INTERNATIONAL EXPERIENCE OF LMP & FTRS

29 MAY 2020

TRANSMISSION ACCESS REFORM
PUBLIC FORUM #1

AEMC

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Format for the forum

- You will have the option to make comments or ask questions via the Q and A function on the right hand side of your screen
- When asking questions or presenting comments, please relate them to the purpose and scope of the meeting.
- In the Q and A area please first indicate whether you are asking a question or making a comment, then add your remarks, and then finally please include your name and organisation at the end
- We will attempt to answer all questions during the scheduled Q and A sessions - if we don’t get to your question during the forum, we will follow up after the event on your query.
- Comments will also be raised during the Q and A sessions. Where possible, and time permitting, participants will be invited to present their comments - if this happens, your mic will be taken off mute, and you will be asked by the presenter to make your comment

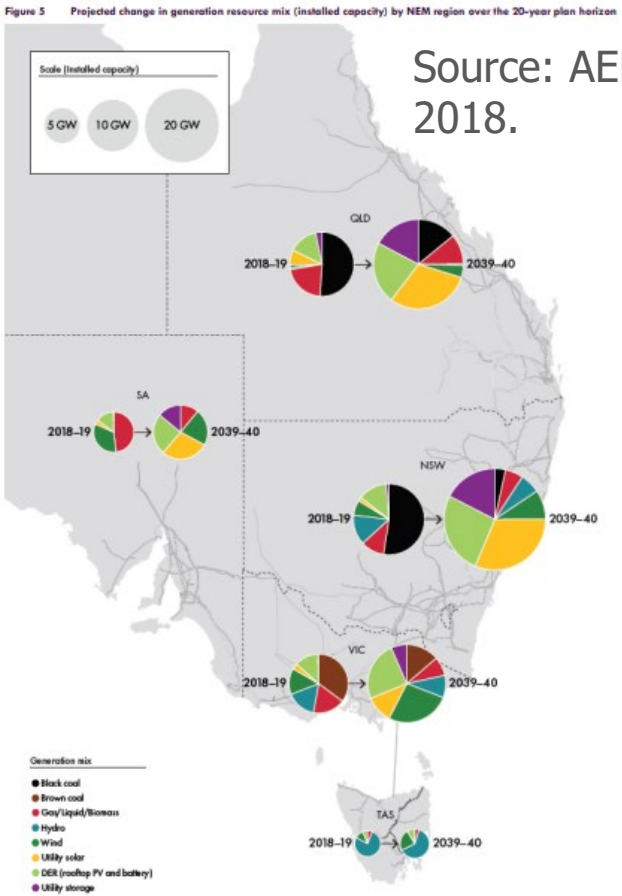
Agenda

- **Introduction** to the forum and ground rules (10 mins)
- **Context -** problem statement, benefits of reform, what is being proposed, interactions with other reforms (20 mins)
- **International experience –** presentation and discussion (80 mins)
  - Impacts on dispatch
  - Impacts on investment
  - Distributional impacts
  - Cost of capital, liquidity and competition
  - Implementation costs
- **Close** - concluding remarks and next steps (5 mins)

CONTEXT

THE PROBLEM TO BE FIXED, THE PURPOSE OF REFORM AND OUR PROCESSES

What is the problem that needs to be addressed?



Source: AEMO, ISP 2018.

The NEM will replace most of its generation stock by 2040. Given changing generation mix, signals about where to locate in the transmission network are more important than they used to be.

Overview of the access model

Current regional pricing regime

1 Wholesale electricity pricing

Generators, storage and scheduled load receive the **local marginal price (LMP)** that better **reflects the value** of supplying electricity at their location in the network. Non-scheduled load would continue to pay the regional price.

2 Financial risk management

Market participants are better able to **manage the risks of congestion and losses** by purchasing a **financial transmission right (FTRs)**

While LMP and FTR markets all have the above core features, a number of detailed design decisions need to be made. Design choices will be made that reflect NEM specifics and so will be aimed at facilitating the new regime in the Australian context.

What are the key benefits of reform?

