RELIABILITY PANEL AEMC

REVIEW

Reliability Panel AEMC

DRAFT REPORT

Reliability standard and settings review 2018

21 November 2017

Submissions due 22 December 2017. Reference: REL0064

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Reference: REL0064

Citation

Reliability Panel 2017, *Reliability standard and settings review 2018*, draft report, 21 November 2017, Sydney

About the Reliability Panel

The Panel is a specialist body within the Australian Energy Market Commission (AEMC) and comprises industry and consumer representatives. It is responsible for monitoring, reviewing and reporting on reliability, security and safety on the national electricity system, and advising the AEMC in respect of such matters. The Panel's responsibilities are specified in section 38 of the National Electricity Law.

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Executive summary

The Reliability Panel (Panel) has completed its draft review of the reliability standard and reliability settings to apply in the national electricity market (NEM) from 1 July 2020. We are required to review the reliability standard and settings every four years.[1] The Panel is proposing to leave the current reliability standard and reliability settings unchanged.

The framework for delivering reliability in the national electricity market is primarily market-based. Under this structure, market participants decide to invest in electricity generation, operate and maintain units, and retire plant based on price signals and incentives from both the wholesale market and the contracts market. Expectations of future spot prices provided by the contract market, and the need for investment in new capacity to manage price risk, also impact on their decisions.

The reliability standard and reliability settings – the market price cap, cumulative price threshold, administered price cap and market floor price – are an integral part of this market-based reliability framework. They protect the long term integrity of the market by limiting the extent to which wholesale prices can rise and fall. They are set at a level so as not to interfere with the price signals needed for efficient investment. While the reliability standard and settings cap extreme prices, they remain part of the broader reliability framework.

This broader reliability framework is currently under a lot of focus, given significant load shedding events earlier this year, the Finkel review, and various government interventions in energy markets. The Energy Security Board's proposal of a National Energy Guarantee - a dual reliability and emissions guarantee - outlines a framework for a reliability guarantee that is intended to provide greater assurance that the NEM's reliability needs are met while addressing the policy uncertainty in the sector that has been impacting on investor confidence.

It is in this context that the Panel has completed its draft review. The Panel is not proposing to recommend changes to the reliability standard and reliability settings because:

- The current reliability standard and settings are, in our view, achieving their purpose and are likely to continue to do so out to 2023/24.
- The market price cap and cumulative price threshold been effective at limiting market participants' exposure to excessive high prices with the overall market integrity maintained. These settings appear to be sufficiently high to allow investment in enough generation so there is not more unserved energy expected than that allowed for by the reliability standard.
- The Panel considers that providing regulatory stability through no changes will benefit consumers and market participants, given the current impact of policy uncertainty on investor confidence, the rapid technological change underway in the national electricity market, and the absence of sufficient evidence in support of a change to the price settings.

1 National Electricity Rules clause 3.9.3A

The Panel notes that issues relevant to other aspects of the broader market and regulatory frameworks for reliability are being considered through other proposals and reviews being progressed by the market bodies.

Stakeholders are invited to comment on the draft report by 22 December 2017.

Specifically, the Panel has made the following draft recommendations:

Component and purpose	Current level (2017/18)	Recommended level from 1 July 2020
Reliability standard • Expresses the level of reliability sought from the NEM's generation and transmission inter-connector assets.	A maximum expected unserved energy in a region of 0.002 per cent of the total energy demanded in that region for a given financial year.	A maximum expected unserved energy in a region of 0.002 per cent of the total energy demanded in that region for a given financial year.
Market price cap • Limits market participants' exposure to temporary high prices, being the maximum bid (and therefore settlement) price that can apply in the wholesale spot market. It should be set at a level such that prices over the long term incentivise enough new investment in generation so the reliability standard is expected to be met.	$14,200/MWh	$14,200/MWh ($2017)
Cumulative price threshold • Limits participants' financial exposure to prolonged high prices, by capping the total market price that can occur over seven consecutive days. It should be set at a level such that prices over the long term incentivise enough new investment in generation so the reliability standard is expected to be met.	$212,800	$212,800 ($2017)
Administered price cap • Limits participants' financial exposure to prolonged high prices, being the price 'cap' that applies when the cumulative price threshold is exceeded.	$300/MWh	$300/MWh
Market floor price • Prevents market instability, by imposing a negative limit on the total potential volatility of market prices in any half hour trading interval.	-$1,000/MWh	-$1,000/MWh

These draft recommendations have taken into account stakeholders submissions to the review's issues paper, Panel members' analysis and judgment, and the results of wholesale market modelling, assessed against set assessment criteria.

The Panel will consider other policy developments that may be relevant to the Panel's draft findings and recommendations, including the status of the AEMC's rule on five-minute settlement and the National Energy Guarantee, before the Panel's final report is published (by 30 April 2017).

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Report overview

Extend the current reliability standard and settings

The Reliability Panel (Panel) has completed its draft review of the reliability standard and reliability settings to apply in the national electricity market (NEM) from 1 July 2020. We are required to review the reliability standard and settings every four years.[2] The Panel is proposing to leave the current reliability standard and reliability settings unchanged.

The Panel is not proposing to change the reliability standard and reliability settings because:

- The current reliability standard and settings are, in our view, achieving their purpose and are likely to continue to do so out to 2023/24.
- The market price cap and cumulative price threshold have been effective at limiting market participants' exposure to excessive high prices with the overall market integrity maintained. These settings appear to be sufficiently high to allow investment in enough generation so there is not more unserved energy expected than that allowed for by the reliability standard.
- The Panel considers that providing regulatory stability through no changes will benefit consumers and market participants, given the current impact of policy uncertainty on investor confidence, the rapid technological change underway in the national electricity market, and the absence of sufficient evidence in support of a change to the price settings.

The broader market and regulatory framework for reliability

Reliability of the power system, along with energy affordability and meeting our emission reduction obligations, currently features prominently in many policy, political and media announcements and debates.

The concept of reliability is concerned with having sufficient physical capacity in the electricity system to generate and transport electricity to meet consumer demand. In the Australian context, reliability is separate from issues surrounding system security (ensuring the system operates within prescribed technical operating limits). System security issues are currently being dealt with through a range of processes including the Australian Energy Market Commission's (AEMC's) frequency control framework review and the Australian Energy Market Operator's (AEMO's) future power system security work stream. Similarly, the AEMC is addressing broader issues around reliability (beyond the setting of the level of the standard and settings) through the *Reliability frameworks review* that will report to the Council of Australian Governments (COAG) Energy Council.

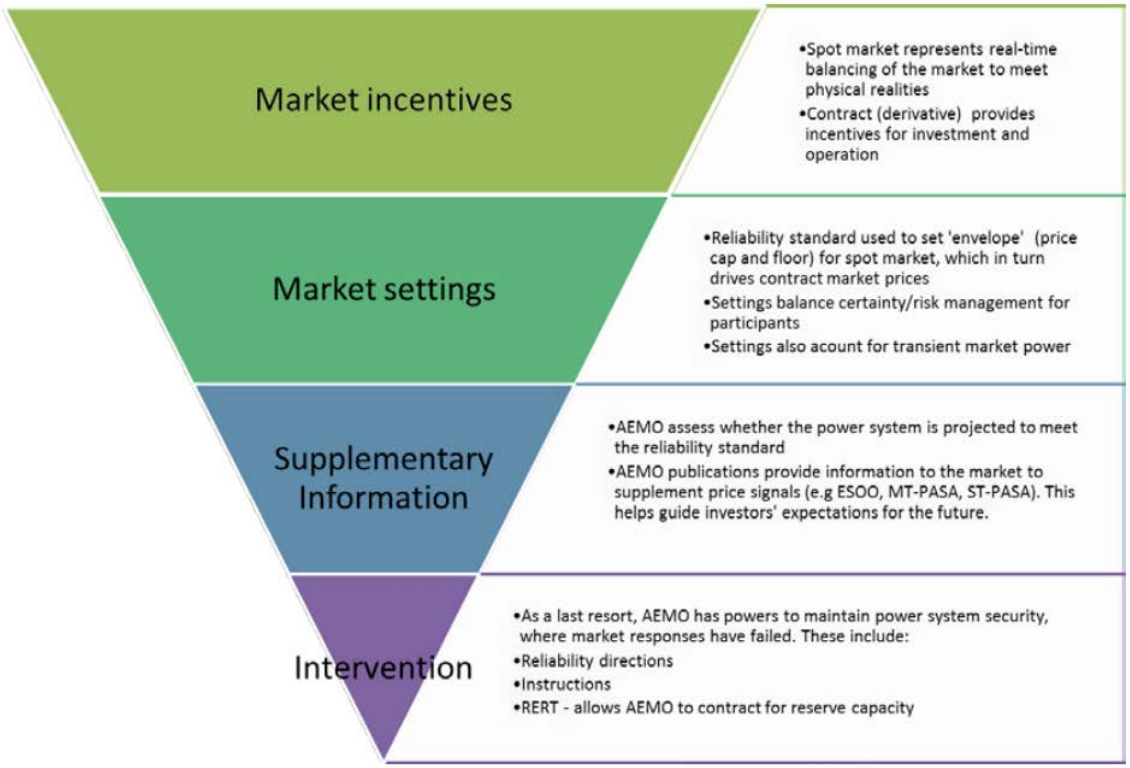
2 National Electricity Rules clause 3.9.3A

The regulatory framework for reliability in the national electricity market is primarily market based. Under this structure, market participants decide to invest in electricity generation, operate and maintain units, and retire plant based on price signals and incentives from both the wholesale market and the contracts market. Expectations of future spot prices provided by the contract market, and the need for investment in new capacity to manage price risk, also impact on their decisions. Figure 1 provides an overview of the existing reliability framework, including the 'market settings' – the reliability standard, market price cap, cumulative price threshold, administered price cap and market floor price—and AEMO's intervention mechanisms.

This broader reliability framework is currently under a lot of focus, given significant load shedding events earlier this year, the Finkel review, and various government interventions in energy markets. The Energy Security Board's proposal of a National Energy Guarantee - a dual reliability and emissions guarantee - outlines a framework for a reliability guarantee that is intended to provide greater assurance that the NEM's reliability needs are met while addressing the policy uncertainty in the sector that has been impacting on investor confidence.

The Panel recognises the context in which we are completing this review. We note that issues relevant to other aspects of the broader market and regulatory frameworks for reliability are being considered through other proposals and reviews being progressed by the market bodies.

Figure 1: Markets and an escalating series of interventions[3]



3 AEMC, *Reliability Frameworks Review*, 2017, p. 10.

The review examines one component of the reliability framework

This review assesses one key component of the market-based framework for delivering reliability in the national electricity market. It examines the market settings to apply from 1 July 2020 until the next review.[4]

The market settings – the reliability standard, the market price cap, cumulative price threshold, administered price cap and market floor price – are an integral part of the reliability framework. They protect the long term integrity of the market by limiting the extent to which wholesale prices can rise and fall. They are set at a level so as not to interfere with the price signals needed for efficient investment. While the reliability standard and settings cap extreme prices, they remain part of the broader reliability framework.

This draft report presents, and seeks comment on, our recommendations on the market settings to apply in the national electricity market from 1 July 2020. The Panel is required to conduct this review every four years to assess whether the reliability standard and settings remain appropriate for expected market conditions.

The market settings focus on the future performance of the national electricity market. Their purpose is to:

- Establish the level of reliability consumers can expect from key aspects of the physical system (generators and interconnectors), by setting the reliability standard.
- Maintain the overall integrity of the market, by protecting market participants and consumers from excessively high prices.
- Allow for sufficient investment to provide electricity to the agreed reliability standard.

Additional supplementary mechanisms exist that allow for interventions to be made in certain limited circumstances when the market based arrangements have not – or will not – deliver the desired outcome.

Providing regulatory stability

The Panel recognises the impact that rapid technological change and policy uncertainty is having on consumers, market participants and the broader investment community. Policy uncertainty, in particular regarding the integration of emissions reduction and energy policy, is potentially raising risk premiums and constraining the investment environment, and ultimately increasing costs to consumers.

The Panel does not wish to unnecessarily exacerbate uncertainty in the market. We have therefore weighted our decisions in this review in favour of supporting certainty and

4 National Electricity Rules (rules), clause 3.9.3A. This review does not address system security. In terms of the physical electricity system, this review considers the reliability provided by generators and inter-connectors between regions, and not the reliability provided by the transmission and distributions networks, which is the responsibility of jurisdictional governments.

stability in the national electricity market. Our approach is consistent with the comments we received from stakeholders in July 2017 on the issues paper for this 2018 Reliability standard and settings review (review).

The Panel is monitoring policy developments, including the status of the AEMC's rule on five-minute settlement and the National Energy Guarantee. If new decisions are made before our final report is published we will address their impact on the recommendations of this review as time permits in our final report, suggesting further work where needed including deadlines for completion.

Approach to this review

In making our draft recommendations, the Panel has been guided by the national electricity objective: to achieve efficient investment in, and operation and use of, electricity services in the long-term interests of consumers. We have also applied the assessment criteria set out in the National Electricity Rules (rules) and the *Reliability standard and settings guidelines* (guidelines).[5]

The Panel's decisions in this review have been informed by stakeholder views, and analysis and judgments based on the experience, knowledge and expertise of Panel members. Our decision making has also taken into account the outcomes of wholesale market modelling conducted by Ernst & Young (EY).[6]

Notably, only the market price cap and the cumulative price threshold are automatically reassessed in each four-yearly review. Before reassessing the level of the reliability standard, the administered price cap and the market floor price, the Panel is to apply a materiality assessment to form a view as to whether there may be material benefit in reassessing each.[7]

The term '*expected unserved energy*' is important to understand in regards to this review. '*Unserved energy*' means the amount of customer demand that cannot be supplied within a region of the national electricity market due to a shortage of generation or interconnector capacity.[8] The term '*expected*' is important – it means a statistical expectation of a future state, an average across a range of future scenarios, weighted for probability.

For the reliability standard, unserved energy is expressed as a proportion of expected demand that is at risk of not being supplied to consumers (0.002 per cent). In simple

5 Reliability Panel, *Review of reliability standard and settings guidelines*, final guidelines (Guidelines), December 2016, Sydney. The guidelines and the terms of reference are available at www.aemc.gov.au.

6 See EY, *Reliability Standard and Settings Review 2018, Modelling Report, DRAFT* (EY Report), November 2017, Brisbane, available at http://www.aemc.gov.au/Markets-Reviews-Advice/Reliability-Standard-and-Settings-Review-2018

7 Guidelines section 3.1.

8 Where generation and inter-regional transmission capacity has been adjusted to consider a reasonable number of outages.

terms, the reliability standard requires that there be sufficient generation and transmission interconnection in a region such that at least 99.998 per cent of forecast annual demand for electricity is expected to be supplied.

It should be noted that there can be instances where consumer demand for electricity is not met, which are not deemed unserved energy. For example, events such as two of the largest units in a region simultaneously tripping, measures taken to restore the security of the power system, or outages on the network.[9]

Finally, many factors – independent of the market price cap and cumulative price threshold – may impact on people's willingness to invest, which are beyond the scope of this review.

Draft review outcomes

The current, and recommended, reliability standard and reliability settings are as follows:[10]

Component and purpose	Current level (2017/18)	Recommended level from 1 July 2020
Reliability standard • Expresses the level of reliability sought from the national electricity market's generation and transmission inter-connector assets.	A maximum expected unserved energy in a region of 0.002 per cent of the total energy demanded in that region for a given financial year.	A maximum expected unserved energy in a region of 0.002 per cent of the total energy demanded in that region for a given financial year.
Market price cap • Limits market participants' exposure to temporary high prices, being the maximum bid (and therefore settlement) price that can apply in the wholesale spot market. It should be set at a level such that prices over the long term incentivise enough new investment in generation so the reliability standard is expected to be met.	$14,200/MWh	$14,200/MWh ($2017)
Cumulative price threshold • Limits participants' financial exposure to prolonged high prices, by capping the total market price that can occur over seven consecutive days. It should be set at a level such that prices over the long term incentivise enough new investment in generation so the reliability standard is expected to be met.	$212,800	$212,800 ($2017)

9 The rules require that certain events are included, and other events excluded, when determining the amount of unserved energy - the measure of reliability. See the rules clause 3.9.3C and the summary table provided in the Review's Issues Paper, p. 44.

10 Under the rules clauses 3.9.4 and 3.14.1, the Commission is required to adjust the market price cap and cumulative price threshold in line with the consumer price index by 28 February each year, to apply from 1 July that year.

Component and purpose	Current level (2017/18)	Recommended level from 1 July 2020
Administered price cap • Limits participants' financial exposure to prolonged high prices, being the price 'cap' that applies when the cumulative price threshold is exceeded.	$300/MWh	$300/MWh
Market floor price • Prevents market instability, by imposing a negative limit on the total potential volatility of market prices in any half hour trading interval. It bears on the clearing of supply and demand at times of low demand and excess generation.	-$1,000/MWh	-$1,000/MWh

1. The reliability standard

The reliability standard is not automatically reassessed every review cycle. This is to provide stability and certainty to the market. The Panel must apply a materiality test to determine if the reliability standard should be reassessed.

Having considered whether AEMO has changed its value of customer reliability measure, changes in the way consumers use electricity, and the benefits of predictability and stability, the Panel considers that there would be no material benefit in reassessing the level of the reliability standard at this time.

In considering this matter, the Panel also assessed the following additional matters as permitted by the guidelines:

- The potential for upcoming changes in the value of customer reliability due to the growth in the uptake of new technologies and heightened public interest in system reliability following recent system security events.
- Potential changes in the costs of necessary new generation since the 2014 review.

While there is clearly potential for some of these matters to impact on the reliability standard, the Panel did not consider there would be a material benefit at this time in reassessing the level of the standard. This is particularly so given there are a number of changes and potential changes to market and regulatory frameworks in development that could be relevant to investment decisions and therefore could impact the effect of any revised reliability standard for the near term.

The Panel notes that the decision not to reassess the reliability standard in this review means that from 1 July 2020 the reliability standard will remain unchanged from its current level; a maximum expected unserved energy in a region of 0.002 per cent of the total energy demanded in that region for a given financial year.

2. The market price cap and the cumulative price threshold

The Panel does not propose to recommend any change to the current levels of the market price cap and cumulative price threshold as we consider that at the current levels, these settings are serving their purpose and are likely to continue to do so.

The overall purpose of the market price cap and the cumulative price threshold is to protect market participants from exposure to high prices that could threaten the financial viability of prudent market participants and thereby the integrity of the national electricity market.

The Panel considers the current settings have been effective at limiting market participants' exposure to excessive high prices with the overall market integrity having been maintained.

Similarly, the level of the market price cap and cumulative price threshold appear to have been sufficient so as to not interfere with the price signals needed to drive efficient investment to meet the reliability standard.

This view is supported by the fact that since the settings were last increased in real terms on 1 July 2010 through to June 2016, the amount of unserved energy in each region has been below the reliability standard.[11] By 'below' we mean the reliability standard is met; the amount of expected unserved energy is forecast to be significantly smaller than the amount of unserved energy allowed for under the reliability standard.

Based on the modelling, with the settings at their current levels, unserved energy outcomes are projected to be well below the reliability standard throughout the review period in all regions of the national electricity market.[12] The level of unserved energy under circumstances such as high demand and/or high generator forced outage rates is also forecast to be well below the reliability standard.[13] It should be noted that some

11 The cumulative price threshold was last increased in 2010, noting both settings are increased annually with changes in the consumer price index.
The Panel recognises that there were several directions issued by AEMO over the 2016-17 summer period (discussed in chapter 3). The Panel is awaiting data on unserved energy for the financial year 2016-17 from AEMO, including for the summer period. The Panel has reviewed AEMO's incident reports of the reliability-related events. Given unmet demand that could be potentially be classified as unserved energy, our preliminary view is that it appears unlikely that sufficient load was shed such that the unserved energy recorded exceeded the reliability standard in any region for 2016-17 financial year. We will review this view following the provision of data by AEMO, prior to our final report. The Panel also notes that the South Australia System Black event was a power system security event and not the result of insufficient generation being available. As such, any subsequent unmet demand would not be counted toward measures of unserved energy, which exclude load lost due to security events.

12 Based on the outcomes of the modelling conducted by EY.

13 The Panel notes that the reliability standard allows for up to 0.002 per cent expected unserved energy in a region. Also, the unserved energy findings are forecasts underpinned by modelling assumptions that aim to reflect the likely outlook for the NEM over the review period. As such, actual unserved energy outcomes will differ from forecasts. In addition, AEMO has intervention powers under the rules to address potential shortfalls of reserves which in and of itself will tend to limit actual occurrences of unserved energy.

level of unserved energy is expected, and the forecast does not encompass early retirement of thermal plant.[14]

The Panel considers there is value for market participants and consumers in maintaining policy stability, where warranted. As already highlighted, the national electricity market and the energy sector are in a time of transition. Market participants and potential investors are currently factoring into their business models developments including: rapid technological change; the potential introduction of a National Energy Guarantee; the potential for a five minute settlement period; the growth of distributed energy resources; changes in contract types; advances in demand response; and government-sponsored generation projects.

The Panel notes that many stakeholders identified the importance of regulatory stability, and the uncertainty associated with any reassessment of the settings.

As such, the Panel recommends no change to the real value of the market price cap and the cumulative price threshold from 2020, noting that they will be subject to two CPI indexations before July 2020.

While we consider that the existing levels of the market price cap and the cumulative price threshold, in themselves, are unlikely to lead to levels of unserved energy above the reliability standard during the review period, many factors independent of the market price cap and cumulative price threshold may impact on people's willingness to invest, which are beyond the scope of this review.

3. The administered price cap

The administered price cap is not automatically reassessed every review cycle. The Panel must apply a materiality test to determine if the reliability standard should be reassessed.

Following consideration of stakeholder submissions to the issues paper, and the materiality assessment criteria, the Panel has decided to reassess the level of the administered price cap in this review.

The Panel has examined: the expected short run marginal costs of high marginal cost, low utilisation generators; the potential impacts on consumers; fuel price volatility; the benefits of stability in promoting efficient investment; the compensation framework; and the need to ensure continued supply during an administered price period. The Panel's views were also informed by stakeholders' comments.

The Panel's draft recommendation is to retain the current administered price cap of $300/MWh for the review period, for the following reasons:

- **No increase in short run marginal cost** – there does not appear to be strong evidence of a substantial, permanent increase since 2008 in the short run marginal costs of low utilisation generators.

14 Early retirement refers to a plant closing sooner that it would be expected based on the typical asset life of that type of generation technology.

- **Minimise costs to consumers** – costs to consumers can be minimised by using the current compensation mechanism for those generators that are dispatched during an administered price period with a short run marginal cost above the administered price cap, rather than exposing all consumers to prices close to the highest short run marginal cost of generators.

- **Address fuel price volatility through compensation** – generators can recoup losses where their short run costs are above the administered price cap due to temporary factors, such as increases in fuel prices, through compensation.

- **Promote predictability and stability** – leaving the administered price cap unchanged provides predictability and stability to the national electricity market, supporting efficient investment.

The Panel considers in the current context retaining a $300/MWh administered price cap reflects an appropriate trade-off between the competing objectives of limiting price risk for market participants, allowing for the continued supply of electricity during an administered price period, and limiting the risk of the need for compensation.

4. The market floor price

The market floor price is not automatically reassessed every review cycle. The Panel is required to leave the level of the market floor price as previously determined unless we consider there may be material benefit in reassessing it.

The Panel has considered factors including but not limited to:

- The number and frequency of trading intervals where the market price has been equal to, or has approached, the level of the market floor price.

- Whether there have been significant changes in the generation fleet, such that average generator cycling costs have changed significantly.

We have identified that market floor price events (and low price events more generally) related to excess generation occur infrequently in the market. In 2016 and 2017, the number of low price events (i.e. prices below -$900/MWh) is estimated to be close to the average number of such events for the past eight years.

The Panel has found no evidence that changes in the generation fleet are causing a significant change in the range of generator cycling costs, indicating that the current level of the market floor price remains sufficient to support efficient operational decisions by generators.

The Panel considers that there would not be material benefit in a reassessment of the level of the market floor price. As such the market floor price will remain -$1,000/MWh from 1 July 2020.

