

# CONSUMERS' WELFARE AND INDEPENDENCE OF REGULATORY INSTITUTIONS

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**AEMC**

## Overview

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- The role of AEMC and relationship with other regulatory institutions
- Emerging power system challenges
  - New forms of generation
  - Forecasting and volatility
- Power system security
- Coordinating transmission augmentation with new generation
- Facilitating the development of distributed energy resources
- Concluding remarks and questions

# Australian national governments and energy policy development

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**Council of Australian Governments (COAG)**  
implements policy reforms of national significance that require cooperative action by federal, state and territory governments



**COAG Energy Council**  
is made up of the nation's energy ministers. They provide national leadership on energy market development which is so important for the health of the national economy

# Roles of the Australian energy market bodies

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## **Australian Energy Market Commission**

Rule maker, market developer and expert adviser to governments

*Protects consumers and achieves the right trade-off between cost, reliability and security.*



## **Australian Energy Regulator**

Economic regulation and rules compliance

*Polices the system and monitors the market.*



## **Australian Energy Market Operator**

Electricity and gas systems and market operator

*Works with industry to keep the lights on.*

# Reliability Panel

The Reliability Panel, which forms part of the AEMC's institutional arrangements, **reviews and reports** on the safety, security and reliability of the national electricity system.

The Panel is comprised of members who represent a range of participants in the national electricity market, including:



Consumer groups



Generators



Network businesses



Retailers



Australian Energy Market Operator (AEMO)

## Role of the Australian Energy Market Commission

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The AEMC makes the **rules**, conducts **reviews** and provides **advice** to governments.

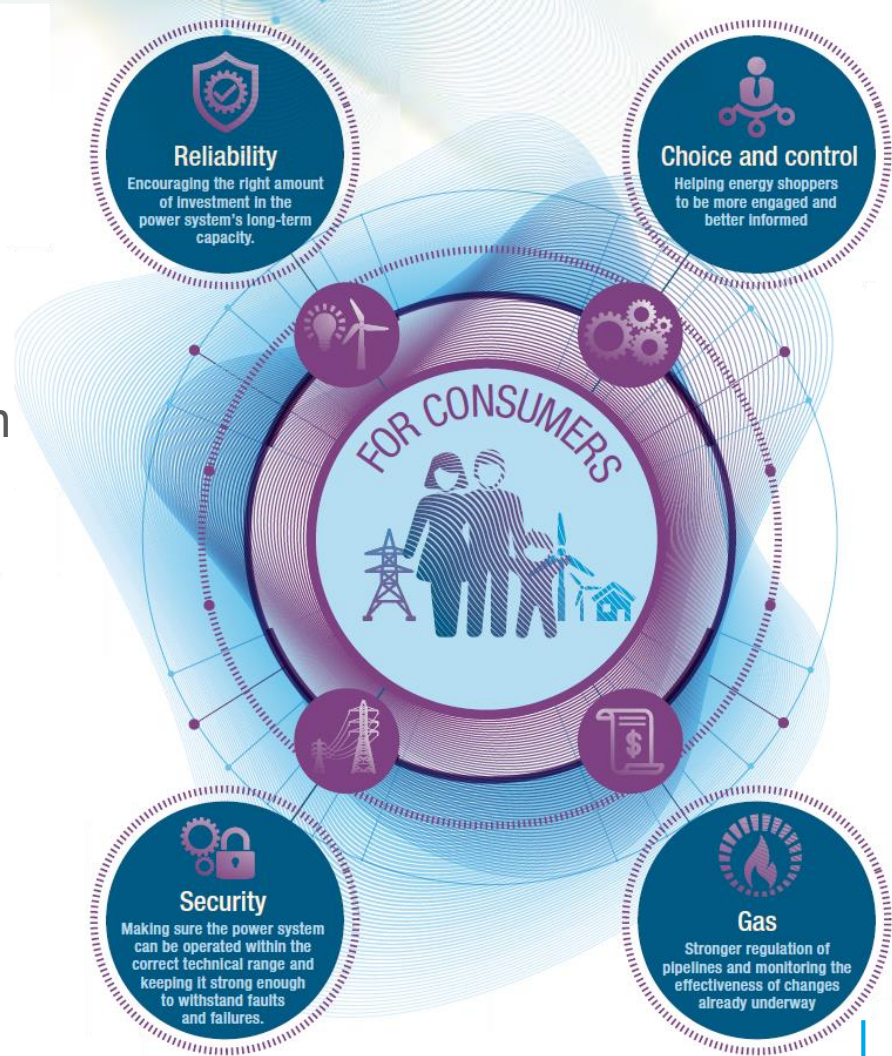
We are guided by national objectives for electricity, gas and energy retail.

**“...to promote efficient investment in, and efficient operation and use of, electricity [or natural gas or energy] services for the long term interests of consumers with respect to price, quality, safety, reliability and security of supply...”**

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## AEMC key areas of focus

- Choice, control and protection for consumers
- A continuing focus on power system security
- Making it easier to buy and sell gas
- Encouraging the right amount of investment in the power system's capacity over the long term