Local marginal prices are a **more efficient price signal** than regional prices, resulting in generation and transmission infrastructure savings, lower fuel costs and lower emissions

Financial transmission rights provide investors a better means to **manage congestion and loss risk**

Market participants have to purchase FTRs (other than those that are grandfathered), with the proceeds primarily going to consumers, **directly lowering prices.**

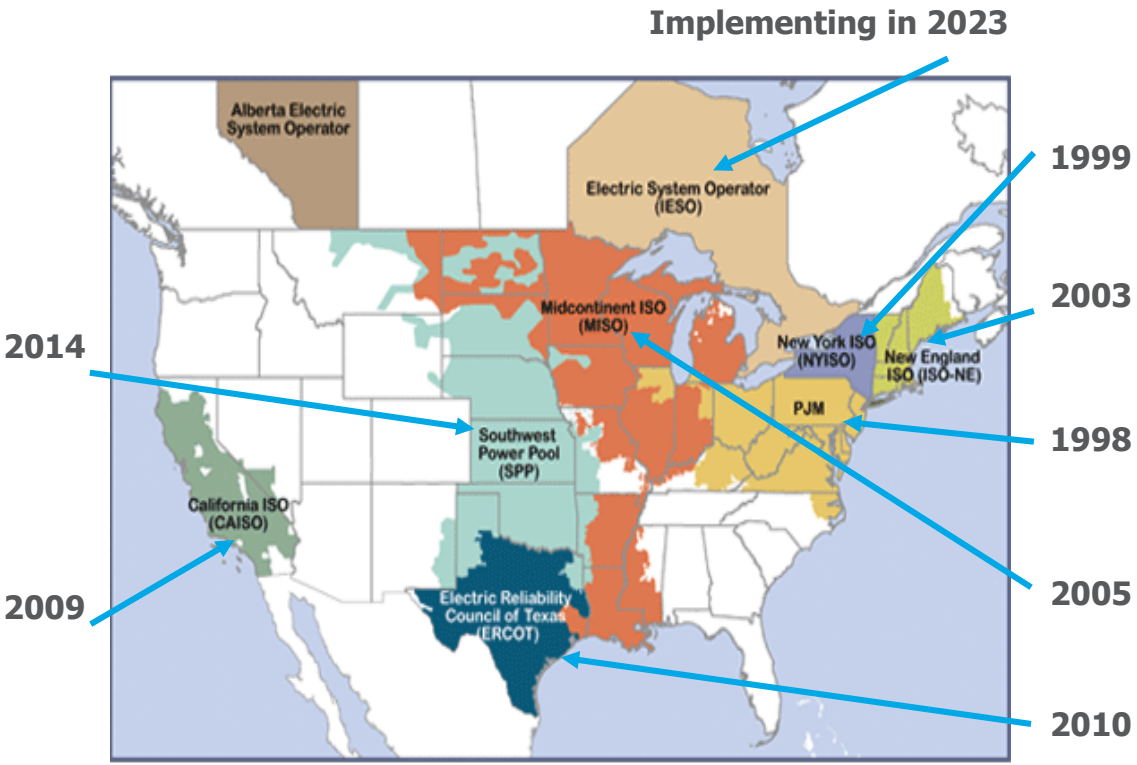
Outcomes for consumers

The model will result in **more affordable prices** through lower infrastructure costs, more efficient dispatch, and the direct offsetting of bills.

Will **integrate new technologies** into the national grid in a way that's reliable, secure and works in consumers' best interests.

Integral to Australia taking the cheapest, fastest and fairest path to a **low-emissions energy future.**

LMP and FTR markets well established overseas in a variety of different markets…



Source: US Federal Energy Regulatory Commission, AEMC analysis

…and widely regarded as successful in those jurisdictions

"Locational marginal pricing (LMP) is the electricity spot pricing model that serves as the benchmark for market design – the textbook ideal that should be the target for policy makers."

International Energy Agency, 2007

"LMP – should encourage short-term efficiency in the provision of wholesale energy and long-term efficiency by locating generation, demand response and/or transmission at the proper locations and times."

US Federal Energy Regulatory Commission, 2002

"Nodal pricing is crucial to ensuring that accurate economic evaluations of engineering decisions can be made."