Consultation

The Panel invites comments on this draft report and our draft recommendations. Submissions are due by **22 December 2017** and will inform the Panel's final recommendations. The report on the modelling commissioned from EY—*Reliability Standard and Settings Review 2018, Modelling Report, DRAFT* (EY Report)— can be found on the review's webpage at http://www.aemc.gov.au/Markets-Reviews-Advice/Reliability-Standard-and-Settings-Review-2018

The Panel will hold a public meeting early in 2018 to discuss stakeholder feedback on the draft report, policy developments and the market outlook, and implications for the Panel's final report. Details will be posted on the review webpage (above).

The Panel's final report is to be published by 30 April 2018.

1 Introduction

This draft report has been prepared for the Reliability Panel's (the Panel's) 2018 Reliability standard and settings review (the review).

Its purpose is to present, and seek stakeholder views on, the Panel's findings and recommendations on the reliability standard and reliability settings to apply in the national electricity market from 1 July 2020.[15] Submissions we receive on this draft report will inform the Panel's final recommendations to be contained in the final report, to be published by 30 April 2018.

This chapter describes:

- why the Panel is undertaking this review
- the review's scope and purpose
- the assessment framework the Panel will use
- how this review addresses market trends and uncertainties the relationship between this and other reliability-related projects
- how you can provide input to this review, including on this draft report.

1.1 The reliability standard and settings review

Reliability of the power system, along with energy affordability and meeting our emission reduction obligations, currently features prominently in many policy, political and media announcements and debates. This review—while addressing the reliability of the national electricity market—centres on one key aspect of the reliability framework. It considers the reliability standard and settings to apply from 1 July 2020 until the next the next review.

Under the rules the Panel is required to carry out a review of the reliability standard and reliability settings every four years. The reliability settings are the market price cap, the cumulative price threshold, the administered price cap and the market floor price (Table 1).

This periodic review allows the Panel to consider whether the current levels of the reliability standard and reliability settings remain suitable for expected market conditions, or whether changes should be made to ensure these mechanisms continue to meet the requirements of the market, market participants and consumers. Regular review of the reliability parameters allows appropriate price signals for investment as the market environment and market arrangements change, so as to provide a reliable supply of electricity to consumers. The Panel recognises that it is conducting this review at a time of uncertainty and significant and rapid change in the national electricity market. As required by its terms of reference, the Panel has considered the scale and pace of changes, and uncertainties, in our deliberations (see section 1.4).

15 The next review is due to be completed by 30 April 2022 and will consider settings to apply from 1 July 2024.

Table 1: Current reliability standard and settings[16]

Reliability standard	The reliability standard for generation and inter-regional transmission elements in the national electricity market is a maximum expected unserved energy in a region of 0.002 per cent of the total energy demanded in that region for a given financial year.
Market price cap	$14,200/MWh
Cumulative price threshold	$212,800
Administered price cap	$300/MWh
Market floor price	-$1,000/MWh

1.2 Scope and purpose

Scope of this review

Reliability of the power system is about having sufficient physical capacity in the system to generate and transport electricity to meet consumer demand.[17] Many factors impact on the power system's overall reliability, and the level of reliability a particular customer experiences.

In terms of the physical power system, this review focuses on the reliability provided by electricity generation and inter-regional transmission assets (called "interconnectors"). The review does not address the reliability provided by the electricity transmission and distribution networks, as this is the responsibility of jurisdictional governments.[18]

16 Under the rules clauses 3.9.4 and 3.14.1, the Commission is required to adjust the market price cap and cumulative price threshold in line with the consumer price index by 28 February each year, to apply from 1 July that year.

17 Unless otherwise stated, references to demand throughout this paper refer to operational demand, (consistent with the approach used previously by the Panel in the *Annual Market Performance Review*). Operational demand consists of electricity used by residential, commercial and large industrial consumers, as supplied by scheduled, semi-scheduled and significant non-scheduled generating units. Demand response activities and embedded generation are not included on the 'supply' (or 'capacity') side with large generating units. Instead these 'behind-the-meter' activities have the effect of reducing total demand. Nevertheless, behind-the-meter activities are relevant to reliability. As reliability relates to the ability to meet customers' demand for electricity, reductions in demand can make it easier to meet the desired level of reliability. For an explanation of scheduled, semi-scheduled and non-scheduled generating units see AEMC, *Demand side obligations to bid into central dispatch, consultation paper*, 2015, Sydney, pp. 2-3

18 Unserved energy excludes power system security events, network outages not associated with interruptions to supply that are caused by failures of the intra-regional transmission network and outages on the distribution network. The reliability standards for distribution and transmission assets within regions are the responsibility of regional jurisdictions. For example, the NSW Department of Planning and Environment sets the *Transmission Network Design and Reliability Standards for NSW*, which specifies that "there will be no inadvertent loss of load (other than load which is interruptible or dispatchable) following an outage of a single circuit (a line or a cable) or transformer, during periods of forecast high load" (the "N-1" criterion).

In terms of the regulation of the power system, the framework for delivering reliability in the national electricity market is primarily market-based. The reliability standard and reliability settings are key components of this market-based approach. This review does not examine the non-market components of the reliability framework, such as the powers of the Australian Energy Market Operator (AEMO) to intervene in the operation of the market.[19]

The Panel recognises the related, importance of system security to the power system and the significant work underway on supporting system security (see Box 1.1 on the difference between security and reliability).[20] Issues related to system security are being progressed through a range of avenues, including the AEMC's system security work program.[21]

Box 1.1 What is the difference between reliability and security?

Reliability

"Reliability" of the power system is about having sufficient generation, demand side response, and interconnector capacity in the system to generate and transport electricity to meet consumer demand.

System security

"System security" relates to operating the power system within defined technical limits even if there is an incident, such as the loss of a major transmission line or large generator.

Purpose of the review

This review considers the reliability standard and settings to apply on and from 1 July 2020.

The purpose of this review is to:

- Consider whether the existing reliability standard remains appropriate for the market conditions expected from 1 July 2020.
- If the Panel considers that the existing reliability standard is not appropriate for the expected market conditions from 1 July 2020, recommend a revised reliability standard that should apply from 1 July 2020.

19 AEMO's "intervention powers" are outlined in Chapter 3 of this draft report, see Box 3.3.

20 While the two concepts are separate, they are closely related operationally. A reliable power system is also a secure power system. However, the converse is not necessarily true; a power system can be secure even when it is not reliable. For example, the rules allow AEMO to undertake involuntary load shedding, potentially compromising reliability, in order to return the power system to a secure operating state.

21 See the AEMC's website at http://www.aemc.gov.au/Major-Pages/AEMC-work-overview/System-security-review.

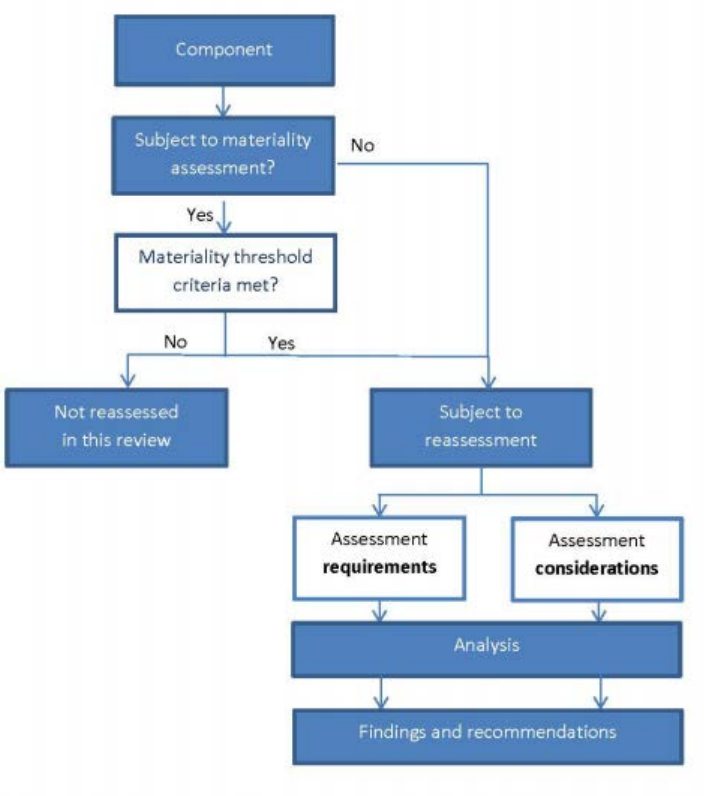
- Consider whether the existing reliability settings remain appropriate for the market conditions expected from 1 July 2020.
- If the Panel considers that the level of an existing reliability setting is not appropriate for expected market conditions from 1 July 2020, recommend the level appropriate to that reliability setting that should apply from 1 July 2020.
- Propose changes to the rules to implement any recommended changes arising from the review. [22]

The Panel notes that all the recommendations provided in this draft report are *proposed* recommendations and subject to stakeholder consultation.

1.3 Assessment framework for this review

The Panel's assessment framework is based on a series of obligations that are set out in the rules, the review's terms of reference issued by the Commission, and the Panel's *Review of reliability standard and settings guidelines* (the guidelines).[23] Figure 2 illustrates the assessment process and various assessment criteria.

Figure 2: Assessment process and type of assessment criteria



22 Following the completion of this review, the Panel must submit any recommended changes to the reliability standard or a reliability setting to the Commission as a rule change request.

23 Reliability Panel, *Review of reliability standard and settings guidelines*, final guidelines (Guidelines), 1 December 2016, Sydney. The guidelines and the terms of reference are available at www.aemc.gov.au

The Panel must apply a specific framework when assessing the reliability standard and settings:

- the Panel is guided by the national electricity objective in undertaking the review
- only certain components of the reliability standard and settings are to be reassessed
- the Panel must use specific criteria to assess each component.

1.3.1 The national electricity objective

The national electricity objective is the goal (or objective) of the National Electricity Law, the legislation under which the Panel is established. The Panel must be guided by the national electricity objective when it undertakes its assessment and makes recommendations for this review.[24]

The national electricity objective is:

> to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to:
>
> (a) price, quality, safety, reliability and security of supply of electricity; and
>
> (b) the reliability, safety and security of the national electricity system.[25]

The objective is the achievement of efficient investment in, and operation and use of, electricity services in the long-term interests of consumers.

The national electricity objective also includes a specific set of variables – price, quality, safety, reliability and security of supply. The Panel must consider how the outcome of a particular decision would impact on these variables, where relevant. For this review, the most relevant variables are price and reliability.

The question the Panel is to answer through this review is therefore whether a recommendation to change the reliability standard or (one or more of) the reliability settings would likely promote more efficient investment in and operation and use of electricity services, which would ultimately promote the **long term interests of consumers** *with respect to price and reliability of the supply of electricity, and the reliability of the national electricity system*. [26]

24 Guidelines p. 2.

25 National Electricity Law section 7.

26 More information about how the Commission and Panel interpret the national electricity objective can be found in Applying the energy objectives, a guide for stakeholders. AEMC, *Applying the energy objectives, a guide for stakeholders*, December 2016, Sydney.

The Panel is to be guided by the following general principles in order to meet the national electricity objective:[27]

- **Allowing efficient price signals while managing price risk:** The Panel will exercise its judgment so as to allow the market to send efficient price signals while limiting price risk exposure for participants.
- **Delivering a level of reliability consistent with the value placed on that reliability by customers:** The Panel will have regard to estimates of the value placed on reliability by customers to exercise its judgment as to the level of the standard. The settings should be sufficient to support the level of investment necessary to deliver the standard, over the long run.
- **Providing a stable, predictable and flexible regulatory framework:** The Panel will exercise its judgment to achieve stable outcomes, while reflecting significant changes in market conditions, to support efficient investment and operational decisions by participants.

1.3.2 Materiality assessments

Not all the components of the reliability standard and settings are automatically subject to review in each review. In 2016 the Panel determined that only certain components would be automatically reviewed every four years.[28] The Panel took this decision to deliver both a stable and flexible regulatory framework for system reliability.

The level of the market price cap and the cumulative price threshold are the only two parameters that are automatically reassessed every four years. As indicated in Figure 3, the levels of the reliability standard, the administered price cap and the market floor price are subject to a materiality assessment. The Panel will only open these parameters for reassessment if it considers there is likely to be a material benefit in doing so, as judged against the criteria outlined in the guidelines. The use of CPI for the annual indexation of the market price and cumulative price threshold is also subject to a materiality assessment. The measures (or metrics) used to express the reliability standard and each of the settings are not subject to review.[29]

This draft report presents the Panel's views on the:

- materiality assessment of the reliability standard, the administered price cap and the market floor price
- levels of the market price cap and cumulative price threshold, as well as those parameters deemed through the materiality assessment to be reviewed.

---

27 Reliability Panel, *Review of reliability standard and settings guidelines final determination*, December 2016, Sydney (Guidelines Determination).

28 Guidelines pp. 4-9.

29 Guidelines p. 8. The annual indexation of the market price cap and the cumulative price threshold (and the non-indexation of the market floor price and the administered price cap) is also not subject to review.

Figure 3: Components of the reliability standard and settings subject to a materiality assessment

	Reliability standard	Market price cap	Cumulative price threshold	Administered price cap	Market floor price
Level	Materiality assessment	Automatically reassessed	Automatically reassessed	Materiality assessment	Materiality assessment
Basis of indexation		Materiality assessment	Materiality assessment		

1.3.3 Assessment criteria

The criteria the Panel has applied in undertaking this review can be divided into two categories:

- ***Materiality threshold criteria.*** These are the criteria the Panel has used to assess the reliability standard and the various settings that are subject to a materiality assessment. Established in the guidelines, they are described and discussed in the chapters on those parameters subject to a materiality assessment.
- ***Assessment criteria:*** These are the criteria set out in the rules, guidelines and terms of reference that the Panel has considered when reviewing a reliability standard or setting. In considering these criteria it is useful to differentiate between:
  - ***Assessment requirements*** – a condition that the Panel must meet when undertaking its review.
  - ***Assessment considerations*** – factors or impacts to which the Panel must (or may) have regard.

Table 2 presents the main criteria in each category. They are described and discussed in detail in each of the following chapters of this draft report.

Table 2: Assessment criteria

Assessment requirements *- Conditions that must be met -*
Under rules clauses 3.9.3A(f) and (g), in making a decision on the market price cap and the cumulative price threshold, the Panel may only recommend a market price cap/cumulative price threshold that it considers will: • Allow the reliability standard to be satisfied without use of AEMO's powers to intervene under clauses 3.20.7(a) and 4.8.9(a).[30] • In conjunction with other provisions of the rules, not create risks which threaten the overall integrity of the market. If the Panel is of the view that a decrease in the market price cap/cumulative price threshold may mean the reliability standard is not maintained, the Panel may only recommend such a decrease where it has considered any alternative arrangements necessary to maintain the reliability standard. The Panel must comply with the reliability standard and settings guidelines.[31]

Assessment considerations *- Factors that must or may be considered -*
Under rule clause 3.9.3A(e), the Panel: • Must have regard to the potential impact of any proposed change to a reliability setting on: (i) spot prices; (ii) investment in the National Electricity Market; (iii) the reliability of the power system; and (iv) Market Participants. • Must have regard to any value of customer reliability (VCR) determined by AEMO which the Reliability Panel considers to be relevant. • Must have regard to the terms of reference provided by the Commission. Amongst other things, these state the Panel should 'consider how changing the relevant reliability settings may affect price risk management behaviour, including potential impacts on contract markets, and how this may affect investment outcomes in the NEM.' • May take into account any other matters specified in the guidelines or which the Panel considers relevant.

30 AEMO's "intervention powers" are explained in chapter 3, Box 3.3.

31 Rules clause 3.9.3A(e).

1.3.4 How the Panel makes its decision

The Panel's consideration against these assessment criteria is based on analysis of wholesale market modelling findings, and the experience, knowledge and expertise of its members.

Wholesale market modelling for this review is to be provided by energy market experts Ernst and Young (EY).[32] The Panel engaged EY to provide advice and modelling assistance to inform the Panel's recommendations on the reliability standard and settings. The Panel requested that EY:

1. Forecast the expected amount of unserved energy over the period 1 July 2020 - 1 July 2024 (the review period) under the current reliability settings, and assess whether the current reliability standard will be met.
2. Estimate the theoretical optimal level at which the market price cap could be set over the review period.
3. Estimate the theoretical optimal level at which the administered price cap could be set over the review period.
4. Analyse how the level of the cumulative price threshold influences the effectiveness of the theoretical optimal market price cap and discuss the implications on the market from changing the cumulative price threshold and the market price cap.

The results of these modelling tasks are summarised in the main chapters of this report. The principal assumptions used in the modelling are provided in Appendix B. A detailed description of the modelling methodology and modelling outcomes can be found in EY's report.[33]

It is the Panel's intention that our interpretation of the assessment framework, the modelling method, the findings and analysis, and our judgements made in relation to the assessment criteria are transparent. We therefore welcome stakeholder feedback on each of these matters.

1.4 Change and uncertainty

The review of the reliability standard and settings is informed by forecasts of market conditions seven years into the future. Development of these long-term forecasts is particularly challenging at this point in time. In conducting this review, the Panel has considered the significant uncertainty and the change underway in the national electricity market, and the attendant implications for consumers and reliability over the review period.

32 Formerly ROAM Consulting. EY were appointed following a competitive tender process.

33 Available at http://www.aemc.gov.au/Markets-Reviews-Advice/Reliability-Standard-and-Settings-Review-2018

The current context

The emerging and persistent trends in the physical power system and the national electricity market particularly relevant to this review include the following:

- **Continued retirement of thermal generation –** the trend of withdrawal of thermal, scheduled generation from the market has continued since 2012.
- **Increasing penetration of renewable, intermittent generation** - as wind and solar PV form an ever-larger part of the generation mix, their output in certain regions may at times impact price outcomes, and there is more focus on the availability characteristics of different forms of electricity generation and potential impacts on reliability.
- **Emergence of new technologies** - new technologies, including small scale solar PVs, battery storage and demand response, have emerged that:
  - may alter the profile of demand for electricity sourced from the grid
  - may offer new options for supply of energy and demand reductions that were not mature at the time of the 2014 Review.
- **Coupling of gas and electricity prices** - increased use of gas as a fuel for power generation is strengthening the connection between the gas and electricity markets. A comprehensive discussion of these trends can be found in the issues paper for this review.

Uncertainty is another feature of the current investment and market environment. There are a number of drivers of this uncertainty.

The Panel notes the Australian energy sector has suffered from the sustained absence of national, coordinated policy integrating emissions reduction and energy. This has resulted in pervasive uncertainty, which makes it difficult for business and consumers to invest, and undermines the reliability of power supply. The Panel notes that at the time of publication of this draft report, on advice from the Energy Security Board, the Federal Government is seeking COAG Energy Council agreement to a National Energy Guarantee (see Box 1.2).

There is also uncertainty due to variability in:

- the nature, extent, rate of technological change
- the absolute and relative costs of generation technologies, and demand-side responses
- the price and availability of gas
- increasing uncertainty about long term weather patterns due to climate change (for instance more frequent, contiguous hotter days).

The pace, scale and fragmentation of government policy announcements and interventions in the market are also contributing to uncertainty. The following issues have brought to prominence the reliability of the power system (with security issues often heightening reliability concerns, and vice versa):

- the South Australian black system in September 2016
- the prospect and subsequent occurrence of load shedding in February 2017

- political debates about the effect of intermittent renewable generation on reliability.

In response, State governments and the Australian Government are investing in new generation and storage projects such as the 100MW South Australian battery[34], the Queensland Government's 400MW large-scale renewable energy reverse auction with 100MW storage[35], and the proposed Snowy Hydro 2.0.[36] There have been numerous reviews commissioned (such as the Finkel Review), and a range of new regulatory approaches proposed and implemented (such as the National Energy Guarantee and the South Australian Energy Minister's intervention powers).[37]

In September 2017, AEMO published an updated *Electricity Statement of Opportunities* and provided Ministerial advice.[38]

Additionally, the Commission is currently undertaking reviews and considering rule changes that, if made, would represent substantial changes to the market framework. A key proposal is the Commission's draft rule to align operational dispatch and financial settlement. A final determination on this rule change is due shortly.[39]

The Panel's approach

The Panel' recognises the complex context in which it is conducting this review, and has adopted the following principles in response to the change and uncertainty in the market:

1. **Model the changing market –** As described in section 1.3.4, wholesale market modelling for this review informs the Panel's recommendations on the reliability standard and settings. The model the Panel has used is technology-neutral. It uses a sophisticated approach to modelling renewable intermittent generation, assesses the market price cap on the basis of the cheapest marginal technology, and

34 Government of South Australia, *Battery storage and renewable technology fund*, accessed at http://ourenergyplan.sa.gov.au/battery.html, 24 October 2017.

35 Queensland Government, *Renewables 400,* accessed at https://www.dews.qld.gov.au/electricity/powering-queensland-plan/transition/renewables-400, 12 October 2017.

36 SnowyHydro, *Snowy 2.0,* accessed at: http://www.snowyhydro.com.au/our-scheme/snowy20/, 24 October 2017.

37 Government of South Australia, *Local powers over national market,* accessed at http://ourenergyplan.sa.gov.au/local-powers.html, 24 October 2017.

38 AEMO, 2017 Electricity Market Electricity Statement of Opportunities, September 2017, Melbourne, and AEMO, Advice to the Commonwealth Government on dispatchable capacity, September 2017, Melbourne.

39 Sun Metals Pty Ltd has submitted a rule change request to reduce the time interval for settlement in the wholesale electricity market from 30 minutes to five minutes. The proposal involves compulsory five minute settlement for generators, scheduled loads and market interconnectors. Demand side participants in the wholesale market, including retailers and large consumers, could choose to be settled on either a five or 30 minute basis. The final determination for this rule is to be published on 28 November 2017. See AEMC, *Five Minute Settlement, draft determination*, 5 September 2017, Sydney, available at www.aemc.gov.au.

addresses investment decisions about both new generation and retirements.[40] Also the reliability settings are reviewed in light of 'plausible futures'.

2. **Use sensitivity analysis –** The Panel has tested the robustness of forecasts through extensive sensitivity and scenario analysis. Sensitivities are applied to the 'plausible futures' to test how different assumptions and forecasts impact on reliability, investment and price outcomes. We have examined sensitivities on market factors including: levels of demand, technology costs, gas prices, thermal generator outage rates, the weighted average cost of capital and asset life.
3. **Only incorporate confirmed policy and projects** - The modelling only incorporates government projects and policies that are certain and will come into effect within the review period. For example, regulatory changes that have been adopted in legislation and projects with funding committed.[41]
4. **Monitor developments** -- The Panel is monitoring policy and project developments, including the status of the AEMC's draft rule on five-minute settlement and the National Energy Guarantee. If new decisions are made before our final report is published we will address their impact on the recommendations of this review as time permits in our final report, suggesting further work where needed.[42] We will also outline in our final report any future market or policy conditions that are likely to have a significant bearing on the effectiveness of the reliability standard and settings recommended by the Panel and necessary responses should these conditions arise.[43] One response could be requiring a reassessment of the findings of this review prior to the next four-yearly review.
5. **Value stability and predictability** - While the rules require the standard and settings to be reviewed at this time, as allowed for in the guidelines, the Panel remains cognisant of the need to support stability and predictability in the market wherever possible. This is central to efficient investment over the long term, a key pillar of the national electricity objective.

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40 Previous reviews assumed the marginal generator was an OCGT. The modelling for this review does not presuppose a single, optimal technology. Instead it provides an optimal mix of technologies as an output of the model. For instance, it assesses the market price cap on the basis of the cheapest marginal technology that can be used to deliver the standard, incorporating not just one, but multiple possible new-entrant technologies (including grid-scale batteries).

The model for this review has a sophisticated approach to modelling renewable technologies. In particular the output of a new wind farm is based on the actual observed wind 'resource' at that location. Battery charging and discharging operations are optimised for arbitrage opportunities.

Also the model did not focus only on new entrant generation. Retirement is an important driver of reliability and has been incorporated into the model through analysis of the commerciality of existing plants through the review period, and additionally a range of sensitivities that vary the amount of retirement as retirement decisions are typically driven by factors that are highly uncertain. See EY report.

