CONSUMERS’ WELFARE AND INDEPENDENCE OF REGULATORY INSTITUTIONS

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Overview

• 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

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

**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)
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...”
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

• 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

- 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

Source: AEMO
Increasing challenges for power system operation – security

- 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

- 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

- **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

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

- 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

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

Source: AEMO ISP Group 1 & 2 projects
Potential future network investment – long term

Source: AEMO ISP Group 1, 2 & 3 projects
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

Fast-tracking the network expansion: Planning

Access and congestion

Payments system: Charging

Actions to integrate renewables and storage: Connection

Cutting red tape: Economic regulation
Fast-tracking the network expansion: planning

- 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

- **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

- 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

- **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

Source: AEMC analysis
Total cumulative PV capacity installed (MW) by state

Source: AEMC analysis
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.

Source: AEMC analysis
Challenges to be addressed

- 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

Energy Efficiency
PV
Batteries
Demand Response
Pumping
VPPs
EVs
Cooling
Heating

Source: ARENA
Integration of distributed energy resources

• 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

• **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

• 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

• 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.