Singapore Energy Market Authority, 2010

"Financial transmission rights are essential ingredients of efficient markets in wholesale electricity systems"

Prof. Bill Hogan, Harvard University, 2013

"The purpose of FTRs to serve as a congestion hedge has been well established."

US Federal Energy Regulatory Commission (FERC), 2017

"Operating alongside the electricity hedge market, the FTR market helps to promote retail competition by encouraging retailers to compete for customers on a nationwide basis, as opposed to focusing primarily on regions close to where they own generation assets."

NZ Electricity Authority website

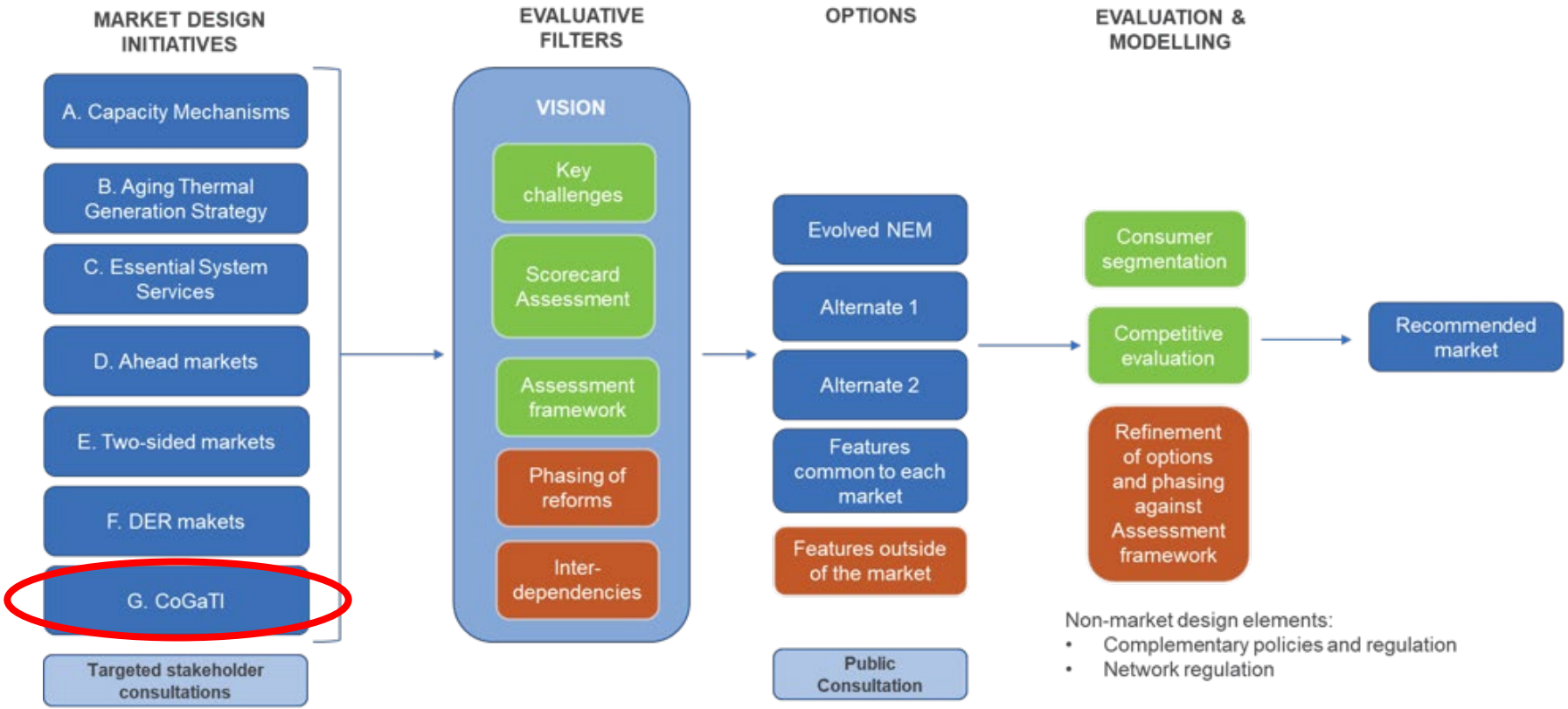
The long run solution to the various transmission inadequacies, particularly the issue of providing clear locational signals for investment, lies with full nodal pricing [ie, locational marginal pricing].