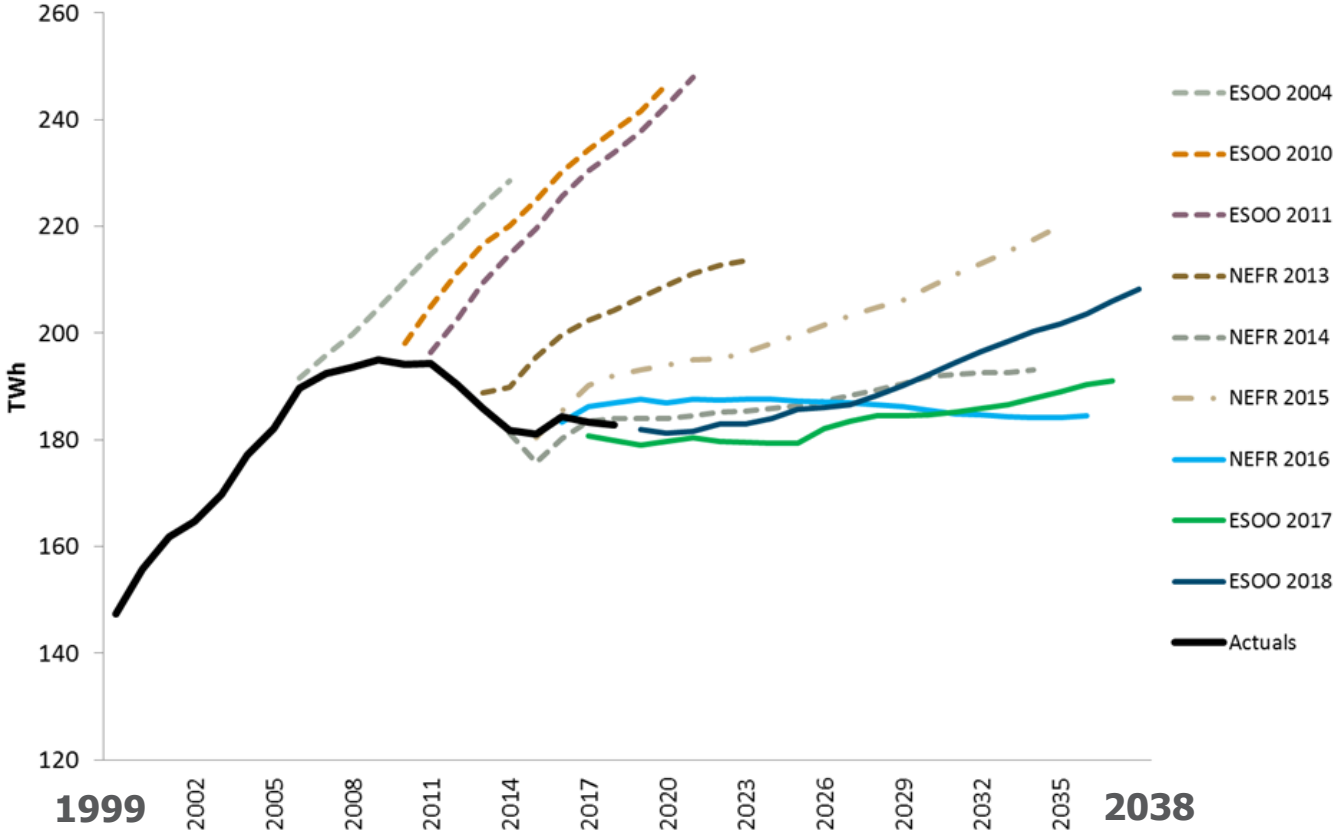


## Emerging power system challenges

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- Changing nature and forms of **generation mix** on the system at all levels
- Issues for **power system security** as new renewable generation replaces traditional forms at the transmission level
  - Creates technical challenges for security and reliability
  - Challenges for economic siting for new generation
- Rapid deployment of **distributed energy resources**
  - Volatility and forecasting challenges for operation
  - Maximising the contribution and delivering the value customers expect

# Forecasting demand



Source: AEMC analysis

# Reliability and security: different challenges, different solutions

## **Power system security:**

the power system's capacity to continue operating within defined technical limits even if a major power system element, like a large generator or a major customer, disconnects from the system.

## **Power system reliability:**

having enough generation, demand response and network capacity to produce and transport enough electricity to meet consumers needs in line with the reliability standard

*A reliable power system will also be a secure power system; however, a secure power system is not necessarily always a reliable power system.*

