricity sector achieves Zero Net Emissions by 2050.

For More Information: www.energynetworks.com.au