Parer Review (of the NEM), 2002

How does this interact with the Integrated System Plan?

- Clearly, more transmission infrastructure in required.
- The actioned Integrated System Plan (ISP) is the best way to deliver the appropriate amount, location and timing of transmission investment required. But as transmission investment is costly, and the appropriate amount of congestion is never zero, it is important that the appropriate checks and balances are there so that consumers don't pay too much
- COGATI is part of a two-part solution to improving transmission frameworks and supporting the ongoing transition to a lower emissions electricity sector.
  - Transmission planning arrangements, including the ISP, are about **delivering the appropriate amount of transmission investment** to facilitate the sector's transition.
  - The access model is about providing **better incentives and information** for market participants to better utilise existing and yet-to-be built transmission capacity.

Links with ESB Post 2025 market design process



NERA REPORT

RECAP ON THE PURPOSE AND CONCLUSIONS

The Context for the NERA cost benefit analysis of grid access reform

- NERA have been tasked by the AEMC with assisting in the analysis of the costs and benefits of grid access reform as applied to the NEM.
- This work was divided into two stages:
  - **Stage 1**: A benchmarking study of the costs and benefits based on similar reforms applied overseas. Jan - Mar 2020
  - **Stage 2**: Specific modelling of the reforms as applied to the NEM. April – mid 2020.
- Stage 1 is intended to both define the overall potential size of benefits and to help refine the NEM specific modelling to come later.
- Stage 1 results were extrapolated to the size and characteristics of the NEM where possible.
- The AEMC and NERA recognise the limitations of benchmarking of analysis in providing definitive answers in relation to the likely cost benefit of grid access in the NEM.
  - Stage 2 is intended to provide further evidence for the reforms in the specific context of the NEM.

The focus of this workshop is to better understand the international experience, building upon the findings of stage 1

The benefits and costs to be addressed

- The key categories of impacts that NERA analysed were as follows:
  - **Changes to dispatch**
  - **Changes to investment decisions** or a different capital cost development pathway for generation and transmission investment
  - **Competition** effects
  - **Cost of capital** changes
- The **distributional impacts** of access reform.
- NERA was also asked to look at the potential impact on **contract market liquidity**
- The direct **costs of implementing** access reform were another key element of the study

The markets NERA looked at in compiling their report

	New Zealand	NEMS (SGP)	PJM	NYISO	ISO-NE	MISO	SPP	ERCOT	CAISO	IESO	NEM
Generator LMP?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Consumer LMP?	✓	✓	✓	×	×	×	×	×	×	×	×
LMP Year	1996	2003	1998	1999	2003	2005	2007	2010	2009	2023	TBD
FTRs	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	✓
FTR Year	2013	2003	1999	1999	2003	2005	2014	2010	2009	NA	TBD
Motivation	Facilitate Inter-island trade (FTRs)	Move to comp. market	High intra-zonal congestion	Move to comp. market	Move to comp. market	Move to comp. market	Move to comp. market	High intra-zonal congestion	High intra-zonal congestion and strategic bidding	High intra-zonal congestion	High intra-zonal congestion and strategic bidding
Annual Load in TWh	39 (2013)	32 (2003)	250 (1998)	147 (1999)	131 (2003)	595 (2006)	210 (2007)	319 (2010)	207 (2009)	143 (2021)	196 (2018/9)
Cost estimates available?	✓(FTRs)	×	×	✓	×	✓	✓	✓	✓	✓	×
Benefits estimates available?	✓(FTRs)	×	×	✓	×	✓	✓	✓	×	✓	×

Source: NERA Analysis.

Impacts on dispatch – questions?

We want to better understand the participant experience of these markets in relation to operational decisions and dispatch, and also observations of the impact on other stakeholders

What are your experiences of the efficiency of dispatch in markets with LMP/FTRs?