41 Refer to the Appendix B which details the principal assumptions.

42 The final report must be published by 30 April 2018.

43 This is a requirement under the review's Terms of Reference, which can be found at http://www.aemc.gov.au/Markets-Reviews-Advice/Reliability-Standard-and-Settings-Review-2018

Box 1.2 The National Energy Guarantee

On 17 October 2017, the Australian Government announced that it had accepted the recommendation of the Energy Security Board (ESB) for a new National Energy Guarantee to deliver more affordable and reliable electricity while meeting our international emissions reductions commitments.

The Guarantee is made up of two components that will require electricity retailers across the national electricity market to contract for reliable and lower emissions generation each year.

- A **reliability guarantee** will be set to deliver the right level of "flexible dispatchable resources", which includes any "form of technology, generation, batteries and demand that can respond to a request by the operator to increase or decrease their output over a defined time interval", as needed in each state.[44]
- An **emissions guarantee** will be set to contribute to Australia's international commitments. The level of the guarantee will be determined by the Australian Government and enforced by the Australian Energy Regulator (AER).[45]

The Guarantee is subject to approval by COAG Energy Council.

1.5 What is unserved energy?

The term '*expected unserved energy*' is important to understand in regards to this review. '*Unserved energy*' means the amount of customer demand that cannot be supplied within a region of the national electricity market due to a shortage of generation or interconnector capacity. The term '*expected*' is important – it means a statistical expectation of a future state; an average across a range of future scenarios, weighted for probability.

For the reliability standard, unserved energy is expressed as a proportion of expected demand that is at risk of not being supplied to consumers (0.002 per cent). In simple terms, the reliability standard requires that there be sufficient generation and transmission interconnection in a region such that at least 99.998 per cent of forecast annual demand for electricity is expected to be supplied.

It should be noted that there can be instances where consumer demand for electricity is not met that are not deemed unserved energy. For example, events such as two of the largest units in a region tripping simultaneously, measures taken to stabilise the security of the power system, or outages on the network. Only single credible contingencies are considered in the definition of unserved energy.[46]

44 ESB, *ESB advice on a retailer reliability, emissions guarantee and affordability*, 13 October 2017, p. 3.

45 ESB, *ESB advice on a retailer reliability, emissions guarantee and affordability*, 13 October 2017. p. 4.

46 The rules state that for the purposes of the reliability standard, 'unserved energy is to: include unserved energy associated with power system reliability incidents: that result from a single credible contingency event on a generation unit or an inter-regional transmission element, that may

1.6 How this review fits in

Reliability is market based

The regulatory framework for reliability in the national electricity market is primarily market based. Figure 4 provides an overview of the existing reliability framework, including the market settings – the reliability standard, market price cap, cumulative price threshold, administered price cap and market floor price—and AEMO's intervention mechanisms.

The **wholesale spot market and contract market** provide market incentives for investment and operation. Revenue earned in the spot market, in conjunction with participants' contract positions, supports reliability in the short-term since it provides a financial incentive for generators to supply electricity when there is demand to meet it. To manage their exposure to the spot market, participants typically seek to enter contracts which convert uncertain future spot prices into more certain wholesale prices.

The **market settings** focus on the future performance of the national electricity market. Their purpose is to:

- Establish the level of reliability consumers can expect from key aspects of the physical system (generators and interconnectors), by setting the reliability standard.
- Maintain the overall integrity of the market, by protecting market participants and consumers from excessively high prices and thereby preventing systemic financial collapse within the energy sector.[47]
- Allow for sufficient investment to provide electricity to the agreed reliability standard.[48]

AEMO assesses whether the power system is projected to meet the reliability and publishes **supplementary information** (such as, Medium Term Projected Assessment of System Adequacy). AEMO publications provide information to the market to supplement price signals. This information helps to guide investors' expectations for the future.

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occur concurrently with generating unit or inter-regional transmission element outages…' clause 3.9.3C(b). The rules establish that: 'A credible contingency event means a contingency event the occurrence of which AEMO considers to be reasonably possible in the surrounding circumstances including the technical envelope. Without limitation, examples of credible contingency events are likely to include: (1) the unexpected automatic or manual disconnection of, or the unplanned reduction in capacity of, one operating generating unit; or (2) the unexpected disconnection of one major item of transmission plant (e.g. transmission line, transformer or reactive plant) other than as a result of a three phase electrical fault anywhere on the power system.' See rules clause 4.2.3 for a definition of credible contingency event.

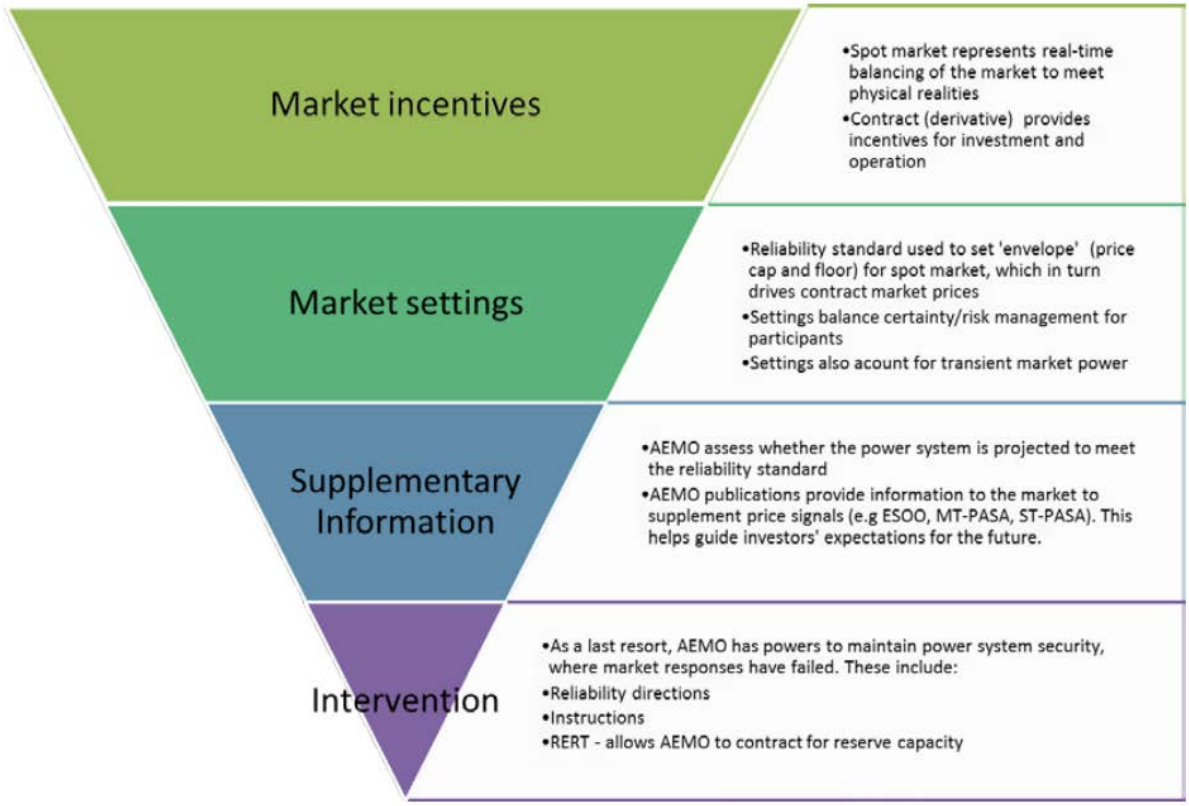
47 Large consumers who buy wholesale are directly protected by the settings. The market settings indirectly protect consumers assuming that retailers will pass through the impact of the price caps in a competitive market.

48 Also, it does not address system security, which is about keeping the power system operating within defined technical limits.

Additional supplementary mechanisms exist that allow for interventions to be made in certain limited circumstances when the market based arrangements have not - or will not – delivered the desired outcome. These intervention powers are described in detail in chapter 3, Box 3.3.

This review centres on the market-based rather than the interventionist components of the framework for delivering reliability in the national electricity market..

Figure 4: Markets and an escalating series of interventions[49]



Related work

Significant work is underway across the national electricity market related to reliability.

Most recently the Federal Government has announced a proposal to introduce a National Energy Guarantee based on the advice of the Energy Security Board (see Box 1.4).

A key initiative being undertaken by the Commission is the *Reliability frameworks review*. This examines the broader market and regulatory frameworks that underpin reliability in the national electricity market.[50] A number of recommendations from the Finkel review are within the scope of the review, such as:

- the recommendation to establish a Generator Reliability Obligation

49 AEMC, *Reliability Frameworks Review*, 2017, p. 10.

50 See AEMC, *Reliability frameworks review, issues paper*, 22 August 2017, Sydney, available at www.aemc.gov.au.

- the need for a strategic reserve to act as a safety net in exceptional circumstances or replacement to the existing reliability and emergency reserve trader mechanism
- the suitability of a 'day-ahead' market
- a mechanism that facilitates efficient demand response in the wholesale energy market.

An issues paper was published for this review that explains the features of the existing reliability framework and considers a range of potential issues associated with the current framework. The Commission intends to provide a progress report to the COAG Energy Council by the end of the year.

The Reliability Panel's *Annual market performance review* assesses the performance of the power system in terms of reliability, security and safety. The Panel has commenced the 2017 review and will publish its final report next year.

As explained earlier, the Panel is monitoring reliability and other policy developments and initiatives in the sector. If new decisions are made before our final report is published we will address them as time permits in our final report.

1.7 Consultation

On 6 June 2017 the Panel published an issues paper for this review. Submissions on the issues paper closed on 12 July 2017. The Panel received seven submissions and these are available on the AEMC website. Issues raised in submissions have been grouped according to the standard or setting to which they refer and, along with the Panel's response, are detailed in the relevant chapter in this report. They are also summarised in the table in Appendix A.

Stakeholder comments are sought on the Panel's draft report and EY's modelling report. The Panel invites comments from interested parties by **22 December 2017**. All submissions will be published on the Commission's website.

We will also hold a public meeting in early 2018 to discuss stakeholder feedback on the draft report, the policy and market outlook, and the implications for the Panel's final report.[51] The key dates are shown in Table 3.

Table 3: Review timetable

Draft determination - close of consultation	22 December 2017
Public meeting	Early 2018
Final determination published	March/April 2018

Electronic submissions must be lodged online through the Commission's website www.aemc.gov.au using the link entitled "lodge a submission" and reference code

51 The rules require that the Panel follow the rules consultation procedures in carrying out this review. The rules consultation procedures are set out in section 8.9 of the rules.

"REL0064". The submission must be on letterhead (if submitted on behalf of an organisation), signed and dated.

If choosing to make submissions by mail, the submission must be on letterhead (if submitted on behalf of an organisation), signed and dated, and posted to:

Reliability Panel

c/- Australian Energy Market Commission

PO Box A2449

SYDNEY SOUTH NSW 1235

1.8 Structure of this draft report

The remainder of this final report consists of analysis and recommendations in relation to the following:

- **Chapter 2** - the reliability standard
- **Chapter 3** - the market price cap
- **Chapter 4** - the cumulative price threshold
- **Chapter 5** - the CPI indexation of the market price cap and cumulative price threshold
- **Chapter 6** - the administered price cap
- **Chapter 7** - the market floor price.

2 The reliability standard

This chapter describes:

- our draft recommendation on the reliability standard
- the purpose of the reliability standard
- the materiality threshold criteria that the Panel must consider in deciding whether the reliability standard should be reassessed in this review
- stakeholders' views
- why we consider the reliability standard should not be reassessed in this review.

2.1 Draft recommendation

The reliability standard is not automatically reassessed every review cycle. This is to provide stability and certainty to the market. The Panel must apply a materiality test to determine if the reliability standard should be reassessed.

Having considered whether AEMO has changed its value of customer reliability measure, changes in the way consumers use electricity, and the benefits of predictability and stability, the Panel considers that there would be no material benefit in reassessing the level of the reliability standard at this time.

In considering this matter, the Panel also assessed the following additional matters as permitted by the guidelines:

- The potential for upcoming changes in the value of customer reliability due to the growth in the uptake of new technologies and heightened public interest in system reliability following recent system security events.
- Potential changes in the costs of necessary new generation since the 2014 review.

While there is clearly potential for some of these matters to impact on the reliability standard, the Panel did not consider there would be a material benefit at this time in reassessing the level of the standard. This is particularly so given there are a number of changes and potential changes to market and regulatory frameworks in development that could be relevant to investment decisions and therefore could impact the effect of any revised reliability standard for the near term.

The Panel notes that the draft decision not to reassess the reliability standard in this review means that from 1 July 2020 the reliability standard would remain unchanged from its current level; a maximum expected unserved energy in a region of 0.002 per cent of the total energy demanded in that region for a given financial year.

2.2 Purpose

As outlined previously, the regulatory framework for reliability in the national electricity market is primarily market based. Investment and operational decisions about electricity generation are made in response to price signals provided by the wholesale electricity market or 'spot market'. These signals in the spot market in turn create signals for participants to enter into contracts, i.e. to *hedge* their exposure to these

spot prices. The market rules also establish mechanisms for the market operator to intervene in the market in extreme circumstances when the market-based arrangements may not, or do not, deliver the desired reliability outcome.[52]

The reliability standard is a crucial market setting:

> The reliability standard is an expression of the reliability sought from the national electricity market's generation and interconnection assets.[53]

The Commission's Reliability frameworks review recently elaborated on the purpose and use of the reliability standard:

> What exactly the reliability standard *is* is not entirely tangible. It is not a test against which the market is formally assessed after the fact. Neither is it a regulatory or performance standard that is 'enforced'.
>
> Rather, it is a criterion which bodies such as the Reliability Panel and AEMO use as an input into their decision making. For example, the Reliability Panel uses the 0.002% figure (along with other inputs) to determine what is an appropriate level for the wholesale [market] price cap. It is also the measure which when translated into reserve margins provides operational guidance for AEMO to engage in medium-term intervention. More broadly, AEMO is responsible under the NER for operationalising the reliability standard across the power system in accordance with standards and guidelines.[54]

In summary, the reliability standard provides a clear, actionable expression of the level of reliability sought from the national electricity market's generation and transmission interconnector assets. It establishes the level at which the reliability settings are set, and is a key criterion in AEMO's operation of the power system including contingency management.

The level of the reliability standard

The issues paper emphasised that setting the level of the reliability standard involves:

> a trade-off, made on behalf of consumers, between the prices paid for electricity and the cost of not having energy when we need it.
>
> The trade-off is between two sets of costs, both of which are ultimately borne by consumers. On the one hand, are the costs of building, maintaining and operating generation and interconnection assets to provide greater reliability—costs which are ultimately reflected in electricity prices – and on the other hand are the costs to consumers and society generally of not having electricity when it is needed.[55]

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52 AEMC, *Reliability Frameworks Review*, Issues paper, 22 August 2017, Sydney (Frameworks paper), pp. i – ii.

53 Reliability Panel, *2018 Review of reliability standard and settings*, Issues paper, June 2017 (Issues paper), p. 10.

54 Frameworks paper, p. 19.

55 This general approach is supported by stakeholders, for example "Origin supports the Panel considering the appropriateness of the reliability standard in a manner that weighs the cost of any

Currently:

> [t]he reliability standard for generation and inter-regional transmission elements in the national electricity market is a maximum expected unserved energy (USE) in a region of 0.002% of the total energy demanded in that region for a given financial year.[56]

In other words, the current standard requires that there be sufficient generation and transmission interconnection in a region such at least 99.998 per cent of expected annual demand for electricity in that region will be supplied.[57]

The Commission recently observed that:

> Having the standard set at this level reflects the fact that the most efficient level of reliability is not 0% unserved energy. Such an approach would be inefficient: the cost of the provision of supply of energy at all times would exceed the value placed on it by consumers, given this value is not a constant and varies over time and with the duration and frequency of interruptions.[58]

This chapter examines whether the Panel should, based on the required considerations and other matters, reassess the reliability standard in this review cycle. Recent public statements regarding the need to tighten the current 0.002 per cent reliability standard (i.e. allow for less unserved energy than is currently the case) are among the issues discussed.

2.3 Criteria – Materiality

The reliability standard and settings guidelines (the guidelines) establish that the reliability standard should not necessarily be reviewed every four years. Rather at each review the Panel should apply a materiality test to determine if the reliability standard should be reassessed. The level of the reliability standard should remain as previously determined unless the Panel considers there may be material benefit in reassessing it.[59]

In making its decision at each review as to whether to reassess the reliability standard, the Panel must consider factors including but not limited to:

- any changes made to AEMO's VCR (value of customer reliability) measure
- any marked changes in the way consumers use electricity, particularly through the use of new technology, that suggests a large number of consumers may place a lower value on a reliable supply of electricity from the national electricity market.[60]

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additional generation and interconnection capacity against the cost of unserved energy". Origin submission, p. 1.

56 Rules, clause 3.9.3C(a)

57 Frameworks paper, p. ii.

58 Frameworks paper, p. 19.

59 Final guidelines, p. 5.

60 Final guidelines, p. 5.

Both these factors relate to the value consumers place on power system reliability. The Panel may consider other matters it deems appropriate including factors associated with the 'other side' of the reliability trade-off; namely, the costs of providing additional generation and interconnection.

The Panel did not take a position on whether the materiality threshold had been met for the reliability standard in the issues paper.

2.4 Stakeholder submissions on the issues paper

The subject of the reliability standard was addressed by all seven organisations that submitted comments on the issues paper: the Australian Energy Council, Origin, ERM Power, Public Interest Advocacy Centre (PIAC), EnergyAustralia, Engie, and Snowy Hydro.

Five of the submissions supported keeping the reliability standard at its current level.[61] Two submissions, from Origin and the Australian Energy Council, did not comment on the current level of the reliability standard but focused on the value of customer reliability materiality criterion. ERM Power supported retaining the reliability standard at its current level and also discussed the second materiality criterion relating to changes in the way consumers used electricity. These views are discussed further below.

Origin

In relation to changes to AEMO's VCR, Origin considered that:

> We agree that for a change to the reliability standard to be considered, there would need to be significant variance between the Panel's VCR and that calculated by AEMO under its 2014 study. We hold this view while noting the inherent limitations of any VCR analysis and the extent to which it can be used to inform the appropriate level of the reliability standard.[62]

Australian Energy Council

Also on the topic of changes to AEMO's VCR, the Australian Energy Council stated that:

> Aside from the self-evident age of [AEMO's 2014 VCR review] report, concerns have been raised about the small sample size, exclusion of high-profile customers and inadequacy in capturing low probability but high impact supply interruptions.[63] The Energy Council concurs with those views and… believes it's important to review the value customers place on reliability in light of anticipated technological and market changes, as well as recent reliability issues.[64]

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61 These were from: EnergyAustralia, Engie, PIAC, ERM Power and Snowy Hydro

62 Origin submission, p. 1.

63 Independent Pricing and Regulatory Tribunal of New South Wales, *Electricity transmission reliability standards – An economic assessment*, August 2016, p. 35

64 Australian Energy Council submission, p. 1.

ERM Power

In relation to the materiality threshold criterion regarding changes to consumers' use of electricity (suggesting a decrease in the value consumers place on reliable supply from the grid), ERM Power considered that:

> While some trends are emerging with regard to the way in which consumers use electricity through the introduction of new technology, these trends are only just starting to emerge.[65]

ERM Power does not believe the reliability standard should be changed:

> Currently ERM Power does not believe any change to the reliability standard is warranted.[66]

EnergyAustralia

EnergyAustralia does not consider the threshold for reassessment for the reliability standard has been met:

> We do not consider it likely that the threshold for reassessment has been met at this time, as there have not been significant reliability issues in the market up to this point. We see that the current standard still provides an appropriate balance between providing a reasonable level of reliability without significantly increasing costs to consumers in providing a higher target.[67]

On the topic of providing a stable regulatory framework, EnergyAustralia stated:

> It is likely that stability in regards to this key measure is more beneficial to consumers until such time as the distortionary effects of policy instability are reduced.[68]

EnergyAustralia considers the cost trade-off established by the reliability standard will remain appropriate for the review period, and stability will benefit consumers.

PIAC

PIAC supports keeping the reliability standard at its current level:

> PIAC supports the current reliability standard, and does not see merit in moving away from the value of 0.002% USE at this time. PIAC is of the view that 0.002% USE represents a level of reliability that, given the cost trade-offs of higher reliability and the impact of lower reliability, is consistent with the Panels 2nd general principle:
>
> "Delivering a level of reliability consistent with the value placed on that reliability by customers".[69]

65 ERM Power submission, p. 5.

66 ERM Power submission, p. 5.

67 EnergyAustralia submission, p. 1.

68 EnergyAustralia submission, p. 2.

69 PIAC submission, p. 2.

PIAC also provided commentary on the relationship of storage technologies and consumer reliability (see section 2.6.2).

Engie

Engie supports keeping the reliability standard at its current level:

> From an economic perspective, the 0.002% unserved energy standard is a pragmatic benchmark that is consistent with the value of customer reliability. According to previous studies by AEMO and the AEMC, it is comparable to electrical systems and markets internationally and should be retained in the NEM.[70]

Snowy Hydro

Snowy Hydro also supports keeping the reliability standard at its current level:

> if a combination of these [short term] withdrawn generators return to full service, USE is projected to reduce below the reliability standard in both South Australia and Victoria. We therefore believe that the USE figure should not change.[71]

2.5 Modelled forecasts – unserved energy

This section describes:

- why levels of unserved energy have been modelled for this review
  - the rationale for the base scenario
  - the modelling outcomes regarding unserved energy.

2.5.1 Why levels of unserved energy have been modelled for this review

The Panel commissioned EY to forecast the likely expected unserved energy to 2024 based on the current reliability standard and settings. This was to answer the question (within the limitations of the model): *what is the expected outlook for unserved energy, relative to the reliability standard, from 1 July 2020 – 1 July 2024?*

The Panel has modelled expected unserved energy for the following reasons:

1. **To meet the requirements in the rules:** under the rules the Panel 'must have regard to the potential impact of any proposed change to a reliability setting on … (iii) the reliability of the power system'.[72] To discharge this requirement the Panel needs to understand what level of reliability the current reliability settings are likely to deliver.
2. **To devise scenarios to determine the required market price cap:** the forecast unserved energy under the current reliability settings influences the modelling approach used for the market price cap. If the EY modelling forecasts unserved energy in excess of the reliability standard for the review period, then the

70 Engie submission, p. 2

71 Snowy Hydro submission, p. 2. Snowy Hydro is referring to the reductions in unserved energy projected by the *Update: Electricity Statement of Opportunities* published by AEMO in November 2016.

72 Rules, clause 3.9.3A (e)(3):

assumption underlying this 'base scenario' would have formed the basis for modelling analysis of the required market price cap. If unserved energy is not expected to exceed the reliability standard under the base scenario, then alternative plausible scenarios – where the reliability standard is exceeded – are developed to test outcomes related to the reliability settings (primarily the market price cap). Forecasts of unserved energy are essential to the development of realistic scenarios for the purposes of assessing the appropriate level of the market price cap and cumulative price threshold.[73] As such, these forecasts of unserved energy themselves form key inputs to achieving the final objective of the modelling, which is to determine the appropriate level of the various market settings so as to meet the standard.

2.5.2 Rationale for the base scenario

The initial tasks EY undertook for this review were to forecast the expected amount of unserved energy over the review period under the current reliability settings, and assess whether the current reliability standard of 0.002 per cent USE will be met over the review period given the current reliability settings. Establishing a base scenario is critical to these tasks.

In this review, the purpose of the base scenario is to reflect the most likely outcomes for the national electricity market from 1 July 2020 – 1 July 2024.

EY has sought to deliver a base scenario that reflects the most likely outcomes for the national electricity market by:

- Developing a set of underlying assumptions that reflect the most likely levels, or values, for key drivers of outcomes in the national electricity market (e.g. demand, gas prices, coal prices, new entrant costs). Principal assumptions are outlined in Appendix B.
- Utilising a modelling approach that reflects (as far as possible) the operation of the wholesale market and how commercial decisions are made. For instance, one critical aspect of the approach is that the model determines whether any new generation would enter the market (or whether existing plant would retire) based on commercial drivers for net revenue outcomes. In other words, the modelling approach generally assumes that investment decisions are endogenous to the model, rather than an input assumption.

Formulating a base scenario that reflects the most likely outcomes in the national electricity market in the context of the current scale and pace of change, and uncertainty, is necessarily challenging.