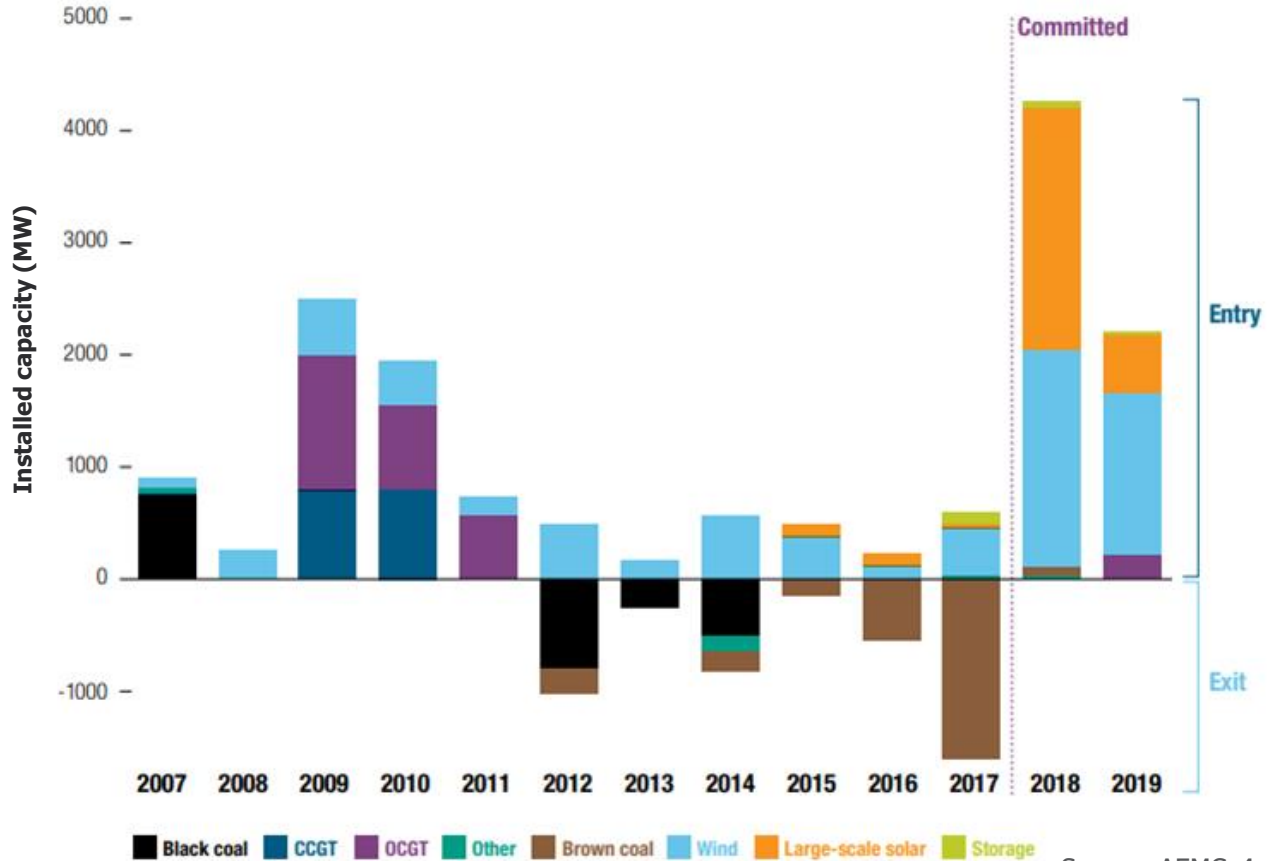


## Security challenges from emerging generation

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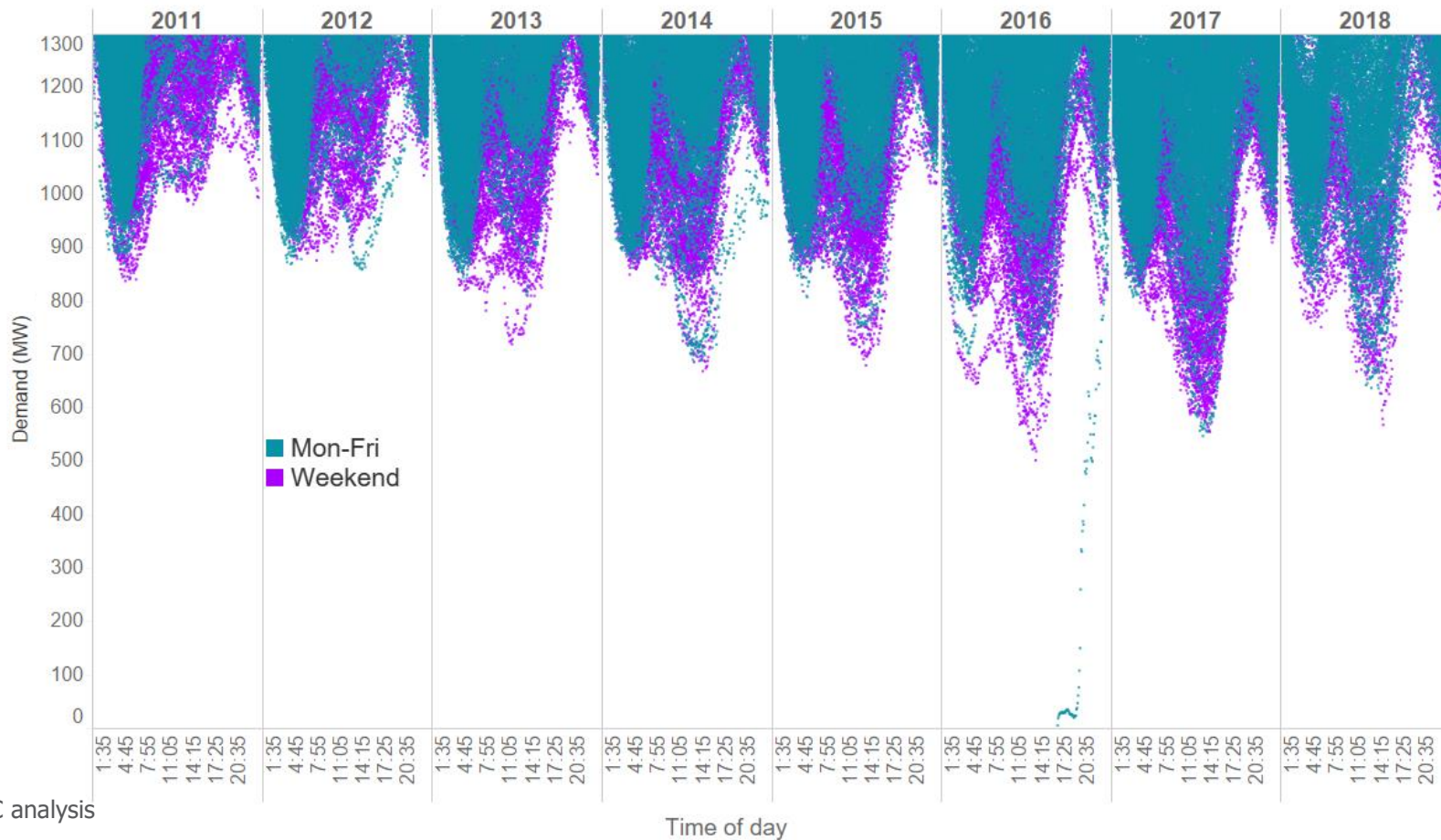
- New renewables have limited ability or are unable to contribute to **inertia**
- System is more difficult to control and more **susceptible to disturbances**
- **Frequency control** is compromised
- Unless addressed, customers may be impacted with outages or power quality not being suitable for their equipment
- The South Australian **system black event** was exacerbated by the level of renewable generation in the system
- The challenge is to ensure the system **continues to be secure** as the contribution from **renewables** grows