How does bidding behaviour behind constraints differ to what you observe in the NEM?

Impacts on dispatch

- LMP enables the system operator to **dispatch the lowest-cost plant** on the system.
- NERA found analyses of this benefit over five jurisdictions in North America.
- NERA found the benefits of more efficient dispatch are mostly felt in **reduced fuel costs**.
- NERA reports this range as **0.6-2.6%** of the variable cost of generation: **AUD 30-137m pa**.
  - The figures in this $ range vary according to the market referred to or the approach to scaling the benefit to the NEM.
- A number of differences between the NEM and these markets mean that it is **unclear if this overstates or under states the potential benefits in the NEM, without further modelling**. These factors are as follows:
  - Differences in firm access before and after reform
  - US markets had sub-optimal congestion management policies in place prior to reform
  - Patterns of congestion and the generation mix differ between these markets and the NEM.

Impacts on investment – questions?

We want to better understand the participant experience of these markets in relation to investment and decision making, and also participant observations of the impact on other stakeholders

To what degree does the LMP/FTR market design influence your investment perspective?

To what degree have locational prices been factored into your decision making? Have they impacted locational decisions, have they impacted the type of technology or combination of technologies invested?

Impacts on investment

- Under LMP investors have improved incentives to locate efficiently because the LMP better represents the value of electricity at specific locations on the network than the existing regional price.
- Benefits from more efficient locational decisions may arise for two reasons:
  - the capital cost of investments may decrease, because investors undertake fewer, but better located generation, transmission and storage investments
  - the costs of electricity generation (excluding capital costs) may fall, relative to the scenario without LMP reform, as a result of better-located plant and storage
- Only one jurisdiction (NYISO) reported the benefit from more efficient investment decisions - USD 500m pa.
- NERA scaled this benefit to the conditions of the NEM and came to a range of **AUD 327m pa to 690m pa**.
- However, this figure is likely to be an **overstatement** when applied to the NEM:
  - It is unclear how the benefits estimate for NYISO is calculated and it likely also includes the benefits from demand-response management and more efficient dispatch
  - NYISO also applied LMP to load, which the proposed reforms for the NEM do not do
- This benefit is one of the hardest to model, but potentially the most significant. It has been a key focus in **stage two** of the modelling.

Cost of capital, liquidity and competition – questions?

Has there been any change in cost of capital in response to the implementation of LMP/FTRs in any of these markets? Is the LMP/FTR market design influential in the cost of capital overseas?

To what extent do FTR type products in these markets help to mitigate the impact of LMP in relation to the cost of capital?

Has any investment been deferred as a consequence of the implementation of LMP/FTRs in these markets?

Has the LMP/FTR market changed your willingness, need or desire to participate in the contract market?

Have you observed any impact on contract market liquidity and the operation of PPAs?

What impact do you think LMP/FTRs have had on competition in these markets? At a wholesale and retail level?

Cost of Capital

- NERA examined the likely impact of the reform on generators risk and cost of capital.
- NERA assessed **no likely impact on a generators cost of equity**
- NERA impact on cost of debt could increase or decrease, depending on the relative costs and benefits of the reform
- Analysis demonstrates that the **generator's cost of debt could reduce by up to 30 to 50 basis points** if the proposed reform is highly successful and the generator's credit rating improves by two notches.
- Impact on cost of debt (direction and magnitude) depends on: constraint risk, firmness of FTRs, probability of owning an FTR and relative volatility of RRP and LMP
- NERA did not consider that the reform could be seen to increase regulatory risk as it is not unexpected or unjustifiable.
- NERA found no commentary by credit rating agencies or financial analysts on the increased regulatory risk as a result of the COGATI reform. This absence of evidence suggests either the market does not consider the COGATI reform to have a material impact on regulatory risk or that it is too early to comment.