The base scenario assumptions proposed were based on the following principles:

- Adopt only those market policy settings that have a high certainty of being

73 A clear understanding of expected levels of unserved energy enables EY to determine the level of retirement needed under different scenarios to achieve unserved energy in excess of the standard, such that a new entrant generator (or the deferral of a generator retiring) is required. With regards to this new entrant generator, the market price cap should not prevent the market sending efficient price signals, to support the efficient operation of and investment in electricity services over the long run.

implemented.

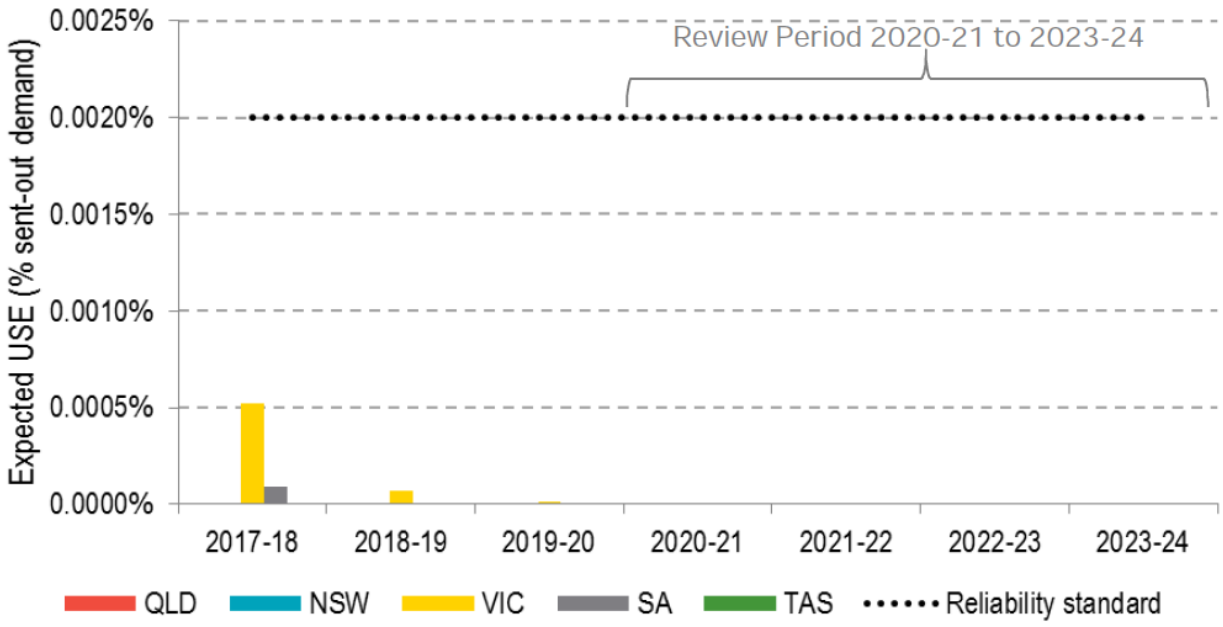
- Use recognised, publicly available data sources as far as possible, and where appropriate.
- Adopt neutral forecasts in relation to demand and energy consumption in the base scenario and use strong forecasts as sensitivity analyses on the base scenario and/or in separate scenarios.

EY has modelled sensitivities to the base scenario to explore outcomes under different possible transition pathways. (See EY report for further detail).

2.5.3 Overview of unserved energy findings

The base scenario modelling conducted by EY (and associated sensitivity analysis) has forecast a level of unserved energy that is well below the expected level of unserved energy defined by the reliability standard.[74] Figure 5 presents the unserved energy modelling outcomes for the base scenario.

Figure 5: Expected unserved energy base scenario[75]

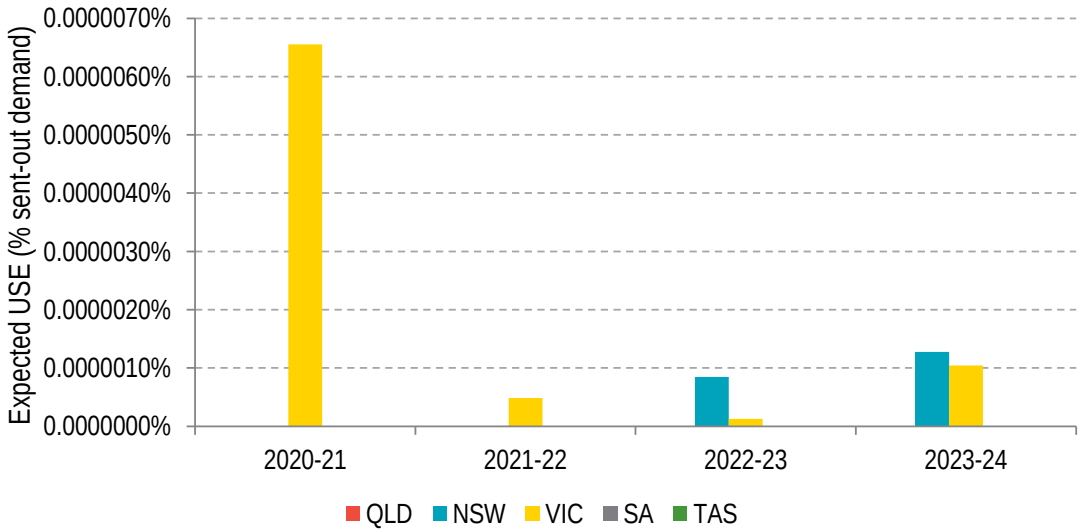


The vertical scale of the above chart obscures the presence of unserved energy over the review period (2020/21 to 2023/24). Expanding the scale and looking at just the review period shows that the highest level of unserved energy under the base scenario is forecast for Victoria in 2020/21 (at around one three hundredth of the standard), decreasing to even lower levels in subsequent years (Figure 6).

74 Forecasting of electricity supply and demand is a complex process the outcomes of which depend on the overall purpose, modelling approach, input data, assumptions, and scenarios and sensitivities tested. The Panel notes that there are other market models that forecast different levels of expected unserved energy.

75 EY Report, p. 28.

Figure 6: Expected unserved energy outcomes for the base scenario (magnified scale)[76]



*Note that y-axis scale shows up to approximately 1/300th of the reliability standard of 0.002 per cent.

To further test the sensitivity of this finding to circumstances such as high demand or higher forced outage rates, EY has run the base scenario varying several key parameters:

- Demand – using AEMO's most recent strong demand forecast rather than neutral demand.
- Generator outage rates – using EY's own higher generator forced outage rates (significantly higher than the base assumptions for many generators).

Over the review period the level of unserved energy forecast by the base scenario model under these sensitivities remains well below the reliability standard. The highest forecast level of unserved energy under this sensitivity analysis is in New South Wales, where the impact of high demand and EY's forced outage rates is to increase 2023-24 forecast unserved energy to approximately 0.0003 per cent, compared with the reliability standard of 0.002 per cent, or around one seventh of the standard (Figure 7).[77]

The modelling suggests that occurrences of unserved energy will be limited to summer months, predominantly in the late afternoon between 3.30pm and 7.30pm.[78]

The Panel notes that the above unserved energy findings are forecasts underpinned by modelling assumptions that aim to reflect the likely outlook for the national electricity market over the review period. As such, actual unserved energy

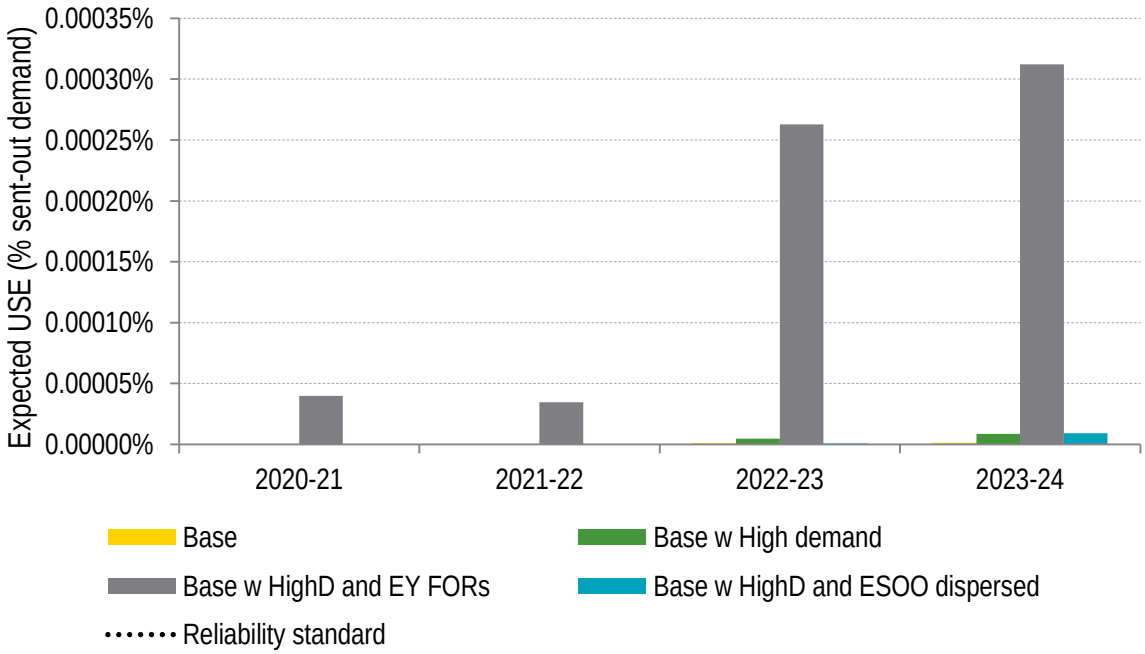
76 EY Report, p. 28.

77 Under this base scenario sensitivity, approximately 0.00025 per cent unserved energy is also recorded in New South Wales in 2022-23.

78 Entirely in January in Victoria in 2020-2021 and predominantly in February in New South Wales in 2023-2024.

outcomes will differ from forecasts. In addition, as described in detail in Box 3.3, AEMO has intervention powers under the rules to address potential shortfalls of reserves which in and of itself will tend to limit actual occurrences of unserved energy.

Figure 7: Expected USE outcomes in NSW for the base scenario sensitivities*[79]



*Note that y-axis scale shows up to approximately 15 per cent of the reliability standard of 0.002 per cent.

2.6 Analysis – Materiality

2.6.1 Changes to AEMO's VCR measure

The relevance of AEMO's VCR measure

Under the guidelines, the Panel is to consider whether there have been any changes to AEMO's VCR measure in determining whether a reassessment of the reliability standard is likely to yield material benefit. As discussed in the issues paper:

> To set the reliability standard at an appropriate level, detailed and accurate information about the cost functions of businesses, and the value of reliability for customers, are needed.[80]

In September 2014 AEMO released its *Value of customer reliability review, final report*. The AEMO VCR study provided national level values of customer reliability for the first time.[81] It estimated the value that all customers place on the reliability of supply from the grid based on a survey of different customer types across all national electricity

79 EY Report, p. 31. 'ESOO dispersed' refers to a scenario conducted as part of the modeling for AEMO"s 2017 *Electricity Statement of Opportunities* publication. Refer to Appendix C for further detail.

80 Issues paper, p. 46.

81 Guidelines, final determination, p. 23.

market states. The report estimated valuations of the cost of outages by customer type and outage length. These values were aggregated to calculate a NEM-wide value of customer reliability of $33,460/MWh.

As the AEMO VCR study was released several months after the Panel completed the *2014 Reliability standards and settings review* (16 July 2014) its results were not considered in the last review. However, the Panel did consider the implications of AEMO VCR study for the level of the reliability standard in 2016 when developing the guidelines.

The Panel stated that AEMO's VCR is "used across the industry as a common proxy for the true value of reliability".[82] The Panel concluded the existing level of the standard (0.002 per cent unserved energy) remained broadly consistent with AEMO's VCR figure.[83] In developing the guidelines, the Panel had regard to ROAM's 2014 finding that the level of the current standard was equivalent to a value of customer reliability of approximately $30,000/MWh, which corresponded to AEMO's estimated NEM-wide aggregate of $33,460/MWh.[84]

Issues paper

The issues paper noted that AEMO had not reassessed its value of customer reliability measure since its 2014 study. On this basis the Panel did not consider that this materiality threshold trigger has been met.

The issues paper proposed that the Panel would:[85]

- Seek to adjust AEMO's VCR for historic and forecast changes to the consumer price index to the 2020 – 2024 period to reflect that the value of customer reliability is a measure of real, and not nominal, value.
- Assess the value of customer reliability associated with the level of the current reliability standard, existing reliability settings and potential market conditions from 2020 – 2024, as a component of the modelling for the 2018 review.
- As a calibration exercise, compare the value of customer reliability obtained from the modelling for the 2018 review with AEMO's VCR figure.

In the issues paper, the Panel took the view that there would need to be significant variance between AEMO's VCR findings and those calculated from the modelling in order to conclude there would be a material benefit in re-opening assessment of the reliability standard.

Stakeholder views on the issues paper

Two submissions to the issues paper, from Origin and the Australian Energy Council, discussed AEMO's VCR measure.

Origin's supported the Panel's conservative approach to considering AEMO's VCR estimate, noting:

82 Guidelines, final determination, p. 23.

83 Guidelines, final determination, p. 24.

84 See: ROAM Consulting, *Reliability standard and settings review, report to the AEMC*, May 2014, p. 64, and AEMO, *Value of customer reliability review*, September 2014, p. 2.

85 Issues paper, p. 47.

> We agree that for a change to the reliability standard to be considered, there would need to be significant variance between the Panel's VCR and that calculated by AEMO under its 2014 study. We hold this view while noting the inherent limitations of any VCR analysis and the extent to which it can be used to inform the appropriate level of the reliability standard.[86]

The Australian Energy Council echoed concerns voiced by the Independent Pricing and Regulatory Tribunal (IPART) over the limitations of AEMO's VCR calculation:

> Aside from the self-evident age of [AEMO's 2014 VCR review] report, concerns have been raised about the small sample size, exclusion of high-profile customers and inadequacy in capturing low probability but high impact supply interruptions.[87]

The Australian Energy Council also suggested a review of value of customer reliability is required in light of anticipated technological and market changes, in addition to recent reliability issues.

Analysis

To date, AEMO has not revised its 2014 VCR figure so this criterion for determining whether there may be a material benefit in reassessing the reliability standard has *not* been met. The publication of a new AEMO VCR study in 2019 could be a trigger for the Panel to consider a future reassessment of the reliability standard at or prior to the next four yearly review, if the study reveals material changes in the value of customer reliability.

The Australian Energy Council commented "it's important to review the value customers place on reliability in light of anticipated technological and market changes, as well as recent reliability issues".[88] AEMO has confirmed that the next VCR study will be completed in 2019 (as part of a five-yearly review cycle).[89]

If in the 2019 VCR study AEMO calculates a value of customer reliability figure that is significantly higher than the current value of customer reliability estimate, it may serve as trigger for the Panel to reassess the reliability standard. The Panel notes Origin's view that there would need to be significant variance between the Panel's value of customer reliability and AEMO's 2014 calculation to warrant changing the reliability standard.

The Australian Energy Council urged caution in drawing conclusions from AEMO's VCR figure highlighting a number of limitations, including "small sample size, exclusion of high profile customers and inadequacy in capturing low probability but

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86 Origin submission, p. 1.

87 Independent Pricing and Regulatory Tribunal of New South Wales, E*lectricity transmission reliability standards – An economic assessment,* August 2016, p. 35

88 Australian Energy Council submission, p. 1.

89 In its value of customer reliability application guide, AEMO stated that a five year update strikes a balance between the costs involved in undertaking the survey and the consumer insights obtained from updating the values more frequently. AEMO, *Value of customer reliability application guide, final report*, December 2014, p. 24.The intention to undertake a five-yearly review of the value of customer reliability has been confirmed by AEMO staff.

high impact supply interruptions".[90] Some of these limitations may be addressed in AEMO's 2019 VCR study.

In the issues paper, the Panel acknowledged that "other measures of reliability exist and that AEMO's VCR measure only represents an estimation of the true value that customers place on reliability".[91] However, stakeholders did not present any other measures of the value of customer reliability that may be more appropriate for the Panel to consider.

In the issues paper the Panel stated it would compare AEMO's 2014 VCR figure (indexed for increases in CPI) against modelling outputs for the 2018 review as a calibration exercise. Following further discussions with EY since the publication of the issues paper, the Panel has determined that the most feasible and useful output would be to examine the profile of unserved energy and investigate the costs of providing additional levels of reliability (see section 2.6.3). It should be noted that the value of customer reliability analysis presented by ROAM in 2014 was a supply cost curve not demand-side value of customer reliability, and was an output of the in depth modelling undertaken for the complete review of the reliability standard.[92]

2.6.2 Changes in consumer electricity use suggesting a lowering of the value of customer reliability

The relevance of changes in consumer use of electricity

In deciding whether there may be a material benefit in reassessing the reliability standard, the Panel must also consider whether there have been:

> any **marked changes** to the way consumers use electricity, particularly through the use of new technology, that suggest a **large number** of consumers may place a **lower value** on a reliable supply of electricity from the NEM [for the period 2020-2024].[93]

This requires evidence that would support a **relaxing** of the reliability standard, which would allow for **more** unserved energy in the future. The Panel acknowledges that current public discourse centres on **tightening** the reliability standard (i.e. less unserved energy), and addresses this under 'other matters'.

Issues paper

Regarding the criterion relating to consumers' use of electricity, in the issues paper the Panel had not formed a view regarding the impact of expected changes to consumer use of electricity on the value of customer reliability for the period 2020-2024.

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90 Australian Energy Council submission, p. 1.

91 Issues paper, p. 46.

92 In 2014 ROAM undertook modelling to estimate the minimum total cost of meeting a range of different unserved energy levels (from 0.0004 per cent to 0.0055 per cent for all regions of the NEM) based on new entrant OCGT capacity as the marginal generating unit. The cost being minimised is the total cost of generation, plus the cost (capex) of the new-entrant OCGT capacity plus the cost of unserved energy, valued at the VCR.

93 Issues paper, p. 45. Emphasis added.

The issues paper discussed five trends that could affect the value of customer reliability of particular consumers:

- household appliance use
- non-manufacturing business use
- manufacturing business use
- rooftop solar PV
- new storage technologies.

A summary of the issues paper analysis is presented in Box 2.1, based on the *2016 National Electricity Forecasting Report* for the national electricity market.[94]

Box 2.1 Issues paper overview - key points on changes in consumer electricity use

- **Household appliance use:** residential consumption is not predicted to increase over the review period, despite increased appliance use, in part due to an increase in the energy efficiency of appliances.
- **Non-manufacturing business use:** (non-price) drivers of electricity consumption by non-manufacturing business use include: population; household disposable income; and heating and cooling needs. While long term forecasts exist for these factors, they may not accurately represent the change in the value of reliability for non-manufacturing business use.
- **Manufacturing business use:** long term drivers of manufacturing electricity use include producer input prices, and state output. While long term forecasts exist for these factors, they may not accurately represent the change in the value of reliability for manufacturing business use.
- **Rooftop solar PV:** Rooftop solar PV penetration is expected to increase over the review period. Rooftop solar PV is expected to decrease observed grid level residential consumption of electricity and non-manufacturing business consumption. However, many existing household PV installations cannot operate unless they are connected to the energised grid. For these consumers, rooftop solar PV would not reduce the value of the reliability of grid sourced energy.
- **New storage technologies:** New technologies, in particular, distributed energy storage, may insulate households and small businesses from the impact of interruptions in supply, and thus reduce the value of reliability for some consumers.

94 Issues paper, p. 48.

Stakeholder views on the issues paper

ERM Power commented at length on the changes in the way consumers use electricity:

> While some trends are emerging with regard to the way in which consumers use electricity through the introduction of new technology, these trends are only just starting to emerge. While there are forecasts regarding future adoption, we believe the Panel needs to consider that these forecasts will be subject to revision and may be impacted by other new technologies, changes in the costs of existing technologies or overall prevailing economic conditions.
>
> We believe the Panel should reconsider the impact of integrated solar PV and battery systems on the level of supply reliability required by consumers from the grid as these integrated systems allow consumers to accept a lower level of grid based supply reliability.[95]

ERM Power considers the Panel should recognise two factors when deciding whether a reassessment of the reliability standard is likely to yield material benefit:

1. there is significant uncertainty regarding forecasts of new technology adoption
2. some customers install "batteries to allow a continuation of reliable supply following loss of grid supply and integrated battery and solar PV installations are permitted to be installed to achieve this outcome."[96]

The role of batteries was also discussed by PIAC:

> PIAC agrees with the Panel's assessment that many batteries aren't currently able to operate in islanded mode, but notes that:
>
> - as battery products become prevalent and innovative, more are likely to be able to operate in islanded mode; and,
> - in any case, as more batteries are deployed, a great portion of the load on the grid will be interruptible battery charging loads, that have a much lower VCR than average.
>
> At this time, however, the battery and energy services market may not be mature enough for the future wholesale market implications to be fully understood. Considering this, and noting PIAC's preference for an interim review in 2020, PIAC recommends that the Panel asks the AEMC to undertake a review examining the role of battery energy storage in the reliability and security of the energy market in time for an interim review.[97]

The subsequent sections address the issues raised by ERM Power and PIAC.

Analysis

The Panel considers that this materiality criterion **has not been met.** This section examines two related technology trends and their associated issues, namely:

- rooftop solar PV

95 ERM Power submission, p. 5.

96 ERM Power submission, p. 5.

97 PIAC Submission, p. 5.

- storage technologies

Rooftop solar-PV

Intuitively, if a significant number of households and/or businesses had installed rooftop solar PV, then these customers may place a lower value on grid-sourced energy than they did previously, warranting a review of the reliability standard.

The recent and forecast continued significant growth in rooftop solar PV is well documented. The Panel's issues paper highlighted increased penetration of solar PV (and storage) as key emerging market trends.[98] The Commission in its *Distribution market model, final report* more recently detailed that it expects there to be "large future demand for distributed energy technologies, such as solar PV, energy storage and electric vehicles".[99]

This expected uptake is driven by a range of factors, including:

- the falling costs of these technologies[100]
- increasing functionality of these technologies[101]
- more sophisticated information and control technologies, and fast, cheap computing platforms[102]
- changing consumer attitudes to electricity supply and prices.[103]

Forecasts suggest a significant increase in the number, capacity (Figure 8), and proportional share of total generation by rooftop solar PV. EY's base scenario modelling indicates that rooftop PV would increase as a share of total generation capacity in the national electricity market from 10 per cent to 18 per cent between 2017/18 and 2023/2024.

98 Issues paper, p. 48.

99 AEMC 2017, *Distribution Market Model final report*, 22 August 2017, Sydney, p. 10.

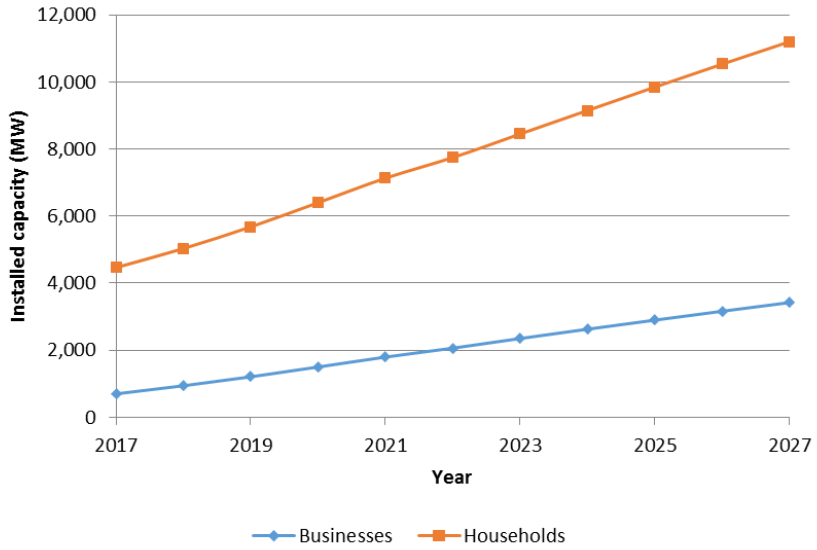
100 For example, Bloomberg New Energy Finance predicts that battery packs are likely to experience cost declines at a rate of 19 per cent for every doubling of production due to productivity and efficiency improvements. Further, that the costs of inverters have halved from 2016 to 2017 due to the entrance of a number of competitive inverter manufacturers that have traditionally made inverters for solar plants. Source: Bloomberg New Energy Finance, *Economic for some: Grid-scale batteries in Australia*, 3 April 2017.