# Changing generation mix



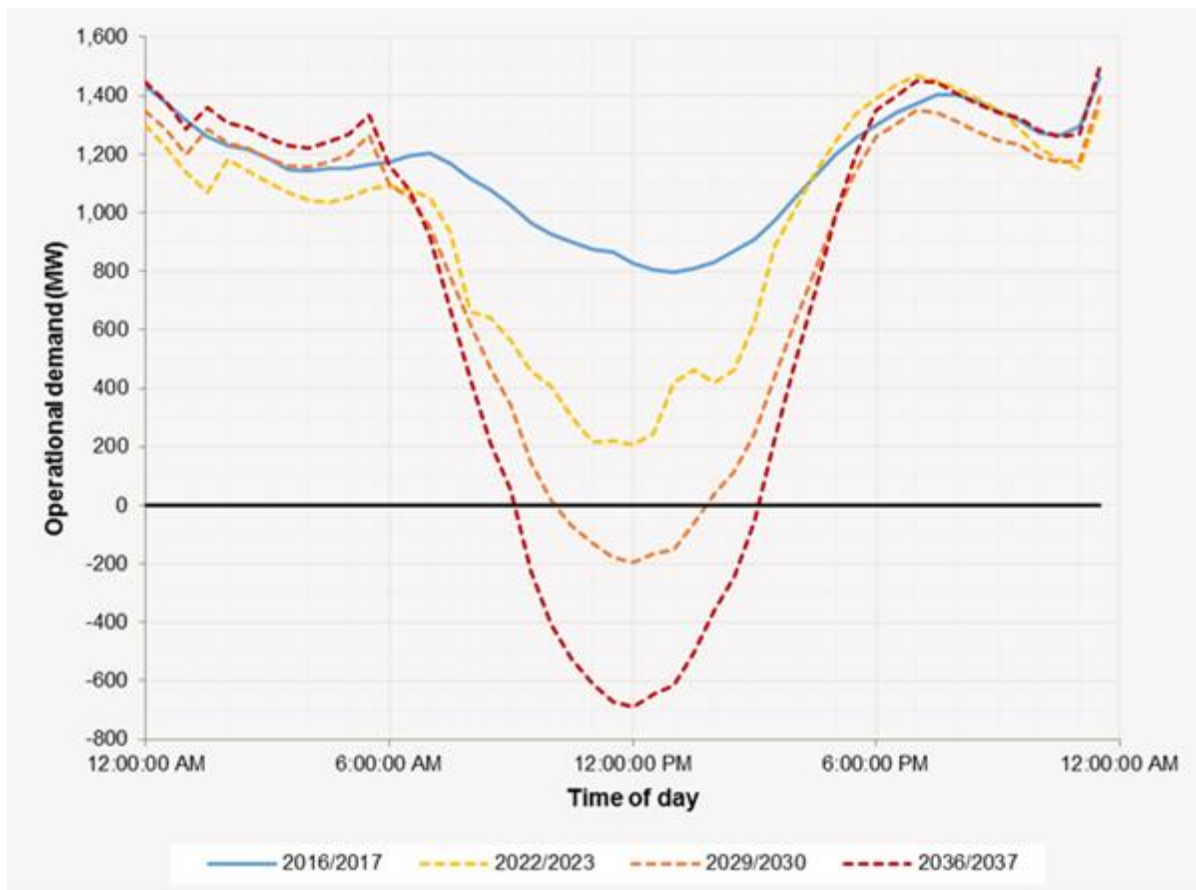
Source: AEMC Annual Report 2017/18

# South Australian demand outcomes below 1300 MW: 1 January 2011 to 30 June 2018



Source: AEMC analysis

## The changing demand profile



## Increasing challenges for power system operation – security

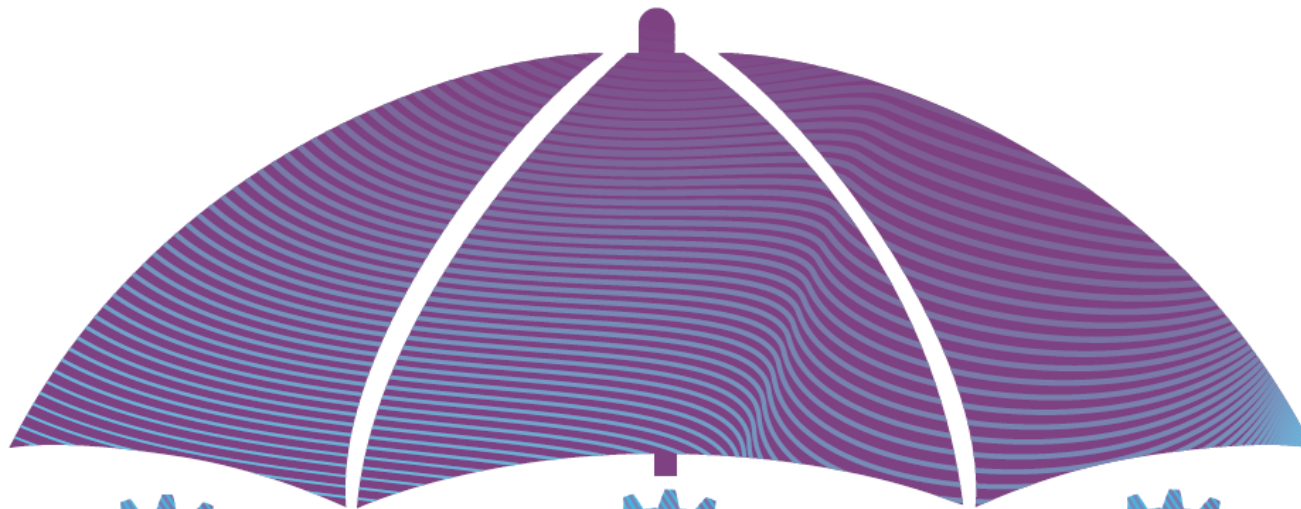
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- The AEMC has a **broad security work program** which began in mid-2016, prior to the SA system black event
- The outcomes of this work program are now being implemented in the energy sector, but this change takes time
  - ***Facilitating, defining and incentivising new services***
    - Emergency frequency control scheme rules, Inertia ancillary service market rule, Frequency control frameworks review
  - ***Specifying requirements for connections***
    - Generating system model guidelines rule, Register of distributed energy resources rule, Generator technical performance standards rule
  - ***Tools for the system operator*** (AEMO)
    - System security market frameworks review, Managing the rate of change of power system frequency rule, Managing power system fault levels rule



## Increasing challenges for power system operation

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**Giving AEMO the tools it needs to keep the power system secure**



**Strengthening the power system to withstand faults and failures**



**Keeping frequency operating within the correct range**

## Keeping the power system secure

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### **Generator technical performance standards**

creating the foundation for a secure, least cost transition as new generators with different technical characteristics join the power system



### **Generating system model guidelines**

helping AEMO manage the changing power system by requiring generators and networks to provide more detailed information about how their equipment performs



### **Register of distributed energy resources**

giving AEMO and distribution network businesses more data to help keep the power system secure and safe, and to enable more accurate forecasting of consumer demand

# Strengthening the power system to withstand faults and failure

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**Emergency frequency control schemes**  
a new management framework for the 'last line defence' mechanism to help prevent system-wide blackouts



**Managing power system fault levels**  
requiring networks to maintain minimum levels of system strength to keep the system stable



**Managing the rate of change of power system frequency**  
requiring networks to maintain required minimum levels of inertia to keep the system secure

## Keeping frequency operating within the correct range

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**Managing the rate of change  
of power system frequency**  
working with AEMO to assess the required  
level of primary frequency control from  
generators



**Reliability Panel review of the frequency  
operating standard**  
assessing whether the existing standard  
is appropriate to maintain a secure power  
system as the generation mix changes



**Frequency control frameworks review**  
looking at ways to integrate new  
technologies and demand response to  
help keep the system secure