Liquidity

- Across the case studies examined NERA found that **liquidity was not reported to substantially improve nor decline** as a result of the introduction of LMP.
- However, the **distribution of liquidity in markets was reported to change** due to the introduction of LMP, with the formation of trading hubs throughout the system, not necessarily at regional reference nodes, and relatively stronger liquidity at those hubs compared to the rest of the market.
- Changes to liquidity in the wholesale market do not necessarily lead to social benefits or costs and may instead be efficient responses to contract market structure.
- The existing contract market structure in the jurisdictions NERA examine is very different to that of the NEM, and consequently the reported impacts on liquidity are likely less relevant comparisons for the impact on liquidity in the NEM.

Competition benefits from the introduction of FTRs

- Competition benefits may arise from the introduction of FTRs in the NEM as they may allow for more inter-regional transmission hedges which could improve cross regional risk management and competition.
- NERA estimate a benefits range of **AUD 25-50m** pa for the NEM based on the New Zealand Electricity Authority's study of the net benefits of introducing FTRs in New Zealand. These benefits are scaled for FX, CPI and the relative size of the two markets.
- These benefits, as calculated by the EA, mostly relate to improvements in retail competition "as a result of retailers supplying regions that they would not have supplied otherwise due to locational price risk".
- NERA maintain that these figures should be treated with caution**.**

Distributional impacts – questions?

What price impacts have you seen to your operations, as a whole or to an asset or assets in particular, as a result of LMP pricing, that you feel would not have been felt were there to have been regional pricing in place?

Distributional impacts

- Distributional impacts (changes in compensation between market participants) due to LMP arise from differences between the zonal price relative to the volume-weighted average of generator LMPs.
  - If the RRP > LMP, implementation of LMP results in a shift in compensation from generators to consumers
  - If the RRP < LMP, implementation of LMP results in a shift in compensation from consumers to generators
- NERA did not identify any studies of the distributional impact. The best estimate for this impact was an ex-post study for the ERCOT market which attributed a 2% fall in wholesale prices to the introduction of LMP.
- NERA translated this to a **AUD 387m pa** benefit to consumers in the NEM, with this including both changes in compensation (distributional effects) and efficiencies.
- These figures should be taken in the context of other changes to market structure that were implemented along with LMP. As a result, bottom up modelling of the reforms in the NEM is required before these impacts can be assessed more accurately.
- The potential magnitude of mispricing behind constraints in the NEM, is supported by recent work by Dr Gordon Leslie and Matthew Katzen in their study "Revisiting Optimal Pricing in Electrical Networks over Space and Time: Mispricing in Australia's Zonal Market", 20 December 2019.

Implementation costs – questions?

Has it been easier/harder to operate in such markets. Costlier/cheaper from a staff/IT perspective?

What costs can you attribute to the operation of LMP/FTR markets versus your operations in the NEM?

Have you observed any difficulties for the market operator in operating in LMP/FTR markets. Have you observed any benefits?

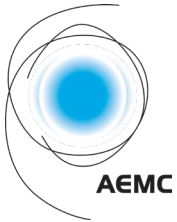
Implementation costs

- NERA found limited studies on implementation costs relevant to the NEM.
- Many reforms overseas form part of a wider reform package and cost estimates are often out of date.
- The most relevant recent estimate identified was from a 2015 study for the IESO market (Ontario), which will be implementing LMP in 2023.
- NERA found that the **AUD 149m** (2019 prices) cost reported for Ontario, being largely fixed costs for a similarly sized market (two thirds the size of the NEM), was the best available relevant estimate.
- However, NERA also concluded that there was upward risk around this figure:
  - The estimate is ex ante and so will not include any potential cost escalation in implementation which were observed in other markets (eg, New Zealand).
  - FTRs already exist in the IESO market to hedge price differentials between Ontario and neighbouring markets.
- NERA concluded that a bottom-up quantification of implementation costs would be required to produce a more accurate estimate of the expected implementation costs of LMP and FTRs in the NEM.

CLOSE AND NEXT STEPS

Close and next steps

- Presentation material and minutes will be published on our website after the forum.
- If forum participants wish to follow up on specific issues raised during the forum, please contact the project leader Russell.Pendlebury@aemc.gov.au or the project sponsor Tom.Walker@aemc.gov.au
- Public forums to follow:
  - Draft results of modelling – July 2020
  - Simplified model of the reforms in action – August 2020



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