101 For example, the Tesla Powerwall 2 has double the storage capacity compared to the Tesla Powerwall 1 with no change in price thereby halving the KWh cost, with these two models being released less than two years apart. See: http://www.cleanenergyreviews.info/blog/tesla-powerwall-2-solar-battery-review

102 SAPN notes that remote monitoring and control technology is evolving rapidly, and quickly expanding the range of cost effective solutions available. Installation of more intelligent devices such as distribution transformer monitors, SCADA enabled remote-controlled switching devices and advanced meters will help them to manage risk and network performance. See: *SAPN, Distribution Annual Planning Report*, p. 23.

103 The Commission's 2017 Retail energy competition review found that energy consumers have more choices to manage their energy use and are looking to take up new technology options. For example: 20 per cent of consumers now have solar panels; 21 per cent are likely to adopt battery storage in the next two years; and 18 per cent are likely to take up a home energy management system in the next two years.

Figure 8: Installed capacity of PV systems 2017-2027, households and businesses, NEM-wide (AEMO data, strong technology uptake forecast[104])



However, notwithstanding this significant change in the way increasing numbers of consumers source at least a proportion of their electricity, many PV installations cannot operate unless they are connected to the energised grid. At a minimum, installing rooftop PV allows consumers to reduce their withdrawals from the grid at certain times, thereby changing the profile of their grid consumption and reducing their electricity bills. However, it does not necessarily allow a customer to sever their connection to the grid. Furthermore, rooftop PV systems without battery support have highly variable output, which from a reliability perspective means they are not a substitute for an energised grid connection. Hence for most consumers rooftop solar PV may not necessarily reduce the value of the reliability of grid sourced energy, as the reliability of the grid is the main factor that determines whether their PV systems will operate.

It follows that, at this stage, there is no clear evidence that consumers will place a lower value on a reliable supply of electricity from the national electricity market over the review period as a result of the installation of rooftop solar PV. It is expected that AEMO's 2019 VCR study will examine this issue.

Storage technologies

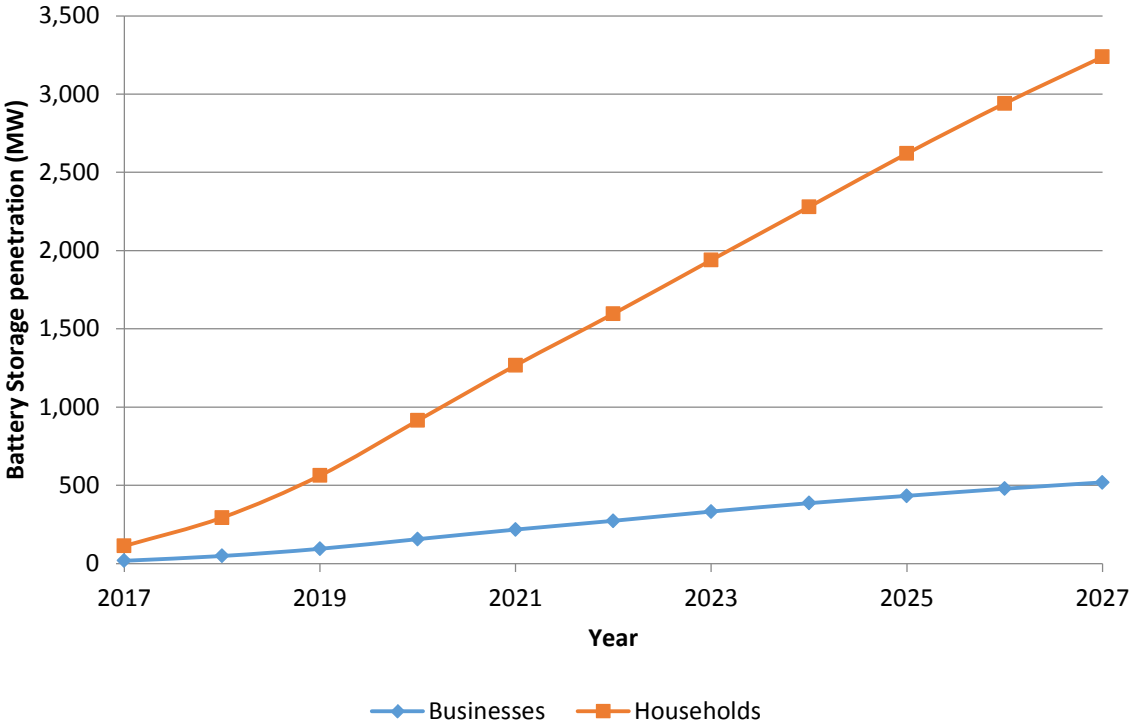
Installing storage (with rooftop PV) could insulate households and small businesses from the impacts of interruptions in grid supply, and thus reduce the value these consumers place on grid reliability.

Households and businesses are expected to install a significant amount of storage capacity during the review period. Figure 9 shows that forecast growth rates for new storage technologies for households and businesses are high. The chart is based on AEMO's strong battery growth projections from the *2017 Electricity Statement of Opportunities* to provide insights on maximum projected uptake of

104 Corresponds to confident consumers in a strong economy.

storage technologies over the period. Battery storage installations are forecast to reach 5.6 GW by 2036–37, up from a capacity close to zero today.

Figure 9: Forecast uptake of storage technologies by households and businesses, NEM-wide, 2017-2027. (AEMO data, strong technology uptake forecast)



AEMO expects a proportion of new storage to be aggregated and used for price hedging by retailers and provision of ancillary services, further increasing the value streams from innovation and accelerating the rate of uptake.

Uncertainty in growth rates of rooftop solar PV and storage

ERM Power commented that these trends are still emerging and that forecasts are often revised.[105] The impact of changes in technology uptake trends was also highlighted by PIAC; "the battery and energy services market may not be mature enough for the wholesale market implications to be fully understood".[106] The Panel recognises that currently few consumers have installed battery systems.

Battery configuration – ability to operate independently from the grid

PIAC agree that while significant growth in integrated storage systems is expected, as discussed in relation to rooftop PV "many batteries aren't currently able to operate in islanded mode".[107] That is, they cannot operate unless connected to an

105 ERM submission, p. 5.

106 PIAC submission, p. 5.

107 A prerequisite for integrated solar and battery systems to operate while disconnected from the energised grid (i.e. islanded) is the presence of isolation equipment. Not all integrated systems have such equipment and therefore cannot operate while islanded.

energised grid.[108] Hence, it may be that only a small number of individuals are likely to place less value on reliable grid supply as a result of the use of storage technologies especially over the review period.

Future improvements to storage technology may mean these systems can be cost-effectively configured to operate independently from the grid, potentially altering the value some customers place on reliable grid supply.

Noting comments from both PIAC and ERM Power, we consider that the expected uptake of battery systems that can operate independently of an energised grid is unlikely to be sufficiently high such that a large number of consumers place a lower value on reliable supply from the grid during this review period.[109]

We also note that some batteries are primarily used to shift the time of use of electricity. Where this is the case, these systems may have little or no effect on customer reliability outcomes.

Summary

The Panel considers this criterion has not been met as a sufficiently large number of consumers are not forecast to adopt rooftop solar PV and battery technology and materially change their usage patterns over the 2020 – 2024 period, in a way that would suggest they have become clearly less reliant on the grid and thus place a lower value on grid-supplied electricity.

Given the need for detailed analysis of the potential impact of these trends on the value for customer reliability, it would be prudent to await greater certainty regarding trends and a detailed study such as AEMO's 2019 revised VCR, or an "interim study" in 2020 as suggested by PIAC, to facilitate actionable analysis of impacts of rooftop solar PV and storage on the level of the reliability standard.[110]

2.6.3 Other matters

This section discusses the following additional considerations:

- stability and predictability in the wholesale market environment
- current public sentiment regarding reliability and the potential costs of tightening the reliability standard
- changes in generation costs since the 2014 review.

Stability and predictability

In the issues paper, the Panel noted that maintaining consistency in the level of the reliability standard would provide a degree of certainty and predictability for market participants when planning future operations.

108 PIAC submission, p. 5.

109 PIAC noted "as battery products become more prevalent and innovative, more are likely to operate in islanded mode". ERM Power stated "one of the primary considerations for customers installing batteries is to allow a continuation of reliable supply following loss of grid supply and integrated battery and solar PV installations are permitted to be installed to achieve this outcome".

110 PIAC submission, p. 5.

EnergyAustralia agreed with the Panel on the benefits to consumers of certainty and stability with regards to the reliability standard:

> it is likely that stability in regards to this key measure is more beneficial to consumers until such time as the distortionary effects of policy instability are reduced.[111]

The market price cap, the administered price cap and cumulative price threshold would need to be reviewed in light of a new reliability standard, as well as market developments and forecasts that are considered in any case. Any changes to those settings, as well as to the reliability standard, would create additional uncertainty and unpredictability for consumers and market participants.

Stakeholder feedback on this matter supports the Panel's view that, given the substantial policy uncertainty affecting the national electricity market at present, there is a significant merit in not reassessing the reliability standard to provide a measure of regulatory certainty and stability.

Current public sentiment regarding reliability and costs of changing the standard

Issues such as: the South Australian black out in September 2016; mandatory load shedding (and the threat of it) in February this year; public concerns about the adverse effect of renewable generation on reliability; and the recent published forecasts of 'supply shortfalls' in AEMO's Electricity Statement of Opportunities and Ministerial advice, have led to calls from some quarters for a tightening of the reliability standard.

That is, there appears to be some public and/or political interest in reducing the amount of unserved energy expressed in the reliability standard to less than 0.002 per cent of expected demand in a region in a year, for instance to 0.001 per cent or even to 0 per cent. At the same time the contrary view is held in some quarters; given rising electricity bills and affordability concerns, the reliability standard should be loosened to allow for more expected unserved energy to reduce costs to consumers.[112]

As discussed in section 2.5.3, notwithstanding that the reliability standard is currently 0.002 per cent, EY modelling forecasts the system will provide a level of reliability significantly better than the 0.002 per cent reliability standard in all national electricity market regions, for the review period.

Modelling indications of unserved energy MW peak

The Panel committed in the issues paper to examining the value of customer reliability under the current reliability standard and settings in light of forecast developments in the national electricity market. In its submission to the issues paper, EnergyAustralia suggested improving transparency around the costs associated with higher levels of reliability:

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111 EnergyAustralia submission, p. 2.

112 This is further discussed in section 3.5.3, *the market price cap and consumer prices.*

> We also consider that highlighting the potential costs to consumer of embedding a higher reliability standard would be useful in guiding governments and regulators when they seek to intervene to provide a higher level of reliability than set under the standard.[113]

Given apparent interest in tightening the reliability standard, the Panel has provided some indicative costs, associated with the reduction of unserved energy to zero in the modelling.

While it is impossible to reduce expected unserved energy to zero in all possible modelled futures, under base scenario conditions in Victoria (where there is virtually no estimated unserved energy at 0.000003 per cent in 2020/21), EY indicated that an estimated additional 1,000MW of capacity would be required to be in place in Victoria in 2020/21 to avoid any unserved energy under the modelling assumptions (including the impact of forced outages).

If the annual cost (excluding variable operating and maintenance costs) of new generation is in the order of $200,000 / MW (given a WACC of 10 per cent pre-tax real and a capital cost of around $1.5 million per MW, as included in the modelling run by EY), then the minimum additional annual wholesale energy cost expected to be recovered from customers would be in the order of $200 million ($200,000 / MW * 1,000 MW). This is in the context of a Victorian market with current annual demand of around 45 TWh and wholesale energy value of around $3 billion. That is, the additional cost of moving to (close to) zero expected unserved energy under the base scenario would increase wholesale energy costs by nearly 7 per cent in that region, as measured against current market outcomes in Victoria.

EY also modelled an alternative scenario where unserved energy exceeds the reliability standard (0.002 per cent unserved energy) in Victoria through early coal fired generation retirement (alternative scenario 2). Under this scenario, EY indicated there is a peak unserved capacity of approximately 3,000 MW, or three times the amount under the base scenario. This implies a threefold increase in costs to achieve an expected outcome of zero unserved energy compared to the base scenario. That is around $600 million per annum, or a 20 per cent increase in wholesale energy costs, compared to current Victorian wholesale energy costs.

These indicative results for Victoria are summarised in the following table.

	Base scenario	Alt Scenario 2
Peak unserved energy (MW)	≈1,000	≈3,000
Annual cost ($m)	$200	$600
Percentage of current wholesale energy cost (%)	7 per cent	20 per cent

113 EnergyAustralia submission, p. 2

Appendix D provides further detail on the relationship between the implied market price cap and unserved energy.

Changes in cost of marginal generation

The issues paper stated that the Panel would consider the materiality of changes in the cost of producing an additional unit of energy to meet otherwise unmet demand, because it is the costs of this marginal generation that are the counter point to the value of customer reliability in the reliability "trade-off". Elaborating on this trade-off and assuming the value customers' placed on reliable supply remained constant, if the costs of the marginal generator increased significantly over time this could suggest a loosening of the reliability standard.

In the issues paper the Panel noted that the "costs of new entrant technologies" were of interest.[114] However, the outcomes of EY's modelling results for the review indicate that under all scenarios (including the high demand and high costs scenario) the marginal generation technology is either an OCGT or CCGT unit. EY's modelling shows that the marginal generator remains a gas turbine generator with no substantial changes in cost compared to historical levels. For further detail refer to chapter 6 of the EY report.

2.7 Conclusion

Following analysis and consideration of stakeholder submissions to the issues paper, the Panel does not find there is sufficient evidence to suggest a material benefit in reassessing the reliability standard at this point in time.

An assessment of the two factors the Panel *must* consider suggests that reassessing the reliability standard is unlikely to yield material benefit:

- AEMO has not revised its 2014 VCR measure.
- Conclusions cannot yet be drawn regarding any *fall in the value consumers place on grid-supplied electricity* for the review period from forecasts of battery storage and rooftop solar PV uptake.

Other reasons for not reassessing the standard at this stage include that:

- All five of the stakeholders that commented on the appropriateness of the existing reliability standard supported maintaining its current level. (The remaining two stakeholders commented solely on the value of customer reliability materiality criteria).
- Stability in market frameworks is extremely important in the current environment.
- AEMO has said it will publish a new VCR study in 2019. This will provide critical input to a potential reassessment of the reliability standard in the near future.
- Any tightening of the standard would increase the prices consumers pay for electricity as the additional generation investment would need to recoup revenue sufficient to cover its costs. Given this, the Panel does not consider it

114 Issues paper, p. 49.

beneficial to review the standard until it has sufficient, up to date information about the value consumers place on reliability.

On balance we consider that there is unlikely to be material benefit in a reassessment of the level of the reliability standard in this review.

The Panel notes the reliability standard will remain unchanged at 0.002 per cent from 1 July 2020.

3 The market price cap

This chapter describes:

- our draft recommendation on the market price cap to apply from 1 July 2020
- the purpose of the market price cap
- the assessment criteria the Panel must consider in reassessing the market price cap
- stakeholders' views
- why we consider the level of the market price cap should remain unchanged.

3.1 Draft recommendation

The Panel's draft recommendation is that a market price cap of $14,200 ($2017) should apply from 1 July 2020 (indexed annually to CPI).

3.2 Purpose

Purpose of the market price cap

The issues paper explained the role of the reliability settings as follows:

> The role of the price settings collectively in the national electricity market is to limit market participants' exposure to extreme prices. They do so by placing an "envelope" around the maximum and minimum possible prices that participants may experience in the market. In doing so, the settings promote the long-term integrity of the national electricity system for the long term interests of electricity consumers. However, the settings should allow for the market to send the price signals needed to support efficient operational and investment decision.[115]

The market price cap is the reliability setting that sets an upper bound on the maximum possible price to which market participants can be exposed in any dispatch interval (and therefore in any trading interval).[116] Its purpose is:

> to limit market participants' exposure to very high prices and thereby serve to limit risk.[117]

Put simply, the market price cap serves to safeguard the long term integrity of the national electricity market by limiting market participants' risk exposure to temporary, very high prices.[118] This is explained further in Box 3.1.

115 Issues paper, p. 13.

116 While the market price cap is in effect the maximum that can be reached in any trading interval (or settlement period) it is defined in the rules as 'a price cap which is to be applied to dispatch prices'. Rules, clause 3.9.4(a).

117 Issues paper, p. 53.

118 The cumulative price setting is the reliability setting that seeks to limit market participants' exposure to very high prices over a sustained period, see chapter 4.

Box 3.1 Why limiting market participants' risk exposure to high prices benefits market integrity

As outlined in the issues paper[119], markets rely on the presence of willing participants. A principal consideration for participants is the risk that they are exposed to in a market. In the absence of market price limits, purchasers of energy (as price takers) could be exposed to potentially unlimited energy cost risk in any dispatch interval. Such an extreme level of risk may make it unlikely that purchasers would be willing to participate in the market.

Similarly, in the absence of a market price cap, generators could be unwilling to provide energy on a "firm" basis – that is, they would not be willing to enter into contracts as by doing so the generator would take on the (limitless) exposure to movements in spot prices. Were the generator to have a technical difficulty limiting generation, or be constrained off at a time of high prices, it would have unlimited financial exposure. In this, admittedly extreme, example a participant could stand to lose its entire business in a matter of hours. Such a level of risk threatens the integrity of the market, because it deters rather than supports use of the market.

Through the price setting process, markets align the costs and risks of consuming a service with the costs and risks of providing that service. A purist economic approach would warn against imposing any constraints on the prices that can occur in a market.

But there is a point at which there are diminishing benefits in increasing market participants' exposure to price risk. Placing some limits on participants' exposure to very high and very low prices to protect the integrity of that market is a feature of markets in many sectors. This is particularly important given the physics of electricity supply systems that require the instantaneous matching of demand and supply which is done through a focus on the supply side.

The market price cap also:

> serves as a proxy "limit" on [customers'] bids – they will not pay more than this amount for energy in any dispatch interval.[120]

It should be noted that the actual prices paid by customers served by a retailer is not the actual wholesale market spot prices but will reflect the pricing plan found in their contract with their retailer (which will reflect the average cost the retailer expects to incur over the relevant period for that customer).

119 Issues paper pp. 13-14.

120 Issues paper, p. 53.

Considerations in setting the level of the market price cap

The market price cap constrains prices and so is an intervention in the wholesale spot market. As such, setting its level is significant for reliability (and commercial) outcomes in the national electricity market. Hence:

> In setting the market price cap the primary principle observed is that the market price cap should not prevent the market sending efficient price signals, to support the efficient operation of and investment in electricity services over the long run. The process for setting the market price cap assumes that the reliability standard reflects the efficient level of expected unserved energy.[121]

The market price cap needs to be set at a level such that prices over the long term incentivise enough new investment in electricity generation so the reliability standard is expected to be met. Critically, setting the level of the market price cap involves making a trade-off, between protecting market participants' exposure to high prices and allowing for efficient price signals in the wholesale market (see Box 3.2.).

Additionally, the level of the market price cap should allow the market price to create incentives for participants to manage price risk; whether it is through the purchase of contracts or even retailers investing in generation (vertical integration). Also, the market price cap is not a tool for putting downward pressure on the prices charged to consumers. It is not necessarily the case that a higher market price cap leads to higher average prices—actual price outcomes are determined by a range of other factors such as bidding behaviour, gas prices and depth of competition in the market.[122]

The market price cap is indexed to movements in the consumer price index each financial year.[123] It is currently set at $14,200/MWh.

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121 Issues paper, pp. 53-54. The Panel acknowledges that the guidelines have a slightly different emphasis regarding the role of the market price cap, wherein its primary purpose is presented as facilitating efficient price signals in the market, with a secondary purpose of managing participant exposure to price risk. The characterisation of the settings overall in this discussion places more emphasis on the second purpose – the management of exposure to high prices – but is nevertheless consistent with the function of the reliability standard and settings.

122 In theory, reducing the level of market price cap may reduce the ability of generators to earn revenue in the spot market, leading to lower prices for consumers in the short term. However, over the longer term a lower market price cap may dampen investment signals, leading to a shortage of generation capacity. In this case, a lower market price cap could result in increased prices to consumers over the longer term.

123 While the market price cap is in effect the maximum that can be reached in any trading interval it is defined in the rules as 'a price cap which is to be applied to dispatch prices'. Rules, clause 3.9.4(a).

Box 3.2 The trade-off to be made in setting the level of the market price cap

To understand the factors the Panel must consider in this review, it is useful to elaborate on the trade-off the Panel is making when setting the level of the market price cap.

Setting the level of the market price cap involves making a trade-off on behalf of consumers between:

- **Market participants' exposure to high prices** – the higher the price cap the greater participants' exposure to high prices and therefore price risk.
- **Inefficient price signals –** the lower the market price cap the greater the chance of impeding efficient price signals for operation and investment, resulting in higher costs over the long term.

If the market price cap were set extremely high, market participants could be exposed to substantial price risk. This could threaten the stability of the market over the long run. While the contract market would act to provide services to minimise this price risk, market participants would remain exposed to some residual financial risk due to the difficulty of exactly matching contract volume with actual wholesale market.

Equally, the market price cap is a constraint on prices. Its existence prevents prices from rising beyond a certain level. It follows that different levels of the cap may alter the payments for energy in the market. For example, if the cap were set sufficiently low (for instance at $300/MWh) it would prevent the market from sending efficient price signals at times when the marginal cost of energy exceeded $300/MWh. In turn this would feed through to the contract market, potentially reducing the incentive to enter into contracts, decreasing contract market liquidity and, over the long run, reducing incentives for efficient investment in electricity services.

3.3 Criteria – Determination of level

3.3.1 Assessment requirements

Consistent with the purpose of the market price cap, the rules specify that the Panel may only recommend a market price cap that the Panel considers will:

- Allow the reliability standard to be satisfied without AEMO using its power to issue directions to market participants or reserve trader powers.[124]
- In conjunction with other provisions of the rules, not create risks which threaten the overall integrity of the market.[125]

The rules also specify that if the Panel is of the view that a decrease in the market price cap may mean the reliability standard is not maintained, the Panel may only

124 Established under clauses 3.20.7(a) and 4.8.9(a) of the rules.

125 Rules, clause 3.9.3A(f).

recommend such a decrease where it has considered any alternative arrangements necessary to maintain the reliability standard.[126]

These assessment requirements directly relate to the purpose of the market price cap and the trade-off involved in setting its level. The market price cap should be set at a level to allow requisite reliability outcomes to be achieved (everything being equal) through price signals incentivising investment in capacity, without AEMO:

- Exercising its power to issue directions to market participants.
- Exercising its reliability and emergency reserve trader powers through the dispatch of scheduled reserves available under scheduled reserve contracts or the activation of unscheduled reserves available under unscheduled reserve contracts.

Box 3.3 details AEMO's intervention powers.

Box 3.3 AEMO market interventions

Despite the fact that system reliability is based around market-driven investment, retirement and operational decisions, AEMO is provided with powers to intervene in the market to address potential shortfalls of reserves.

Reserve is the level of supply above demand that is forecast to be available for dispatch. Reserve acts as a buffer to help manage unexpected system developments such as the loss of a large generator.