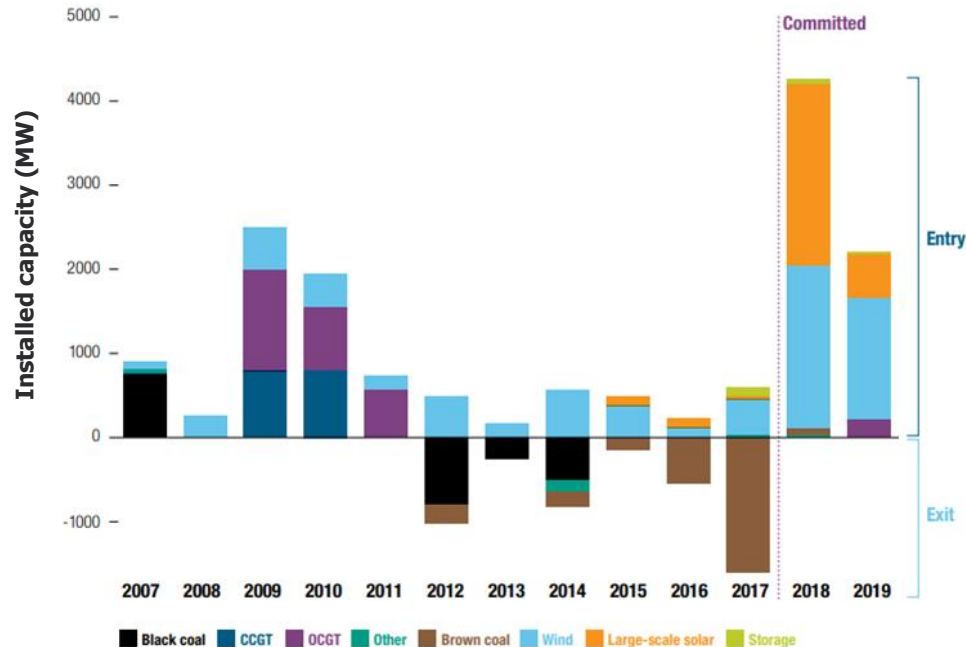
## System security in the longer term

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- Security and reliability action plan 2019
  - Frequency control interim arrangement project and longer term work plan (underway)
  - Reliability Panel review of the frequency operating standard (March 2019 – final report)
  - Reliability Panel assessment of protected event request (March 2019 – draft determination)
  - Intervention mechanisms and system strength project (March 2019 – consultation paper)
  - Review of the system black event in South Australia (pending completion of AER review)
- In the much longer term we need to consider whether there may be **new technology solutions** that can replace the current services **effectively and economically**
  - Batteries and storage; synthetic inertia; inverter control to simulate desired power system behaviour
- New technologies and business models that drive **multi-directional energy flows** both to and from customers will change the way the power system is operated, and **regulatory frameworks** must be **flexible** enough to encourage whatever technology or business model will provide energy at the **lowest cost** to consumers

## New generation

- There are currently plans for **significant levels of new renewable generation**, mostly in new locations, while some traditional generation will be retired over time
- Transmission expansion is **high cost** so must be developed in a manner that **optimises** the **overall development**



## Ensuring coordination of new generation

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- Currently only **demand pays for transmission**, hence there are no signals for siting new generation
- Traditional fuel sources were well established with **transmission corridors**
- Transmission planning carried out through a regulated planning process to meet customer benefits
  - New renewable generation may be **widely dispersed**, and frequently remote from **existing transmission**
  - Large **transmission investment** may be required, important that this be done in an economic manner

# Work in progress

- Integrated system plan
- Coordination of generation and transmission investment review

Australian Energy Market Commission

**FINAL REPORT**

**COORDINATION OF GENERATION AND TRANSMISSION INVESTMENT**

21 DECEMBER 2018

**REVIEW**

**AUSTRALIAN ENERGY MARKET COMMISSION**  
**HELPING TO PUT THE INTEGRATED SYSTEM PLAN INTO ACTION**  
Coordination of generation and transmission investment – final report 21 December 2018

**Facilitating new transmission at the least cost to consumers**

In consultation with stakeholders:  
AEMO, the system planner, provides a system-wide overview about what is needed and when in its Integrated System Plan.

Transmission businesses, drawing on their local knowledge, choose the best project to meet the network need identified in the ISP. This project must undergo a cost-benefit assessment (shown as a RT-T) that includes considering if non-network solutions like demand response may be more efficient.

AER, the regulator, approves the RT-T and sets network prices so customers are only paying for investment that is efficient.

AEMC, the rule maker, designs the regulatory framework so responsibilities are clear and risks are allocated to the right people. The AEMC also has a "fast resort" power to direct transmission businesses to do a RT-T if needed.

**RECOMMENDATIONS**

The AEMC has set out changes to the regulatory framework to put the Integrated System Plan into action. The comprehensive reform package includes:

- Directly linking investment decisions by transmission businesses to the Integrated System Plan to speed up regulatory approval processes.
- Streamlining the cost-benefit assessment (RT-T) for new transmission by removing duplication from the process.
- Managing competition so the cheapest power can get to consumers. This involves implementing phased reforms to change how generators access and use the network, starting with dynamic regional pricing.
- Allowing generators to pay for transmission infrastructure in exchange for access to it – which means generators can influence and have control over transmission planning decisions, leading to better coordination of generation and transmission investment.
- Facilitating renewable energy zones through generators' funding of transmission infrastructure.
- Making it easier for large-scale storage systems to connect by creating a new registration category to support seamless integration.

**TIMING**

The reforms would be implemented in stages to enable delivery of the 2018 Integrated System Plan in the timeframes identified by AEMC. The final stage of reforms would be completed in 2023.

**PROTECTING CONSUMERS FROM PAYING TOO MUCH**

Investment in generation and transmission needs to be better coordinated. The AEMC has recommended a range of changes to the regulatory framework to increase efficient investment in transmission networks, delivering least-cost solutions to consumers.

**AEMO**

**Integrated System Plan**

For the National Electricity Market

July 2018



## Future network investment – short term



Integrated System Plan Group 1 projects will:

- Increase transfer capacity between NSW, Qld and Victoria by 170-460 MW (minor upgrades to QNI and VNI)
- Reduce congestion for existing & committed renewable energy developments in Victoria
- Remedy system strength in South Australia

## Potential future network investment – medium term

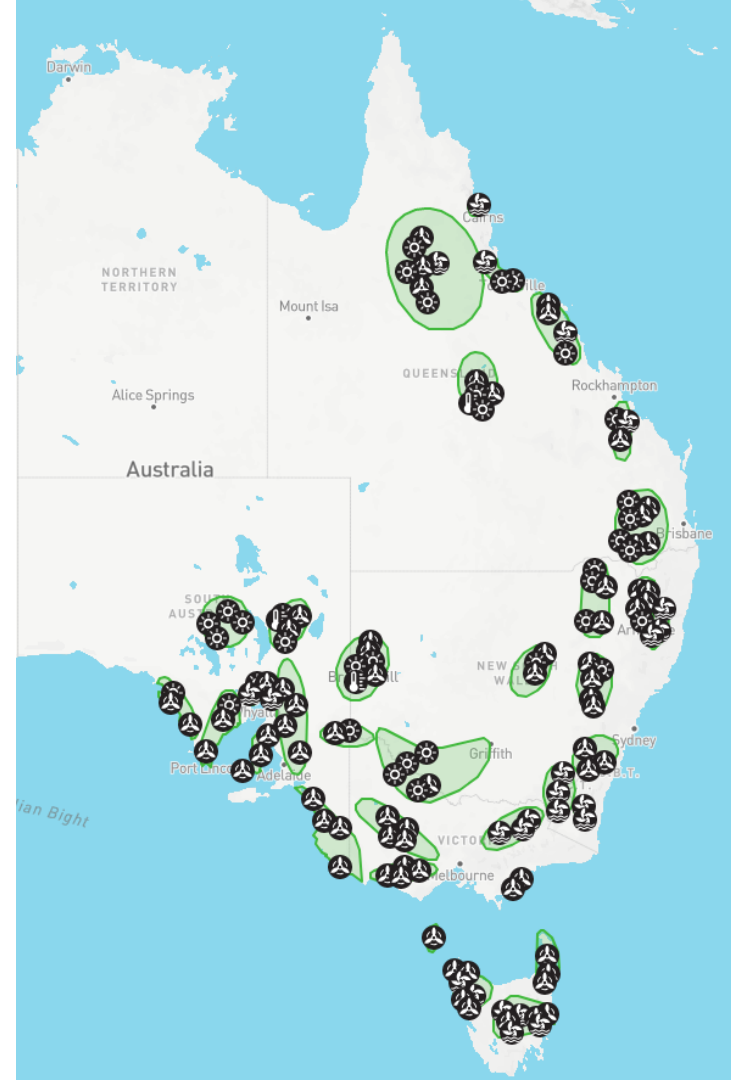


# Potential future network investment – long term



## Suggested approach – Renewable Energy Zones

- A regulated approach where transmission is developed to a **defined zone** that allows a number of generators to connect
- Requires a planner to foreshadow preferred generation development
- **Risks** for consumers of over investment
- Issues can emerge for generators:
  - How much should a generator pay for the connection
  - What performance guarantees do they get, and how are they treated if there is inadequate transmission
- **Implementation challenges** exist



## Coordination of new generation

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Fast-tracking the  
network expansion:  
**Planning**



The right investment in the  
right place at the right time:  
**Access and congestion**



Payments system:  
**Charging**



Actions to integrate  
renewables and storage:  
**Connection**



Cutting red tape:  
**Economic regulation**



## Fast-tracking the network expansion: planning

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- Traditionally transmission system augmentation is a lengthy process requiring extensive project, environmental and land use planning. New forms of generation can be developed quicker than transmission.
- *December 2018* – faster approval of ISP Group 1 projects
- *March 2019* – improvement to the RIT-T through consideration of a rule change request to reduce the time for completing project assessment draft reports from 12 to nine months
- *January to June 2019* – embed the ISP in the regulatory framework with the redrafting of the National Electricity Rules and National Electricity Law
- *July 2022* – a more accurate integrated system plan using information from dynamic regional pricing
- *July 2023* – generators being able to pay for transmission infrastructure, enabling them to influence transmission planning decisions

## The right investment in the right place at the right time: access and congestion

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- *January to December 2019* – development of rule change requests to manage congestion so consumers can get the cheapest power by progressing phased reforms to network congestion and access, starting with dynamic regional pricing
- *January 2020* – COAG Energy Council to submit rule change requests on network congestion and access reforms
- *July 2022* – dynamic regional pricing in place
- *July 2023* – generators being able to pay for transmission infrastructure, enabling them to influence transmission planning decisions

## Payments system: charging

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- Correct charging is important to deliver the right incentives
- *June to December 2019* – consideration of transmission use of system (TUOS) charges, including inter-regional arrangements, and development of rule change requests
- *January 2020* – COAG Energy Council to submit rule change requests on transmission use of system charges and inter-regional TUOS reforms
- *July 2022* – inter-regional transmission use of system charges reforms in place
- *July 2023* – transmission use of system charges reforms in place



## Actions to integrate renewables and storage: connection

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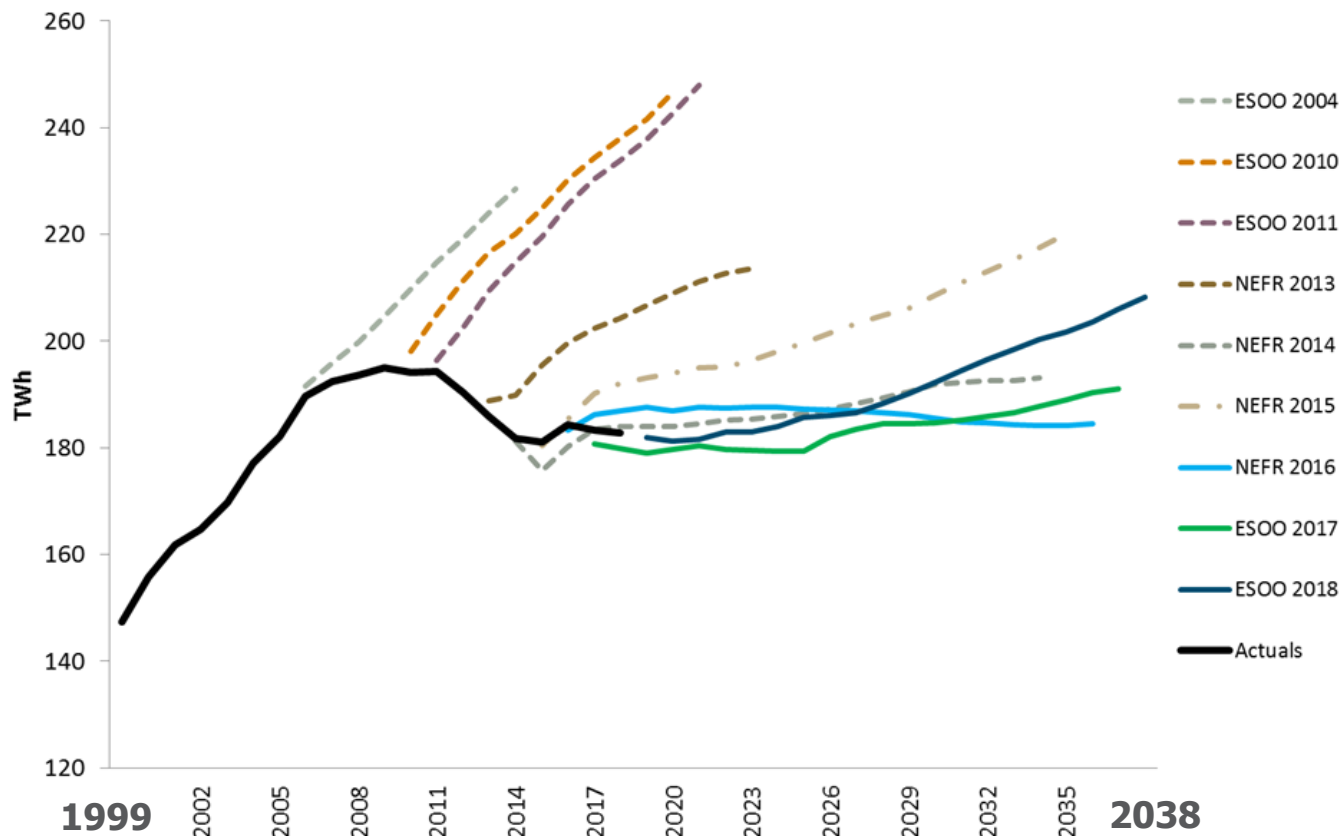
- *March 2019* – making it easier to connect storage with the consideration of a rule change request to create a new registration category for large-scale energy storage systems to help with seamless integration
- *January 2020* – final determination for rule change request on new registration category for large-scale energy storage
- *July 2023* – renewable energy zones enabled through generators funding transmission infrastructure