AEMO may take one or more of the following actions when market responses to lack of reserve (LOR) market notices (i.e. an expected shortfall in reserves) or informal negotiations with market participants are insufficient:

- **Reliability and Emergency Reserve Trader (RERT) contracts** - under clause 3.20.7(a) of the NER, the RERT provisions allow AEMO to contract for ('lock in') reserves ahead of a period where reserves are projected to be insufficient to meet the reserve shortfall (from 3 hours to 10 weeks ahead of time). AEMO is able to dispatch these reserves to manage power system reliability and, where practicable, security.
- **Directions and instructions** -- under clause 4.8.9(a) of the NER, AEMO may issue directions and/or clause 4.8.9 instructions to maintain the power system in a secure, satisfactory or reliable operating state. These include:
- Directions, whereby a generator is asked to increase or decrease its output if physically possible and safe to do so. AEMO determines the price that applies when it issues a direction, with that price intended to 'preserve the market signals that would have existed had the intervention action not been taken'.[127]

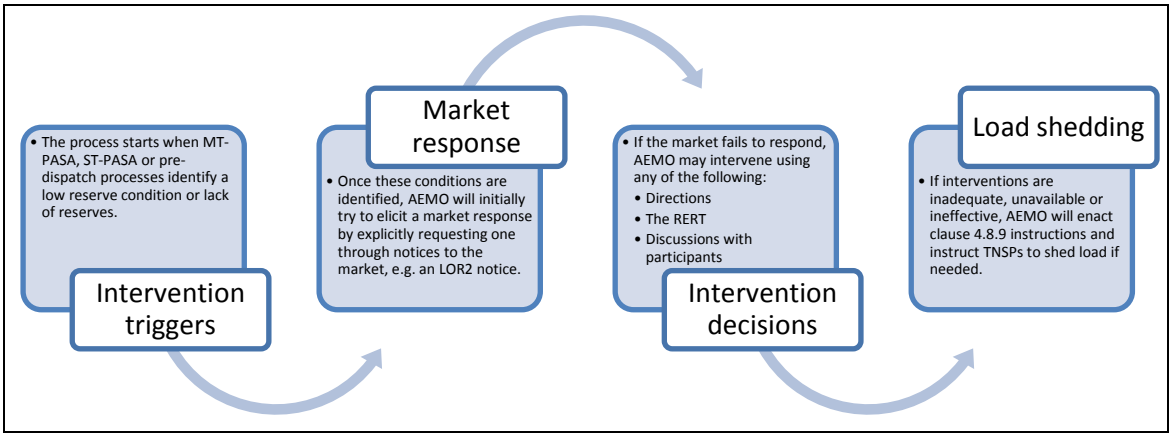
126 Rules, clause 3.9.3A(g).

127 The price that applies when AEMO intervenes in the market is set out in AEMO's Intervention Pricing Methodology (2014), under clause 3.9.3 of the rules. The price that used when AMEO applies (the Intervention Price) is intended to 'preserve the market signals that would have existed had the intervention action not been taken, and it is used as the dispatch price and market ancillary services prices for the purposes of spot price determination and settlements.'

- Instructing a large energy user, such as an aluminium smelter, to temporarily disconnect its load or reduce demand (a 'clause 4.8.9 instruction'). This only applies to large users who are registered participants.
- Instructing a network service provider (NSP) to shed and restore load consistent with schedules provided by the relevant state government (also a 'clause 4.8.9 instruction'). The market price cap would apply when involuntary load shedding occurs, whereby load is intentionally shed in different parts of the network at different times.[128]
- Using network support and control ancillary services (such as reactive power management) to the extent that the projected reserve shortfall is affected by a network limitation that can be addressed by such services.

Figure 10 summarises the chain of events that AEMO would typically go through when triggering an intervention.

Figure 10: Steps in AEMO market interventions



3.3.2 Assessment considerations

The Panel must have regard to the potential impact of any proposed change to the market price cap on: the reliability of the power system; spot prices; investment in the national electricity market, and; market participants.[129]

Additionally, in reviewing the market price cap the Panel is to be guided by the principle of providing a stable, predictable and flexible regulatory framework.[130] The purpose of this principle is to promote investor certainty. The need for a stable and predictable market framework is not new as it was also discussed in the 2014 Review.[131] However, it is particularly crucial to support efficient investment over this

128 See NER clause 3.9.2(e)(1)

129 Rules clause 3.9.3A(e)

130 Guidelines p. 3.

131 Reliability Panel, Reliability standard and reliability settings review 2014, final report, 16 July 2014, Sydney, p. 42.

review's time horizon given the rapid change already underway in the physical system and considerable uncertainty in associated policy areas, such as the integration of energy and emissions policy.

3.4 Stakeholder submissions on the issues paper

The subject of the market price cap was addressed in all seven of the submissions received on the issues paper: Australian Energy Council, Origin, ERM Power, Public Interest Advocacy Centre (PIAC), EnergyAustralia, Engie, and Snowy Hydro.

Three organisations commented on the appropriate level of the market price cap: PIAC suggested it should be lowered, Snowy Hydro supported keeping the cap at its current level, and ERM Power stated it should not be increased. The remaining four submissions discussed factors the Panel should consider in arriving at its decision, including risks to the market from setting the market price cap too low (Engie).

PIAC

PIAC suggests that the market price cap '**should be lowered**':

> [i]n spite of the Panel's commissioned analysis [in the 2014 review] showing ample opportunity to adjust the price settings downward while remaining within the limit of the Reliability Standard, the Panel decided not to adjust the MPC or CPT downwards…
>
> PIAC considers that, in the context of the above, the Panel's second principle [in the guidelines] "Delivering a level of reliability consistent with the value placed on that reliability by customers" makes clear that, outside of SA [South Australia], the actual level of USE could be much higher than it is and still remain within standard, implying that the MCP and CPT should be lowered.[132]

PIAC also commented on several other matters: [133]

- Role of the MPC – PIAC argues that the 'function of the MPC to manage participant exposure to price risk should be considered paramount' over serving as the chief investment (and disinvestment) signal.[134] PIAC argues that investment and disinvestment decisions are increasingly driven by factors such as such as high fuel prices, over supply, renewable energy incentives, lack of a long-term carbon policy, government investment, and opportunities for additional income from new markets (such as for inertia).
- Demand response – The Panel should consider the role of the market price cap in decisions made by demand response proponents (as well as generators), given policy and market changes supporting increased demand response and the "markedly" lower price signal required compared to new generators. Any demand response procured by AEMO through the RERT should not be considered "AEMO intervention" for the purposes of setting the MPC or CPT.[135]

132 PIAC submission, pp. 2-3.

133 PIAC submission, pp. 4-6.

134 PIAC submission, p. 3.

135 PIAC submission, p. 4.

- New revenue streams – The creation of new markets for energy services such as inertia, and the financial investment signals they provide, suggests consideration should be given to a lowering of the market price cap.[136]
- Regional price caps – The market price cap (and cumulative price threshold) should vary by region.[137]
- Contract market – The contract market is a means to an end and should only be preserved to the extent that it serves the long-term interests of consumers.[138]
- Additional review – The Panel should conduct an interim review in 2020 given the scale and pace of changes underway in the market.[139]

Snowy Hydro

Snowy Hydro **supports the current level** of the market price cap:

> There is no evidence to suggest that the MPC at its current levels will not provide the incentives for new investment in the NEM when it is required. All available evidence shows that the MPC has been a signal for new investment which has allowed the reliability standard to be met without AEMO intervention ie. Directions and the use of the RERT.[140]

On the drivers of the rise in market price cap events in South Australia (highlighted in the issues paper), Snowy Hydro points to:

> firm generation retiring as an increasing amount of intermittent generation comes into the market, the need for expensive short-term generation to fill supply gaps, and the absence of national energy policy certainty…
>
> t]he inclusion of Snowy 2.0 would add firm generation back into the grid and will likely minimise the incidence of market price cap events. [141]

ERM Power

ERM considers the market price cap **should not be increased**[142] due to uncertain outcomes, heightened risk to market participants and higher prices:

> We believe the Panel needs to consider that changes to increase any of the reliability settings in value may not translate to what the Panel believes would be positive changes in investment outcomes given the current levels of market uncertainty…
>
> An increase in any of these settings would only increase the risk to all participants of operating in the NEM.[143]

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136 PIAC submission, p. 3.

137 PIAC submission, p. 6.

138 PIAC submission, p. 6.

139 PIAC submission, p. 7.

140 Snowy Hydro submission, p. 4.

141 Snowy Hydro submission, pp. 4-5.

142 Nor does ERM consider that any of the other reliability settings should be increased.

143 ERM Power pp. 1-2.

In addition, ERM Power:

> believe[s] the Panel should consider that even at a relatively high gas or liquid fuel price of $30/GJ, which is above the price outcomes observed in the winter of 2016, the equivalent generator marginal cost remains sub $450/MWh, which is well below the current MPC value.[144]

A further argument ERM Power made for not raising the market price cap is that a higher cap would not necessarily avert load shedding events as recently shown on 8 February 2017. ERM Power instead suggests the Panel consider new rules to improve accuracy in AEMO demand and semi-scheduled forecasting. Refer to Appendix E for further detail.

Other points ERM Power made against raising the market price cap were that:[145]

- Default bid – while the market price cap acts a default bid, it is possible to observe that price sensitive loads do in fact reduce consumption at prices as low as $5,000/MWh. These loads are not scheduled and their price sensitivity is therefore not visible to the market.
- Contracts – increasing the market price cap may reduce the supply of contracts, as generators may decrease their exposure to the contacts market to avoid unfunded contract for difference payments arising from a rise in a contracted generator risk exposure from unplanned outages.
- Direct demand-price link – a direct relationship between high prices and high demand remains strong in South Australia – based on analysis of the impact of reduced network capability and interconnector outages during 2016, and data from January to June 2017.
- The market price cap, cumulative price threshold and administered price cap should be set together.

ERM Power considered the Panel should set a "high bar" for changing the market price cap:

> The Panel's task in reviewing the reliability settings during this review is challenging. Any changes to any of the settings should be based on an assessment that the change will result in positive benefit to the NEM from a consumer's perspective. [146]

Origin

Origin did not comment on the appropriate level of the future market price cap but offered views on matters the Panel should consider. Origin noted the (limited) potential of the MPC to impact on investment in the current environment:

> While the level of the MPC is important in providing an efficient price signal for future investment there are a number of other important factors. For example the lack of a sound and coherent policy framework continues to be the primary

144 ERM Power p. 3.

145 ERM Power pp. 2, 5-6

146 ERM Power p. 5.

> issue dampening investor confidence, and if addressed would have a more significant impact in ensuring ongoing reliability compared to any changes to the reliability settings.[147]

Origin also suggests the Panel examine the reasons for AEMO's increased use of its intervention powers. Origin's view is that recent occurrences should not be assumed to be related to reliability issues, and does 'not believe it should be assumed that AEMO's interventions are indicative of the MPC or other reliability settings being set at an inappropriate level'.[148]

More generally, Origin notes that the Panel's decision necessarily will be based on judgement, informed by evidence.[149]

Australian Energy Council[150]

The Australian Energy Council's submission also discusses AEMO's use of its intervention powers. In contrast to Origin, the Australian Energy Council's view is the recent increase in the use of these powers necessitates a review of the market price cap (and the cumulative price threshold).[151]

The Australian Energy Council also supports a modelling approach that examines the impacts of recent changes in the market on the level of the market price cap. It suggests that the growth in renewable generation and thermal retirement will require a higher market price cap in order for the reliability standard to be met.[152]

Engie

Engie requests the Panel consider the risks to the market of setting the market price too low:

> The MPC needs to be set at a sufficiently high level to underpin an active demand response sector and to encourage unsophisticated commercial players to contract and not 'ride spot' on the back of oversupplied intermittent generation.
>
> A fundamental principle in setting the MPC should be to ensure that the cap is 'out of the way', and the market (supply and demand) can respond below it.[153]

On the current investment environment, Engie comments:

> [I]nvestment in the National Energy Market has been seriously compromised by policy interventions and therefore risk (and hence WACC) has increased at the same time as payback periods have been severely shortened across all

147 Origin submission, p. 2. See also Origin's opening comment on page 1 of its submission.

148 Origin submission, p. 1.

149 Refer to section 1.3.4.

150 The Australian Energy Council is a peak industry body that represents 21 major electricity and downstream natural gas businesses operating in competitive wholesale and retail energy markets.

151 Refer to section 3.5.1.

152 Australian Energy Council submission, p. 2.

153 Engie submission, p. 2.

> technology types. This doesn't impact just new entrants but any investments related to existing plant, especially when considering refurbishment of plant.[154]

Engie's view is that uncertainties and risk should be incorporated into the modelling and lists issues the modelling should address. These include: plant life and WACC "from an investors' perspective" (ie economic life); a flattening of the shape of demand over time; complexity and cost of gas arrangements; transmission risks and costs; levels and impacts of variability of wind and solar generators; and the changing role of thermal plant.[155]

Also regarding the modelling method for setting the market price cap, Engie states:

> As a matter of principle, the modelling should minimise the use of subjective assumptions regarding offer/bid behaviour or dispatch. To be sustainable, the cap contracts need to be valued at the expected value of a cap using the modelling output (without cap contracts in place). [156]

EnergyAustralia

EnergyAustralia commented on the factors the Panel should consider in reviewing the level of the cap. The Panel should:

> be seeking to strike the right balance between providing incentives to invest in the market while not having extreme outcomes from exposure to the price cap.[157]

In relation to raising the market price cap, EnergyAustralia stated that:

> Any significant increase [in the market price cap] has the potential outcome of causing extreme financial stress to retailers that are exposed to the spot price, or generators that are unable to defend hedging positions.[158]

On lowering the market price cap, EnergyAustralia commented:

> Any reduction in the MPC [market price cap] should be considered against the possibility that it would reduce incentives to invest in adding generation capacity to the market. Combined with government interventions in this sector, such a reduction may impact on the market's ability to respond to market signals and meet the reliability standard.[159]

The submission also calls for a market price cap that supports the effective operation of the contract market.[160]

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154 Engie submission, p. 3.

155 Engie submission p. 2.

156 Engie submission, p. 5-6. Engie also stated that it :'believes that the use of the cap defender approach is highly distortionary, misprices generation output or demand side response and therefore must not be used as a technique for the MPC determination.'

157 EnergyAustralia submission, p. 2.

158 EnergyAustralia submission, pp. 2-3.

159 EnergyAustralia submission, p. 3.

160 EnergyAustralia submission, p. 2.

EnergyAustralia notes that the market price cap should be set so as to allow investment sufficient to deliver the reliability standard without AEMO interventions and also notes in this regard the occurrence of multiple directions from AEMO in the last twelve months. Akin to Origin's views, EnergyAustralia considers many of the recent interventions relate to system security issues and as such do not indicate concerns in the effective functioning of the market price cap.[161]

On the broader market environment, EnergyAustralia considers that:

> With the level of change being considered in the market at present it would be difficult to confidently assess the impact of changing the standard and settings.[162]

3.5 Analysis – Determination of level

Having regard to the assessment requirements and assessment considerations, the Panel's view is that the current market price cap of $14,200 ($2017) should apply from 1 July 2020 (indexed annually to increases in CPI). There are three principal reasons for the Panel's conclusion:

- **The current level of the market price cap appears to be serving its purpose effectively** –the level of the current market price cap is protecting market participants from high prices so as to maintain market integrity, and appears to be allowing price signals to incentivise sufficient generation to meet the reliability standard without use of AEMO's intervention powers, and is likely to continue to do so through the review period.
- **Benefits of maintaining policy stability, where warranted** – The Panel has assessed changes in the market for impacts on the required level of the market price cap and, on balance, holds the view that providing stable policy outcomes is appropriate.
- **Modelling outcomes** - The Panel has considered the outcomes of the EY modelling and considers the current level of the market price cap is unlikely to be an obstruction to the market function of delivering investment in supply sufficient to meet the reliability standard.

3.5.1 The current market price cap is working effectively

The Panel considers that, at its current level, the market price cap is serving its purpose and is likely to continue to do so.

Maintaining the overall integrity of the market

The purpose of the market price cap is to protect market participants from exposure to high prices that could threaten the financial viability of prudent market participants and thereby the integrity of the national electricity market, while being sufficiently high so as to incentivise a level of generation capacity and demand response consistent with achieving the reliability standard.

161 EnergyAustralia submission, p. 2.

162 EnergyAustralia submission, p. 1.

This objective is reflected in the requirement on the Panel to only recommend a market price cap that we consider will not, in conjunction with other provisions of the rules, create risks which threaten the overall integrity of the market.[163]

This criterion asks the question: is the market price cap set low enough to protect market participants from excessive financial exposure to high prices? (Refer to Box 3.1).

EnergyAustralia articulated the issue this way in its submission:

> Any significant increase [in the market price cap] has the potential outcome of causing extreme financial stress to retailers that are exposed to the spot price, or generators that are unable to defend hedging positions. A cause of concern would be that if growing volatility is experienced due to the continued penetration of intermittent generation, without corresponding levels of storage, participants are likely to suffer increased exposure to the price cap as the market transitions. Obviously, this exposure would be exacerbated by a higher MPC setting.[164]

Several stakeholders highlighted the importance of strong participation in the contracts market to the overall integrity of the national electricity market. In this regard, Engie argued for upward pressure on the level of the cap:

> The MPC needs to be set at a sufficiently high level to underpin an active demand response sector and to encourage unsophisticated commercial players to contract and not 'ride spot' on the back of oversupplied intermittent generation.
>
> In this context the risk of setting the MPC too low is likely to result in under contracting, and hence underinvestment, possibly leading to market failure. These risks are considered far more detrimental to the market stability and efficacy of the market than if the MPC is set too high which would result in a small amount of excess capacity being built.[165]

For EnergyAustralia: 'the setting of the MPC should also be such that it continues to drive a strong level of participation in financial markets to minimise exposure to the spot price.'[166]

The Panel considers the current settings have been effective at limiting market participants' exposure to excessive high prices and in maintaining overall market integrity.

Allowing for sufficient investment in generation

Importantly, the market price cap should not interfere with the price signals needed to drive investment in generation sufficient to meet the reliability standard. In other words, the level of the market price cap should be high enough to allow investment in enough generation so there is not more unserved energy expected than that allowed for by the reliability standard.

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163 Rules, clause 3.9.3A(f).

164 EnergyAustralia submission, pp. 2-3.

165 Engie submission, p. 2.

166 EnergyAustralia submission, p. 2.

This objective is expressed in the rules requirement on the Panel to set a market price cap that we expect will allow the reliability standard to be satisfied without AEMO using its power to issues directions to market participants or reserve trader powers. [167]

Historical levels of unserved energy

While the reliability standard is a forward-looking measure (that is an outcome sought for planning purposes) that expresses the expected level of unserved energy, it is worthy of note that since the market price cap was last increased in real terms on 1 July 2010, through to June 2016, the amount of unserved energy in each region of the national electricity market has been below the reliability standard.

The Panel recognises that there were several directions issued by AEMO over the 2016-17 summer period (discussed in the next section). The Panel is awaiting data on unserved energy for this summer period and the entire financial year 2016-17 from AEMO. We have reviewed AEMO's incident reports of reliability-related events. Given unmet demand that could be potentially be classified as unserved energy, our preliminary view is that it appears unlikely that sufficient load was shed such that the unserved energy recorded exceeded the reliability standard in any region for the 2016-17 financial year.[168] The Panel will review this view following the provision of data by AEMO, prior to our final report.

Based on information currently available it appears unlikely that the market price cap has been too low as to interfere with *efficient* market investment.

AEMO interventions

As outlined previously, clause 3.9.3A(f) of the rules state that the market price cap must be set so that the reliability standard can be satisfied without the need for AEMO to intervene (i.e., to issue directions to participants and use the RERT), overriding the outcomes that would have occurred in the market.

Some stakeholders asked that the Panel examined recent AEMO interventions in our review of the market price cap. In its submission, EnergyAustralia stated that:

> In terms of the MPC and CPT we note that multiple directions from AEMO have occurred in the last 12 months. The MPC and CPT are both meant to drive outcomes that allow the reliability standard to be met without such interventions, and it would be useful that reassessment of the MPC and CPT takes into account ongoing and increasing use by AEMO of directions. However, we also see that some of the directions are primarily due to system security concerns and less so due to a lack of generation within specific regions. This includes directions for synchronous generation to run in place of wind, in order to maintain system strength. We consider that such intervention does not necessarily point to the MPC and CPT not functioning as intended.[169]

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167 Rules clause 3.9.3A(f)(1).

168 The Panel also notes that the South Australia System Black event was a power system security event and not the result of insufficient generation being available. As such, any subsequent unmet demand would not be counted toward measures of unserved energy, which exclude load lost due to security events.

169 EnergyAustralia submission, p. 2.

Origin also commented on this issue, stating that:

> The Australian Energy Market Operator (AEMO) has used its powers of direction to intervene in the market on a number of occasions. We agree that the MPC and other reliability settings should allow for the meeting of the reliability standard without a reliance on AEMO using its directions or reserve trading powers. However, Origin would suggest that the Panel use this review as an opportunity to examine recent instances where AEMO has used these powers and determine the underlying motivation for doing so. We do not believe it should be assumed that AEMO's interventions are indicative of the MPC or other reliability settings being set at an inappropriate level. This is particularly the case where AEMO's powers of direction are used to maintain system security.[170]

The Australian Energy Council stated that:

> Since 1st December 2016, AEMO has issued directions to generators seven times, and for the coming 2017-18 summer, AEMO is seeking expressions of interest for the supply of reserve contracts as a Long Notice Reliability and Emergency Reserve Trader ("RERT"). While the protracted government policy uncertainty is a contributor to this situation, AEMO's actions suggest that the market price cap and cumulative price threshold need review, particularly as the market price cap has been at the same level in real terms since July 2012.[171]

Summary of recent interventions

The Panel is cognisant of the role of interventions in the market, and their bearing on the review of the reliability settings. Between 9 October 2016 and 19 October 2017 there have been 15 interventions (see Table 4), each of which involved one or more directions.

As noted by both EnergyAustralia and Origin Energy, many of these interventions have been for system security concerns and are unrelated to the scarcity of energy or frequency control ancillary services (FCAS). We note that:

- Eight of the interventions related to a requirement for synchronous generation in South Australia.
- Two of the interventions (i.e. on 1 December 2016 in Victoria, and on 28-29 March 2017 in Queensland) were for other reasons that are unrelated to a scarcity of energy or FCAS.[172]

It follows that only five of the interventions relate to scarcity of energy or FCAS, and so are of consequence to the setting of the market price cap and/or cumulative price threshold. This is not to diminish the significance of these five events.

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170 Origin Energy submission, p. 2.

171 Australian Energy Council submission, p. 1.

172 The intervention on 28-29 March 2017 required a direction to a generator in northern Queensland to maintain security in the event of a separation of northern Queensland. Clause 3.9.7 of the rules establishes that in the event of such a separation, the generator's offer would not affect the determination of the dispatch price. It follows that altering the market price cap and cumulative price threshold would not change the incentives to generators of providing energy under these circumstances.

Considerations in relation to the market price cap

The Panel has considered these interventions and whether they have any consequences for the setting of the market price cap (and cumulative price threshold). Table 5 summarises our analysis.

The Panel considers that these events do not suggest a need to alter the level of the market price cap (and/or cumulative price threshold). These events are discussed in detail in Appendix E, with references to stakeholder comments as available.

Table 4 Intervention events between 9 October 2016 and 19 October 2017[173]

Date	Region of direction(s)	Reason for intervention	Type of intervention reliability or security
9 October 2016	SA	Requirement for synchronous generation in SA	Security
11 October 2016	SA	Requirement for synchronous generation in SA	Security
1 December 2016	SA	Management of FCAS requirements.	Reliability
1 December 2016	VIC	Unexpected system configuration requiring intervention to invoke a system security constraint.	Security
8 February 2017	SA	Scarcity of energy requiring load shedding.	Reliability
9 February 2017	SA	Requirement for additional available capacity to address forecast Lack of Reserve 2 condition.	Reliability
10 February 2017	NSW	Scarcity of energy requiring load shedding.	Reliability
1 March 2017	SA	Requirement for additional available capacity to address forecast Lack of Reserve 2 condition.	Reliability
28-29 March 2017	QLD	Directions to maintain secure system given the credible loss of multiple transmission lines during cyclone in Queensland.	Security
25 April 2017	SA	Requirement for synchronous generation in SA.	Security
26 April 2017	SA	Requirement for synchronous generation in SA.	Security
2-4 September 2017	SA	Requirement for synchronous generation in SA.	Security
17 September 2017	SA	Requirement for synchronous generation in SA.	Security
22-24 September 2017	SA	Requirement for synchronous generation in SA.	Security
7-8 October 2017	SA	Requirement for synchronous generation in SA.	Security

173 Source: Endgame Economics analysis of AEMO event reports and market notices.

Table 5: Panel's analysis of reliability directions

Direction	Panel's analysis
1 December 2016 South Australia	During this event, the application of the cumulative price threshold to FCAS, but not to energy, may have created an incentive for participants to reduce their availability of FCAS to increase their ability to offer energy – a service whose price was not limited by the triggering of the cumulative price threshold.[174] AEMO's efforts to obtain FCAS were potentially hindered by the binding of the cumulative price threshold for FCAS. This does not highlight a problem with the *level* of the cumulative price threshold, but potentially the relationship between energy and FCAS prices at the time.
8 February 2017 South Australia	The key observation made by ERM Power in its submission to this review's issues paper is that adequate generation capacity was available on 8 February, but not ultimately committed in time because of forecasts of wind and demand suggested that capacity would not be required.[175] The Panel notes ERM's views that a higher market price cap would not have altered this outcome. Given the commentary regarding forecasting it appears that the load shedding on 8 February was not the result of inadequate remuneration for available generation.
9 February 2017 South Australia	The Panel notes adequate generation capacity was potentially available. The Panel considers that the expected revenue provided by the market price cap was adequate to provide an incentive for the unit to be made available.
10 February 2017 New South Wales	The supply and demand conditions in New South Wales on 10 February 2017 were extreme, low probability events. The Panel considers that such conditions are an example of the *type of situation* where we might expect to see load shedding, and where such an outcome is efficient – the costs of investing in additional capacity to prevent load shedding in these circumstances would outweigh the reliability benefits provided. The Panel therefore does not consider that the event on 10 February suggests a need to raise the level of the market price cap.
1 March 2017 South Australia	A key question in this case is why generation capacity was not made available without the need for a direction, and whether a higher market price cap would have avoided the need for a direction. The Panel considers that the expected revenue provided by the market price cap was adequate to provide an incentive for the unit to be made available.