# Challenges for integrating distributed energy resources

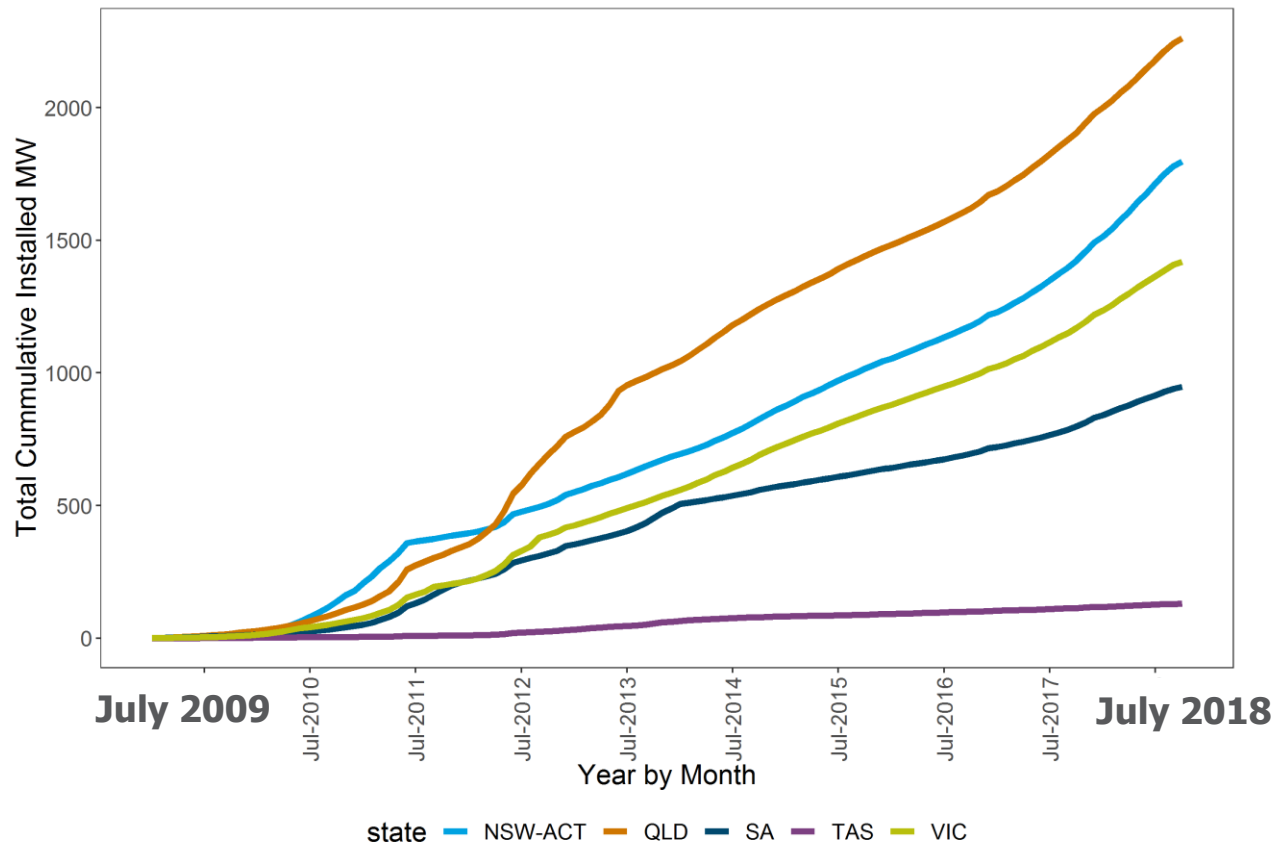
**The electricity system is transforming**  
More consumers are buying and selling power