174 See Chapter 4, footnotes 202 and 203.

175 ERM Power, pp. 3-4.

Future USE forecast

The Panel expects that, with the settings at their current levels, based on the modelling forecasts unserved energy outcomes will continue to be below the reliability standard throughout the review period in all regions of the national electricity market.[176] The outcomes of the EY modelling that support this view were presented in Chapter 2. Additionally, the level of unserved energy under circumstances such as high demand and/or higher generator forced outage rates is also forecast to be well below the reliability standard throughout the period.[177] Snowy Hydro shares this view, commenting that:

> There is no evidence to suggest that the MPC at its current levels will not provide the incentives for new investment in the NEM when it is required.[178]

The Panel notes PIAC's concern that the market price cap has historically been set too high. PIAC argues that wholesale market is effectively being 'gold plated as the market price cap in 2014 was expected to deliver a much higher level of reliability than consumers are prepared to pay for'.[179] The meaning of a forecast 'gap' between expected unserved energy under a base scenario and the reliability standard is explored shortly in the section on modelling undertaken for this review on the market price cap (section 3.5.3).

3.5.2 Stability and predictability

The national electricity market and the energy sector are in a period of transition. Market participants and potential investors are currently factoring into their business models developments including: rapid technological change; the potential introduction of a National Energy Guarantee; the potential for five minute settlement; the growth of distributed energy resources; changes in contract types; advances in demand response; and government-sponsored generation projects.

The Panel recognises the impact that rapid technological change and policy uncertainty are having on consumers, market participants and the broader investment community. Policy uncertainty, in particular regarding the integration of emissions reduction and energy policy, is constraining the investment environment, and potentially raising risk premiums and costs to consumers.

The Panel does not wish to unnecessarily exacerbate these negative impacts. We have therefore weighted our decisions in this review in favour of supporting certainty and

176 Based on the outcomes of the modelling conducted by EY.

177 The Panel notes that the reliability standard allows for up to 0.002 per cent expected unserved energy in a region. Also, the unserved energy findings are forecasts underpinned by modelling assumptions that aim to reflect the likely outlook for the NEM over the review period. As such, actual unserved energy outcomes will differ from forecasts. In addition, AEMO has intervention powers under the rules to address potential shortfalls of reserves which in and of itself will tend to limit actual occurrences of unserved energy.

178 Snowy Hydro submission, p. 4.

179 PIAC submission, p. 2.

stability in the national electricity market. The Panel considers there is value for market participants and consumers in maintaining policy stability, where warranted.

This is consistent with the review guidelines, which require the Panel to follow the general assessment principle of 'providing a stable, predictable and flexible regulatory framework' in order to meet the National Electricity Objective.[180] The guidelines state that:

> The Panel will exercise its judgement so as to achieve predictable outcomes, while reflecting significant changes in market conditions, to support efficient investment and operational decisions by participants.[181]

The Panel has considered the potential impacts of predicted changes in market conditions on the appropriate market price cap for period 2020/21 – 2023/24. We have reflected on stakeholder comments and modelling outcomes.

Stakeholders have communicated a range of views on how current market uncertainty impacts on the level of at which the market price cap should be set. Engie suggests:

> A pragmatic approach is to set the MPC higher than determined by the modelling by adding an uncertainty margin.[182]

In contrast, ERM Power states that:

> An increase in any of these settings would only increase the risk to all participants of operating in the NEM and would lead to further and unnecessary price increase to consumers at a time when many consumers are struggling with significant increases in electricity costs.[183]

Several stakeholders highlight that the uncertainty in the market has dampened the efficacy of the market price cap as an investment price signal. This suggests increases to its level for the purpose of increasing incentives for investment may not have the desired effect.

Other stakeholders, such as EnergyAustralia, consider the scale of uncertainty and change diminishes the Panel's ability to accurately assess potential impacts of any change to the level of the market price cap.[184] This argument could support a conservative approach to changing the market price cap.

The modelling outcomes of market trends are discussed in the next section. In summary, after considering changes in current market conditions, the Panel does not consider it currently has sufficient evidence that the overall benefits to investment and reliability of either increasing or decreasing the market price cap would outweigh the potential costs of that change, including the costs of further instability and uncertainty.

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180 Guidelines, p. 3, in addition to two other general assessment principles - allowing efficient price signals while managing price risk, and delivering a level of reliability consistent with the value placed on that reliability by customers:

181 Guidelines, p. 3.

182 Engie submission pp. 2-3.

183 ERM Power pp. 1-2.

184 EnergyAustralia submission, p. 1.

3.5.3 Modelling outcomes

The Panel has considered the outcomes of the EY modelling and holds the view that the current level of the market price cap is unlikely to inhibit the market facilitating investment in supply sufficient to meet the reliability standard.

Modelling approach

The Panel commissioned EY to estimate the theoretical optimal market price cap for the period 1 July 2020 – 1 July 2024. Given the extent of uncertainty and change, we sought modelling outcomes for a range of circumstances (with varying degrees of likelihood) that could arise in the future. This was to allow the Panel to form judgements about the circumstances under which certain levels of market price cap may be needed; to limit exposure to excessive high price while allowing for investment sufficient to meet the reliability standard.

Of the many potential 'futures' for the national electricity market during the review period, EY and the Panel chose two scenarios, which were considered to be plausible ways in which unserved energy in a region could be expected to exceed the reliability standard. These scenarios were used to examine the market price cap needed to allow investment sufficient to reduce expected unserved energy back below the standard.

One scenario was in South Australia and the other in Victoria.[185] The modelling examined the market price cap(s) needed in each region in the event that:

- thermal plant retired earlier than expected
- renewable technologies accounted for a considerable proportion of the generation mix
- demand was strong, and
- coal plants experienced high outage rates.

Table 6 shows the assumptions needed to lead to unserved energy exceeding the reliability standard.

185 The EY report states that: 'these are the two regions where the most plausible scenarios could be devised to threaten the reliability standard. This is mainly due to the thermal power stations in these regions being older than in other regions and are hence more likely to retire earlier than currently expected.' See EY Report, p. 36 regarding exploratory studies conducted for NSW and Queensland.

Table 6: Overview of MPC scenarios (summary from EY report)[186]

Scenario	Assumptions differing from the base scenario
MPC Scenario 1: South Australia	► AEMO high demand forecast[187] ► EY's coal outage rates[188] ► Early retirement of 1,040 MW of thermal capacity in South Australia
MPC Scenario 2: Victoria	► AEMO high demand forecast ► EY's coal outage rates ► VRET 5150 MW scheme[189] ► Early retirement of 2,600 MW of thermal capacity in Victoria

The rules establish that the Panel's obligations in relation to recommending the market price cap (and cumulative price threshold) are twofold:

- To ensure investment would occur without intervention to meet the reliability standard.
- Not threaten the overall integrity of the market.[190]

To this end, a high cost sensitivity was devised as a plausible upper bound, which included the following assumptions:

- a high gas price of $18/GJ to represent an upper-bound at the liquid-fuel equivalent price given uncertainty in low-cost natural gas supply for a low utilisation generator
- higher capital costs for wind, solar PV and storage
- a 10 per cent WACC to represent investment uncertainty
- CCGTs excluded as a candidate marginal new entrant technology due to their inflexibility and the requirement for long-term high volume gas supply.

A number of other sensitivities were applied to examine the potential impact of uncertainty on the level of the market price cap. The principal assumptions are presented in Appendix B, and the modelling method detailed in the EY Modelling report.

186 EY Report, p. 36.

187 From Strong scenario in AEMO's 2017 ESOO. This includes higher demand, rooftop PV, EV and behind-the-meter battery uptake compared to the Neutral scenario (as used in the base scenario in this Review). For details, see EY Report, Appendix A.

188 EY analysed historical availability of NEM coal generators to estimate an upper bound for its forced outage rates. For details, see EY Report, Appendix A.

189 Involves 700 MW of renewable capacity in addition to the LRET installed in Victoria in each year in the Period (Source: https://www.energy.vic.gov.au/renewable-energy/victorias-renewable-energy-targets).

190 Rules clause 3.9.3A(f).

Once plausible scenarios were established that resulted in levels of expected unserved energy over 0.002 per cent (i.e. more unserved energy than allowed by the reliability standard), for each scenario and sensitivity, the modelling examined what market price cap was needed to stimulate investment in generation sufficient to bring the expected level of unserved energy back below 0.002 per cent.

The modelling methodology utilised a technology-neutral approach, in that a range of technologies were considered as the potential new entrant to reduce unserved energy below 0.002 per cent, and potentially set the theoretical optimal market price cap outcome. The technologies that were considered are as follows:

- Solar PV (Fixed flat plate)
- Solar PV (Single-axis tracking)
- Solar PV (Dual-axis tracking)
- Solar Thermal
- Wind
- OCGT
- CCGT
- Coal
- Nuclear
- Large-scale storage, including batteries and pumped hydro.

The methodology to determine the theoretical optimal market price cap involved finding, for each plausible scenario and sensitivity, the marginal (lowest cost) technology that could be installed to bring unserved energy below 0.002 per cent.[191]

While both demand side participation and pumped storage projects have the potential to reduce unserved energy, EY considered that there is 'insufficient information on the cost of implementing new demand side participation or pumped storage projects to comment on the potential for these types of projects to become a marginal source of reducing USE [unserved energy] to within the reliability standard'.[192]

In the future if information can be provided on assumed implementation costs, potential volumes, and locations for increased demand side participation, it could be included as an alternative assessed technology.[193] To this end, the Panel would encourage the market to collect information on the costs and potential supply of demand side participation.

A detailed explanation of the modelling methodology can be found in chapter 6 of the EY report.

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191 EY report, p. 12.

192 EY report, p. 58.

193 EY report, pp. 16, 58 and 67. Although demand side participation was not included as a potential marginal technology, the explicitly bidding demand side participation data was incorporated into the modelling and the impact of inherent non-disclosed price response is captured in AEMO's energy and peak demand forecasts modelled by EY. Based on AEMO's projected levels of demand-side participation that respond to different price levels, EY's modelling captures the associated impact on demand side participation if the market price cap were reduced from the current level. AEMO's published amount of price-responsive demand bid into the market is provided at: https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Electricity-Forecasting-Insights/Key-component-consumption-forecasts/Demand-side-participation

Key outcomes

Notwithstanding the falling cost of battery storage, EY's modelling found OCGTs to be the marginal new entrant technology to meet the reliability standard for the period 1 July 2020 – 1 July 2024.[194]

As shown in Table 7 (reproduced from the EY report) the market price cap scenario in which the reliability standard is 'threatened'[195] in Victoria presented the highest marginal price cap requirement. It was found that modelled price outcomes for the Victorian region were a significant driver for the market price cap requirement, as there are relatively fewer high price periods compared to the modelled South Australian prices in the other market price cap scenario. This requires a higher market price cap, in order for the marginal generator to recover necessary revenue from a smaller number of high price periods.[196]

With the high cost assumptions in Victoria, EY found a significantly higher market price cap may be required to provide sufficient revenue to allow investment in the marginal unit, such that the risk of unserved energy was maintained within the reliability standard, where the other reliability settings are kept the same.

194 See discussion in the EY report regarding assumptions in relation to CCGTs, pp. 39-40.

195 Meaning that the reliability standard would be exceeded if the reliability settings such as the market price cap were not set sufficiently high to incentivise new entrant investment to keep unserved energy below 0.002 per cent.

196 For an explanation of how market incentives work, and the reliability settings impact on them, see AEMC 2017, *Reliability Frameworks Review, Issues paper*, 22 August 2017, Sydney, particularly sections 2.2 and 6.

Table 7: MPC outcomes, with the present settings for the CPT ($212,800) and APC ($270)[197]

MPC scenario	Sensitivity		Theoretical optimal MPC ($/MWh)	Marginal new entrant technology (achieved capacity factor)
MPC Scenario 1 **South Australia** ► AEMO high demand forecast ► EY's coal outage rates ► Early retirement of 1,040 MW of thermal capacity	Base costs		**$1,500**	CCGT (70%)
	High costs	High	**$8,900**	OCGT (3.5%)
		Cap defender	**$9,500**	OCGT (2.1%)
		12% WACC	**$21,000**	OCGT (3.5%)
		Half lifetime	**>$50,000**	OCGT (3.5%)
MPC Scenario 2 **Victoria** ► AEMO high demand forecast ► EY's coal outage rates ► VRET 5150 MW scheme ► Early retirement of 2,600 MW of thermal capacity in Victoria	Base costs		**$1,500**	CCGT (70%)
	High costs	High	**$23,000**	OCGT (6.3%)
		Cap defender	**$24,000**	OCGT (2.0%)
		12% WACC	**>$50,000**	OCGT (6.3%)
		Half lifetime	**>$50,000**	OCGT (6.3%)

Panel analysis

The Panel notes EY's views that the lowest market price cap under the base costs scenarios ($1,500) may only be sufficient where the marginal generator (in this case, a CCGT unit) can achieve a relatively high capacity factor and if gas fuel is available for a fixed price, at high volumes, over a long period of time.[198]

The Panel has also examined the outcomes of and assumptions underpinning the other scenarios. We consider that:

- The Victorian high costs scenarios with a 12 per cent WACC and half lifetime (resulting in marginal price caps >$50,000) to be outside the bounds of sensitivities informing how to set the market price cap for this review.
- In regards to the Victorian high cost scenario (resulting in a $23,000 market price cap), the underpinning assumptions on which it is based, taken collectively, reflect the 'outer bound' of sensitivities informing how the market price cap could be set. These combined assumptions were:
  - an $18GJ fuel price
  - high renewable technology costs
  - a 10 per cent WACC

197 EY Report, p. 40.

198 EY Report, pp.5- 6.

- high demand, and
- high generator outage rates.

The Panel considers that many of these assumptions represent a relatively low probability future.

For example, the modelled WACC value of 10 per cent represents an uplift on current WACC parameter values based on the risk free rate and debt margins increasing to 10 year historic average values. The Panel considers that this 10 per cent WACC represents a reasonable medium term upper limit that is only likely to be exceeded in a lower probability future in which a severe economic event (similar to the 2008 global financial crisis) has caused a systemic and significant increase in the cost of capital.

We also consider that the high demand values that are used as an input into these sensitivities are also likely to represent a relatively lower probability future. Historic peak demand levels have shown a steady decrease across all jurisdictions since 2009 (other than in Queensland, where LNG plants have driven a moderate increase in recent years), especially in New South Wales and Victoria.[199] Similarly, comparisons of AEMO's peak demand forecasts made since 2011 have shown a clear downwards trend in terms of the revised level of forecast peak demand across the national electricity market from year to year.[200]

The Panel considers that these assumptions warrant exploration as they form a reasonable basis for outer bound sensitivities, and allow modelling to explore the impacts of different variables on the necessary market price cap. They nevertheless represent the outer bounds of a range of potential futures or a relatively low probability future.

The Panel also considers that:

- Many other scenarios, based on assumptions the Panel considers are more likely to match actual conditions over the review period, found the current market price cap level is at a level that will allow the market to function efficiently.

  There is not sufficient evidence of a need to lower the market price cap or cumulative price threshold as it adequately limits market participants' exposure to the risk of high prices.

We note EY's results and analysis in regards to the impact of an increase in the market price cap on the cumulative price threshold, and discuss these in the chapter on the cumulative price threshold.

199 From analysis of annual regional peak demand figures, sourced from www.aer.gov.au, as at 13 November 2017.

200 From analysis of total peak demand forecasts from ESOO 2004 through to NEFR 2015.

The market price cap and consumer prices

As highlighted previously, PIAC has suggested that if the market price cap is set so as to result in a level of expected unserved energy far lower than the reliability standard, then the market price cap may be set 'too high'; leading to PIAC's concern that the wholesale market is being gold plated with negative cost implications for consumers.

The Panel notes the actual level of generation capacity in the market at any point in time reflects historical investment in long life assets, together with the impact of the investment signal sent by the reliability settings and other policies such as feed in tariffs for roof top solar PV and Large-scale Generation Certificates (LGC or LREC). In this context, the reliability settings are established from the perspective of a hypothetical system which is operating at or around the reliability standard with the aim of ensuring that the settings can deliver sufficient revenue to support a marginal new entrant.

The settings are not intended to be a tool for signalling generation to leave the market. This is consistent with the belief that the wholesale market is generally broadly workably competitive so that any excess generation (above that estimated to be required to achieve the reliability standard on a forward looking basis) will simply depress the market price, with that lower expected revenue providing the signal for no new investment.

Critically, the market price cap is a maximum setting for prices. In circumstances where there is excess generation capacity in the market, it would be expected that average wholesale market prices would be lower than where there is a tighter supply demand balance irrespective of the level of the market price cap.

3.6 Conclusion

The Panel's draft recommendation is that no change be made to the market price cap for the review period.

The Panel is of the view that the current level of the market price cap is unlikely to be an obstruction to the market function of delivering investment in supply sufficient to meet the reliability standard. In other words, the setting appears likely to continue to serve its purpose of limiting market participants' exposure to very high prices, while being sufficiently high so that market price signals over the long term incentivise enough new investment in electricity generation so the reliability standard is expected to be met.

By limiting price risk while allowing for efficient price signals in the wholesale and contract markets, we consider maintaining the market price cap at its current level would promote efficient investment in electricity services for the long term interest of consumers, and thereby further the national electricity objective.

The Panel considers that the existing level of the market price cap (and the cumulative price threshold), in themselves, are unlikely to lead to levels of unserved energy above the reliability standard during the review period. Many factors however – independent of the market price cap and cumulative price threshold – may impact on people's willingness to invest, which are beyond the scope of this review.

4 The cumulative price threshold

This chapter describes:

- our draft recommendation on the cumulative price threshold to apply from 1 July 2020
- the purpose of the cumulative price threshold
- the assessment criteria the Panel must consider in reassessing the level of the cumulative price threshold
- stakeholders' views
- why we consider the level of the cumulative price threshold should remain unchanged.

4.1 Draft recommendation

The Panel's draft recommendation is that a cumulative price threshold of $212,800 ($2017) should apply from 1 July 2020 (indexed annually to CPI).

4.2 Purpose

The cumulative price threshold limits participants' financial exposure to the wholesale spot market during prolonged periods of high prices.[201] It limits the total market price that can occur over a period of seven consecutive days (336 trading intervals), before an administered pricing period is declared.[202]

The cumulative price threshold can be triggered in different ways. For example, it could be triggered after many days of sustained high but not extreme prices (in the order of $625/MWh). It can also be breached in just a few hours if prices are at or close to the market price cap ($14,200/MWh). The cumulative price threshold is indexed to the consumer price index and is currently $212,800.[203]

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201 Together with the administered price cap (see chapter 8), the cumulative price threshold also limits the risk of financial contagion across participants in the national electricity market. If market participants are insufficiently hedged, exposure to high price risk could result in sudden market exit. If the failed participant is particularly large, there is a risk of a financial contagion effect, whereby the financial failure of the large participant could trigger a cascading series of failures across the market, leading to significant instability and price impacts for consumers. There are several mechanisms in the rules designed to limit the risk of financial contagion. See: AEMC, *NEM financial market resilience, final report*, 6 March 2015, Sydney.

202 Rules, clause 3.14.2(c)(1). An administered price period is triggered where the cumulative price threshold is reached at any point over a seven day period. Once an administered price period is triggered, the administered price cap applies. In addition, an administered price period in relation to ancillary service markets will apply where the cumulative price threshold for market ancillary service exceeds six times the cumulative price threshold.

203 The cumulative price threshold is also relevant to FCAS markets. For FCAS markets, an administered pricing period is declared after 2,016 dispatch intervals, if the cumulative price is six times the cumulative price threshold reflecting the five minute settlement period applicable to FCAS markets. Rules, clause 3.14.2(c)(1A).

4.3 Criteria – Determination of level

4.3.1 Assessment requirements

In accordance with the rules the Panel may only recommend a cumulative price threshold that it considers will:[204]

- Allow the reliability standard to be satisfied without AEMO using its directions or reserve trader powers.[205]
- In conjunction with other provisions of the rules, not create risks which threaten the overall integrity of the market.

The rules also specify that if the Panel is of the view that a decrease in the cumulative price threshold may mean the reliability standard is not maintained, the Panel may only recommend such a decrease where it has considered any alternative arrangements necessary to maintain the reliability standard.[206]

4.3.2 Assessment considerations

The Panel must have regard to the potential impact of any proposed change to the cumulative price threshold on: the reliability of the power system; spot prices; investment in the national electricity market, and; market participants.[207]

The guidelines establish the following principles for assessing the cumulative price threshold:

- The cumulative price threshold should protect all market participants from prolonged periods of high market prices, with particular consideration to the impacts on investment costs and the promotion of market stability.
- The cumulative price threshold should not impede the ability of the market to determine price signals for efficient operation and investment in energy services.

The cumulative price threshold should be determined giving consideration to the level of the market price cap.[208]

4.4 Stakeholder submissions on the issues paper

Six submissions on the issues paper discussed the consumer price threshold.[209] Snowy Hydro, ERM Power and EnergyAustralia stated that current level of the cumulative price threshold should be retained. Engie and the Australian Energy Council supported the review of the cumulative price threshold. PIAC commented that the level of the cumulative price threshold should be lowered.

204 Rules, clause 3.9.3A(f).

205 Established under clauses 3.20.7(a) and 4.8.9(a) of the rules.

206 Rules, clause 3.9.3A(g).

207 Rules clause 3.9.3A(e)

208 Guidelines, p. 7.

209 The cumulative price threshold was not discussed by Origin.

Snowy Hydro

Snowy Hydro considered that the current level of the cumulative price threshold was appropriate:

> The cumulative price threshold provides a safety net for the NEM to ensure the financial stability of the market. Since market start the CPT has only been activated on 5 occasions which provides a clear indication that it is set at the right level.[210]

Snowy Hydro also stated that the current relationship between the cumulative price threshold and the market price cap should be maintained:

> The CPT should remain at 15 times MPC.[211]

ERM Power

ERM Power stated that the level of the cumulative price threshold should not be increased:

> Any increase … would potentially lead to poor outcomes for consumers…[and] would only increase the risk to all participants of operating in the NEM.[212]
>
> Currently ERM Power has not observed any trends in market outcomes or increased costs for the provision of generating plant and equipment that would suggest a change … is warranted.[213]

ERM Power emphasised that a higher market price cap or cumulative price threshold would not have prevented the involuntary load shedding in South Australia on 8 February 2017.

> In assessing the events in South Australia on 8 February 2017, with regard to considering the potential for USE events in the future… A higher level of MPC or CPT would in all likelihood not have changed this outcome.[214]

ERM Power noted that the cumulative price threshold is rarely reached:

> Historically, the CPT has triggered infrequently in the energy market and looking forward there is no evidence to suggest an increase in the frequency for CPT events.[215]

ERM Power believes the market price cap, cumulative price threshold and administered price cap should all be reviewed together:

> The APC is also interrelated to the MPC and CPT and these three setting should be reviewed together.[216]

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210 Snowy Hydro submission, p. 5.