# Difficulties in forecasting demand

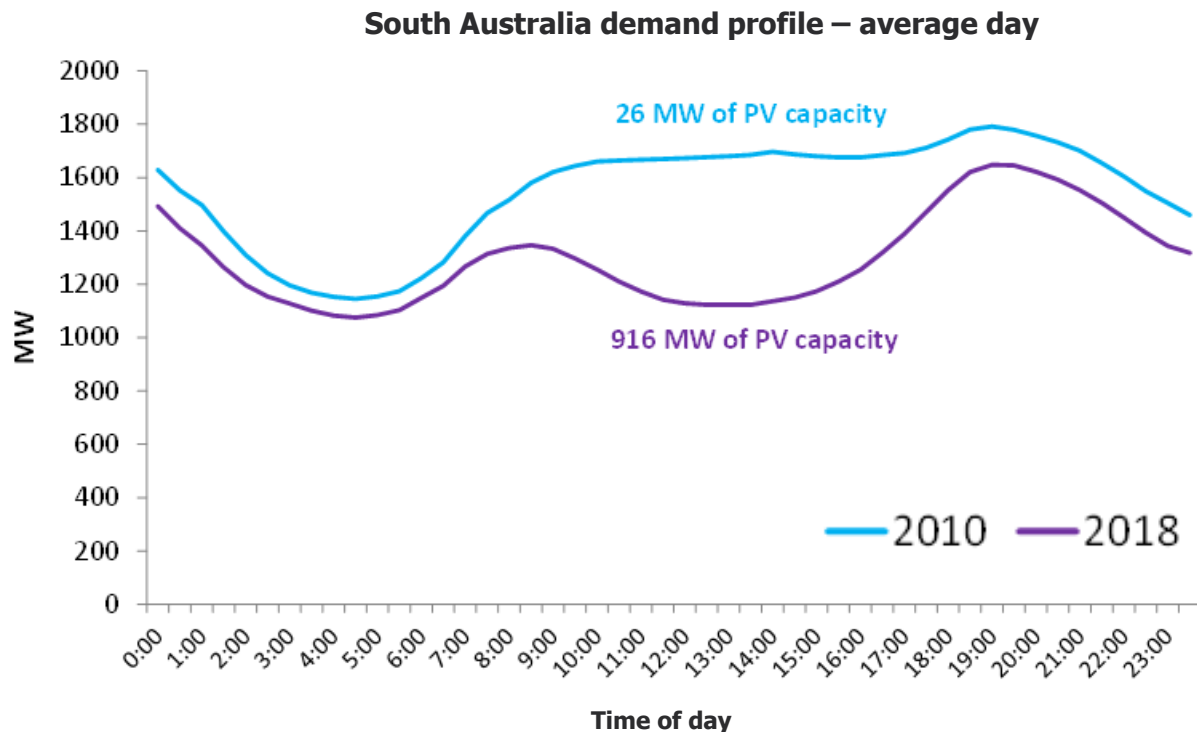


## Total cumulative PV capacity installed (MW) by state



## Distributed energy resources are changing the demand profile

In the second quarter of 2018, over 57,000 rooftop solar PV systems were installed across Australia, adding **310 MW of installed capacity.**

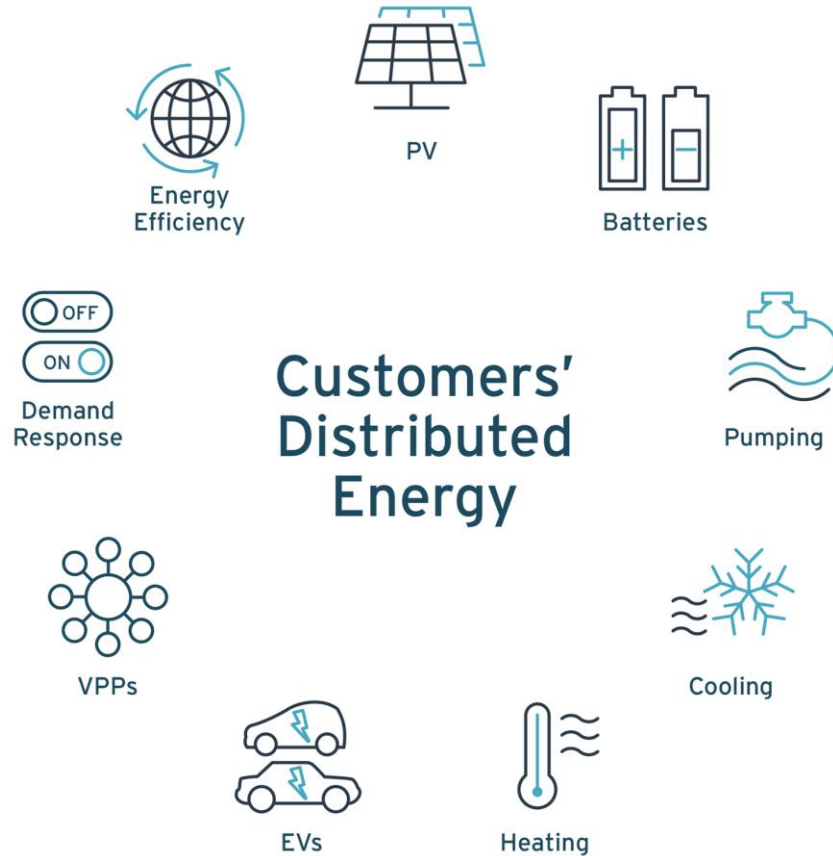


## Challenges to be addressed

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- Distributed energy resources (DER) may be constrained by the performance of **local distribution networks**
- Solar PV results in two way flows on networks designed only to supply customers
- They may impose **constraints** that mean that DER cannot generate or even connect at the level anticipated by customers
- In this case, customers will not receive the **expected value** from installing it
- DER can also provide **broader system benefits**, but this may also be inhibited if the distribution network prevents full output
- The solution is to **optimise** the operation of the distribution networks and distributed energy resources
- Fortunately DER has characteristics that with proper development facilitates this optimisation

# Distributed energy resources



## Integration of distributed energy resources

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- Integration of distributed energy resources into the power system requires an industry wide approach
  - ***ARENA led Distributed Energy Integration Program (DEIP)***
    - Collaboration of 11 government agencies, market bodies, industry and consumer associations aimed at maximising the value of customers' DER for all energy users
  - ***Energy Networks Australia and AEMO joint Open Energy Networks project***
    - Identify how best to transition to a two-way grid that allows better integration of DER to deliver better outcomes for all customers



## Integration of distributed energy resources

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- ***AEMC Distribution Market Model review***

- Set out a vision for a competitive “distribution market” which would enable consumers to get the most value out of their rooftop solar panels, batteries and other distributed energy resources as we move to a lower emissions future

- ***Demand response rule change projects***

- Wholesale demand response mechanism
- Wholesale demand response register mechanism
- Mechanisms for wholesale demand response
  - At the its core, the problem we are trying to address through these rule change requests is facilitating wholesale demand response, at least cost, without undermining the market.

## Distributed energy resources in the longer term

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- Development of **operational practices** that will allow this optimisation – e.g. through development of the distribution service operator models
- Use of the distribution network as a platform that allows optimal interaction with distributed energy resources
- Development of **competitive markets** that facilitate competitive operation of DER and efficient interaction with networks
- In the meantime networks need to develop a clearer understanding of the **limitations** of their networks and the **ability to monitor and control** DER efficiently in real time
- Considerable current focus on this in Australia

## Delivering the transformed energy system

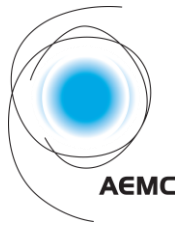
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- The AEMC must develop rules and approaches to guide market participants in achieving a system that continues to meet customer needs at lowest cost
  - Ensuring that there are efficient markets that are largely administered by AEMO
    - Developing the rules for operation of the competitive markets and ensuring that there are incentives to drive efficient operation of the sector
  - Robust regulatory frameworks where competition is not possible
    - Defining mandatory requirements for participants to adhere to – monitored by the compliance function of the AER
    - Defining the rules for regulation of those parts of the value chain that cannot be subject to competition, e.g. economic regulation of networks (often a natural monopoly) is conducted by the AER
  - Well developed rules and approaches that allow AEMO to operate the system reliably and securely, at least cost

We have a unique system in Australia where anyone, any company, government, advocacy group or individual person, can propose a change to the rules.



Collaboration is the key to success as it will deliver workable and lasting change.



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