211 Snowy Hydro submission, p. 3.

212 ERM Power submission, p. 2.

213 ERM Power submission, p. 6.

214 ERM Power submission, p. 3.

215 ERM Power submission, p. 6.

216 ERM Power submission, p. 7.

EnergyAustralia

EnergyAustralia supports the current relationship between the level of the cumulative price threshold and the market price cap:

> It does appear to us that the relationship between the CPT and MPC acts to allow suitable investment signals while preventing unmanageable long term prices impacting participants and consumers.[217]

EnergyAustralia emphasised the importance of stability in setting the level of the cumulative price threshold:

> Similar to the reliability standard we consider that any reassessment needs to factor in that stability is both important for consumer outcomes while also providing an appropriate investment environment.[218]

EnergyAustralia also commented that while multiple [AEMO] directions have occurred in the last 12 months, some were driven by system security concerns and 'considers[s] that such intervention does not necessarily point to the MPC and CPT not functioning as intended'.[219]

Engie

Engie considered the cumulative price threshold should be decoupled from the market price cap and reviewed separately:

> The CPT should be set with reference to the level of risk the market can manage in aggregate and not simply as a function of the MPC. ENGIE continues to suggest that the settings of the MPC and CPT should be decoupled.[220]

Australian Energy Council

The Australian Energy Council supports a review of the cumulative price threshold:

> The Energy Council recommends the Reliability Panel… assesses the market price cap and cumulative price threshold in light of AEMO's recent use of generator directions, and its expected use of the RERT provisions.[221]

PIAC

PIAC recommends that different levels of the cumulative price threshold should be set for different regions:

> PIAC strongly recommends that the Reliability Panel consider setting different MPC's and CPT's in different regions.[222]

217 EnergyAustralia submission, p. 3.

218 EnergyAustralia submission, p. 2.

219 EnergyAustralia submission, p. 2.

220 Engie submission, p. 4.

221 Australian Energy Council, p. 2.

222 PIAC submission, p. 8.

Further, PIAC notes:

> Outside of SA, the actual level of USE could be much higher than it is and still remain within standard, implying that the MCP and CPT should be lowered.[223]

4.5 Analysis – Determination of level

This review has revealed that setting the level of the market price cap and the cumulative price threshold together is important for efficient market outcomes. Modelling conducted for the review has provided evidence for an optimal ratio, from a market outcomes perspective, between the two settings of approximately 15:1.

The market price cap and the cumulative price threshold collectively seek to limit market participants' exposure to high prices, temporarily and over a sustained period of time respectively. As caps on the prices that can apply in the wholesale market, it is their combined impact on potential generator revenue that should be considered in relation to allowing for efficient investment.

The Panel recognises the importance of considering the impacts of the market price cap on the appropriate level of the cumulative price threshold. However, on the basis that the Panel is recommending not to change the market price cap, we also recommend retaining the current level of the cumulative price threshold.

4.5.1 Historical approaches

Table 8 shows that, since its introduction to the national electricity market, the cumulative price threshold has been approximately 15 times the value of the market price cap (previously named the Value of Lost Load).[224] This approximate ratio of 15:1 has since been a working assumption rather than a formal requirement (see Box 4.1)

There appears to be stakeholder support for examining the levels of the market price cap and the cumulative price threshold jointly. ERMPower and Snowy Hydro both commented on the need to do so in their submissions to the issues paper. Engie's view appears to be that an assumed relationship should not be the basis of determining the level of the cumulative price threshold: 'the CPT should be set with reference to the level of risk the market can manage *in aggregate* and not simply as a function of the MPC'.[225]

223 PIAC submission, p. 5.

224 Before the cumulative price threshold was established, the administered price cap would be triggered by the occurrence of "force majeure events". NECA, *Administered price arrangements and force majeure*, April 1998.

225 Engie submission, p. 4, emphasis added.

Table 8: Historical market price cap and cumulative price threshold values

Year	Market price cap ($/MWh)	Cumulative price threshold ($)	Ratio (CPT : MPC)
1998	5,000	-	-
1999	10,000	-	-
2002	10,000	150,000	15:1
2010	12,500	187,500	15:1
2011	12,500	187,500	15:1
2012[226]	12,900	193,900	~ 15:1
2013	13,100	197,100	~ 15:1
2014	13,500	201,900	15.6:1
2015	13,800	207,000	15:1
2016	14,000	210,100	~ 15:1
2017	14,200	212,800	~ 15:1

226 The Reliability Panel recommended in the 2010 review of the Reliability Standard and Settings that the market price cap and cumulative price threshold were to be subject to indexation starting from 1 July 2012.

Box 4.1 Overview of historical levels of the cumulative price threshold

The cumulative price threshold was first set at $150,000 in December 2000.[227] At this level, the cumulative price threshold was 15 times the value of lost load of $10,000 determined by the ACCC (although the latter came into effect in 2002 after a two-year transitional period).[228] The cumulative price threshold of $150,000 meant that the administered price cap would apply after 7.5 hours of prices at the value of lost load. This approximate ratio of 15:1 has since been a working assumption rather than a formal requirement.

In 2008, the Panel lodged a rule change proposal that sought to formally define cumulative price threshold in the rules as 15 times the prevailing level of the market price cap (amongst other things).[229] The Panel argued that this ratio would allow for an efficient level of investment in electricity services, which is in the long term interest of consumers with respect to reliability, while providing an appropriate level of protection to such consumers through the prevention of extended periods of very high prices.

In its final determination, the AEMC deemed that while the cumulative price threshold should be increased in line with the Panel's proposal to an absolute level of $187,500 (equivalent to 15 times the market price cap at the time), the cumulative price threshold should not be "hard wired" to a ratio of 15 times the market price cap as the cumulative price threshold might be perceived as being consequential or subordinate to the market price cap.

The Commission considered that to define a constant ratio between the two variables would require more evidence that such a relationship is robust for all levels of the market price cap and cumulative price threshold. In addition, it reasoned that not formalising a ratio would ensure that, in future, the appropriate value of the cumulative price threshold would be considered in its own right rather than as a matter that is merely ancillary to the appropriate level of the market price cap. Nonetheless, both the market price cap and cumulative price threshold have been adjusted in line with the consumer price index since 2012, and the ratio between the two has remained roughly the same since.

227 See AEMC, *Comprehensive Reliability Review, Final Report*, 2007 and Australian Competition and Consumer Commission, *Determination Applications for Authorisation* VoLL, Capacity Mechanisms and Price Floor, 2000, p. iii.

228 The transitional period was 'to allow market participants sufficient lead-time to put in place the necessary arrangements to accommodate the increase in risk from a doubling of the VoLL (previously $5,000/MWh). Australian Competition and Consumer Commission, Determination Applications for Authorisation VoLL, Capacity Mechanisms and Price Floor, 2000, piii.

229 AEMC Rule change: NEM Reliability Settings – VoLL , CPT and Future Reliability Review, Final Determination (link).

4.5.2 Impacts of the market price cap on the cumulative price threshold

Modelling the Panel commissioned for this review has analysed how the market price cap impacts on the cumulative price threshold, and how the level of the cumulative price threshold influences the effectiveness of the theoretical optimal market price cap.

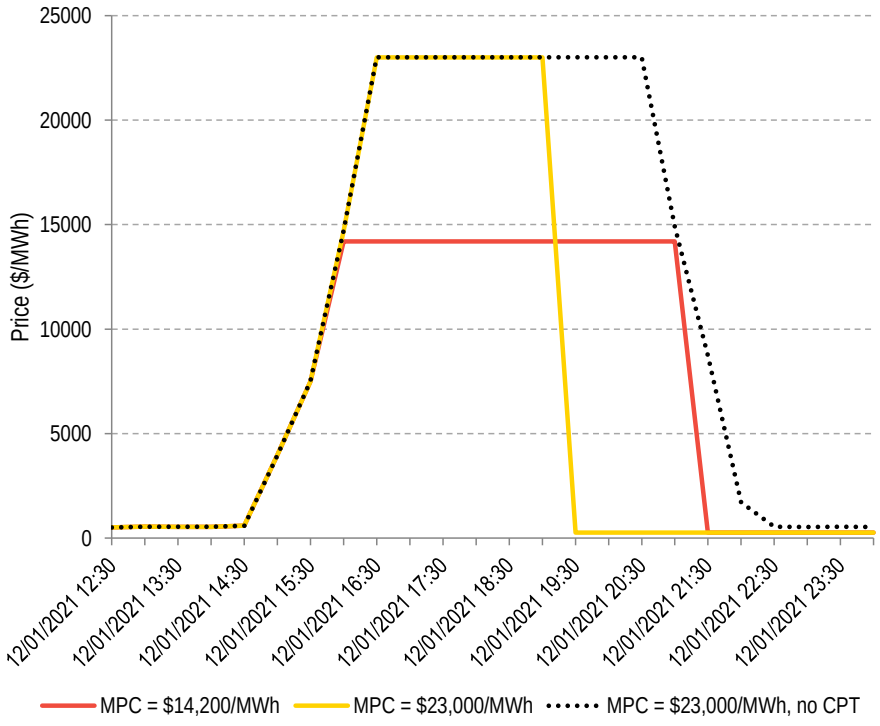
One high cost scenario investigated in Victoria suggested the need for a market price cap of $23,000/MWh to provide revenue sufficient to allow investment in the marginal OCGT and maintain unserved energy to below the reliability standard.[230] This market price outcome is well above the current setting of $14,200/MWh.

EY's analysis showed that:

> a significant contributing factor driving the very high MPC outcome …is the CPT setting, which triggers more frequently as the MPC increases. EY's analysis suggest that the efficacy of the MPC to efficiently incentivise market investment falls if the MPC is increased while keeping the CPT the same…[231]

To illustrate, Figure 11 (reproduced from the EY report) shows the market price outcomes for Victoria for a single 12-hour period.[232]

Figure 11: Price outcomes for Victoria in a single 12-hour period modelled in MPC Scenario 2, under different reliability settings[233]



230 See Table 6 in section 3.5.3.

231 EY report, p. 5.

232 Modelled in the market price cap Scenario 2, under different reliability settings

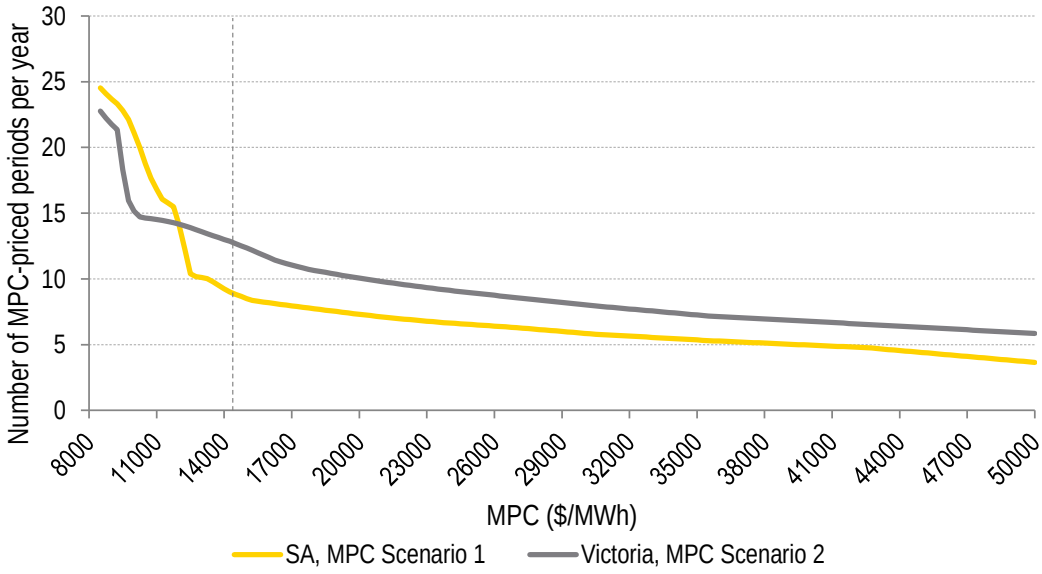
233 EY report, p. 44.

The chart shows that when the market price cap is increased from $14,200/MWh to $23,000/MWh, the number of MPC-priced periods is reduced from 11 to seven during this particular 12-hour period. This is because the cumulative price threshold is triggered four trading intervals earlier when the market price cap is $23,000/MWh, resulting in the price being set at the current level of the administered price cap of $300 (nominal) instead of the market price cap.

The reduction in the number of market price cap-priced periods, and the application of the administered price cap in their place, means fewer high price periods from which peaking / low capacity generators can recover revenue, significantly raising the level of the market price needed to deliver a certain revenue requirement.

Figure 12 is reproduced from the EY report and highlights the impact of a constant cumulative price threshold on the required level of market price cap.

Figure 12: Number of MPC-priced periods in SA for MPC Scenario 1 and Victoria for MPC Scenario 2 (with present settings for the CPT and APC, and for 10% POE demands only)[234]



EY assessed how increasing the cumulative price threshold in 5 per cent increments affected the theoretical market price cap for each scenario and sensitivity modelled. Table 9 presents those results.

234 EY report, p. 45.

Table 9: Exploring reductions in the theoretical optimal MPCs for each High cost sensitivity with increased CPTs if the MPC is higher than the current setting of $14,200/MWh[235]

MPC scenario	CPT	High	Cap defender	12% WACC	Half lifetime
MPC Scenario 1 (SA retirements)	Current	$8,900	$9,500	$21,000	>$50,000
	+5%			$17,000	$37,000
	+10%			$15,000	$30,000
	+15%			$14,000	$24,000
	+20%				$22,000
	+25%				$19,000
MPC Scenario 2 (VIC retirements)	Current	$23,000	$24,000	>$50,000	>$50,000
	+5%	$19,000	$20,000		
	+10%	$17,500	$18,000	$50,000	
	+15%	$16,500	$17,000	$42,000	
	+20%	$15,500	$16,000	$35,000	
	+25%	$14,500	$15,000	$32,000	$45,000

EY concluded that:

> If the reliability settings were to be revised, a moderate increase of 15% to both the MPC and CPT settings would be required. This equates to an MPC in the order of $16,500/MWh and CPT of $250,000 for the Period.[236]

4.5.3 Panel observations

The Panel recognises the importance of EY's outcomes for understanding how the level of the cumulative price threshold influences the effectiveness of the theoretical optimal market price cap, and therefore for setting the market price cap and the cumulative price threshold.

Optimal ratio

With respect to setting the ratio of the market price cap to the cumulative price threshold, EY comments that:

> The modelling suggests that maintaining near to the current ratio of 15 between CPT and MPC delivers a fair balance between limiting customer exposure to sustained high price events and sufficiently incentivising new entrant investment to maintain expected USE within the reliability standard.[237]

235 EY report, p. 47.

236 The figures presented are in June 2017 dollars. EY report, p. 6

237 EY report, p. 58

As outlined in chapter 3, the Panel is recommending to leave the market price cap unchanged from its current level in real terms for the review period. On that basis, and given the current 15:1 ratio of the market price cap to the cumulative price threshold, the Panel recommends not to change the level of cumulative price threshold in real terms.

Market integrity

This section discusses, for both the market price cap and the cumulative price threshold, the rules requirement on the Panel to only recommend a market price cap and cumulative price threshold that it considers will '[i]n conjunction with other provisions of the rules**, not create risks which threaten the overall integrity of the market**.'[238]

Prudential requirements

In relation to increasing the cumulative price threshold, the Panel notes EY's comments that increasing the cumulative price threshold may increase prudential requirements, increasing barriers to entry:

> A material matter is the setting of prudential requirements for market customers. Increasing the CPT may lead to a call for increasing credit support under the participant prudential settings. This may place customers under financial pressure, increase barrier to entry and reduce efficiency in the market…increasing the CPT could trigger an increase in credit support placing a financial burden on market customers.[239]

Impacts on the contracts market

In coming to a conclusion on the levels of the market price cap and cumulative price threshold, the terms of reference for this review require the Panel to consider:

> [H]ow changing the relevant reliability settings may affect price risk management behaviour, including potential impacts on contract markets, and how this may affect investment outcomes in the NEM.[240]

In the terms of reference the Commission articulated the key considerations as follows:

> Secondary contract markets are a key method used by [market] participants to manage their exposure to price risk in the NEM. These contracts may include over-the-counter type products, as well as exchange traded products. The reliability settings, particularly the MPC, will influence prices and liquidity in contract markets. A higher MPC creates additional price risk in the market. This may increase the demand for, and price of, risk management tools including contracts, depending on the strength of this signal compared to other factors relevant to the market generally. High contract prices for generators support investment in the NEM, as they provide the stable cash flows needed to underpin the high cost assets that supply consumer demand for energy.[241]

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238 Rules clause 3.9.3A(f).

239 EY report, p. 56.

240 Terms of reference are issued to the Panel by the Australian Energy Market Commission. AEMC, *Review of the reliability standard and settings - Terms of Reference*, 2017, p. 4.

241 AEMC, *Review of the reliability standard and settings - Terms of Reference*, 2017, p. 4.

EY also notes that:

> A change in the CPT may affect the optimal contracting position that a retailer or customer would seek to manage their risk…. There is an inherent link between the MPC and the CPT. The MPC places an upper bound on the price risk exposure of uncontracted electricity purchases for each trading interval. The CPT adds a mid-term limit (i.e., one week) to that level of exposure.[242]

The market price cap and cumulative price threshold may also impact on the liquidity in the contract market. As noted by EY, it is very difficult to assess the impact of changes to the market price cap and cumulative price threshold on the availability of contracts, as there is little data available on the options available for additional contracts under an altered price caps.[243]

EY modelling indicates that the theoretically optimal level of contracting is not affected by changes to the market price cap or cumulative price threshold at least over the limited range of values considered herein (i.e. 60 per cent market price cap increase or a plus or minus 20 per cent cumulative price threshold change):

> EY explored the potential impact on settlements for an uncontracted load and various levels of contracting under alternative CPT settings. For the case studies analysed EY found that the optimal level of contracting did not change with changes in the CPT up to ±20%.[244]

This suggests that within the limits of the levels examined, there would not be significant changes in the contracting position and price risk management behaviour from changes to the market price cap and cumulative price threshold.

The Panel considers that maintaining the market price cap and cumulative price threshold at the current level or increasing it in line with EY's suggestion would have no material impact on liquidity in the contract market as the optimal level of contracting would not change. As such, this is not a material consideration in the Panel's decision making.

4.6 Conclusion

The Panel considers that together the market price cap and the cumulative price threshold are serving their purpose of protecting market participants from excessive high prices. At the same time, they appear not to be interfering with the price signals required for investment to meet the reliability standard, and are likely to continue to allow for efficient investment through the review period.

In recognition of this, together with the need for stability in the market, and given the outcomes for modelled scenarios with assumptions more likely to match actual conditions over the review period, the Panel on balance considers the current market price cap should be retained from 1 June 2020. It follows, and based on the EY findings in relation to the influence of the cumulative price threshold on the market price cap, that the level of the cumulative price threshold should also remain unchanged.

242 EY Report, p. 14.

243 EY Report, pp. 14-15.

244 EY Report, p. 6.

5 CPI indexation of the market price cap and cumulative price threshold

This chapter describes:

- our draft recommendation on the use of CPI indexation
- the purpose of the CPI indexation
- the materiality threshold criteria that must be considered in deciding whether CPI should be used for the annual indexation of the market price cap and cumulative price threshold
- stakeholders' views
- why we consider the use of CPI for annual indexation should not be reassessed in this review.

5.1 Recommendation

The Panel's draft recommendation is that the use of CPI for annual indexation should not be subject to reassessment in this review (i.e. it should continue to be used) because there is not sufficient evidence that its reassessment may yield a material benefit.

5.2 Purpose of annual CPI indexation

The purpose of the annual CPI indexation of the market price cap and cumulative price threshold is to:

> preserve the real values of the market price cap and the cumulative price threshold over time. [245]

5.3 Criteria – Materiality

The guidelines establish that:

- The application of indexation to the market price cap and cumulative price threshold is not subject to review.
- At each review the use of CPI as the measure of indexation for the market price cap and cumulative price threshold is subject to a materiality assessment. The Panel will continue to use CPI to adjust both settings unless it considers there may be a material benefit in reassessing this approach.[246]

In making its decision, the Panel must consider factors including but not limited to:

- Whether there have been material changes in the basket of goods used to calculate the CPI that make it less relevant for indexation of the settings.
- Whether there have been changes in the methodology used to calculate the CPI.
- Whether a more preferable index has become available and/or there is a change in the designation of the CPI as an official statistic.

245 AEMC 2011, *Reliability Settings from 1 July 2012*, Rule Determination, 16 June 2011, Sydney p. i.

246 Guidelines, p 8 - 9.

- Any other relevant matter.[247]

If the Panel decides that there may be material benefit in reassessing the use of CPI for indexation, then the Panel would apply the provisions in the rules regarding its review.

5.4 Stakeholder submissions on the issues paper

The subject of CPI indexation was addressed in two of the seven submissions received on the issues paper: PIAC and Snowy Hydro.[248] The comments provided by PIAC and Snowy Hydro fall outside the scope of this review.

PIAC recommends the application of indexation should be reviewed as part of the 2018 Review:

> The question the Panel is to answer through this review is therefore whether a recommendation to change the reliability standard or (one or more of) the reliability settings would likely promote more efficient investment in and operation and use of electricity services, which would ultimately promote the long term interests of consumers with respect to price and reliability of supply of electricity and the reliability of the national electricity system.
>
> PIAC considers that leaving the application of indexation out of scope for the review limits the Panel's capacity to fully answer that question as posed.[249]

Snowy Hydro recommends indexing the market floor price:

> It is appropriate for the MFP to have an analogous methodology to that applied to the MPC. Snowy Hydro strongly recommends indexing the MFP to a lower value in line with the indexation of the MPC.[250]

We consider that both stakeholder comments are not within the scope of this review as established in the guidelines. The Panel notes that:

> [the] MPC and CPT are subject to annual indexation and the MFP and APC are not subject to indexation. This will not be opened for reconsideration in future reviews. [251]

Stakeholders did not suggest any alternative indices that could be used in place of CPI for either the market price cap or cumulative price threshold.

5.5 Analysis – Materiality

Issues paper

In the issues paper the Panel held the preliminary view:

> Both the market price cap and cumulative price threshold should continue to be adjusted using the same index and that both should remain indexed to CPI.

247 Guidelines, p.8.

248 Five of the seven organisations commenting on the issues paper did not address CPI indexation. They were Origin, the Australian Energy Council, EnergyAustralia, Engie and ERM Power.

249 PIAC submission, p. 7.

250 Snowy Hydro submission, p. 1.

251 Guidelines, p. 9

The Panel provided the following reasons to support this view:

- the continuing use of the CPI within business and for investment decisions and modelling
- the continued degree of stability and predictability of the CPI
- the impact of any long-term deviations of CPI from the actual cost of generation capacity is mitigated by the fact that reliability settings are reviewed every four years.[252]

The required matters for consideration in the guidelines are addressed below.

5.5.1 Any changes in the basket of goods used to calculate CPI

While weights associated with individual good and services categories are adjusted from time to time, there have not been any material changes in the basket of goods and services that make CPI less relevant for the indexation of the settings.[253]

5.5.2 Any changes in the methodology used to calculate CPI

There have been no significant changes in methodology since the last major review of CPI which was conducted in December 2011.[254] The next major CPI review will occur in December quarter 2017.[255]

5.5.3 Any changes in the designation of CPI as an official statistic

Neither the Panel nor stakeholders have identified a more preferable index. There has not been a change in the designation of CPI as an official statistic. [256]

252 Issues paper, p. 58.

253 The CPI is regularly updated to reflect changes in consumer buying habits, or shifts in population distribution and demographics. Australian Bureau of Statistics (ABS). 2017, http://www.abs.gov.au/websitedbs/d3310114.nsf/home/Consumer+Price+Index+FAQs#Anchor7, accessed 22 September 2017.

254 These major reviews provide an opportunity to reassess the scope and coverage of the index and other methodological issues.
ABS. 2017, http://www.abs.gov.au/websitedbs/d3310114.nsf/home/Consumer+Price+Index+FAQs, accessed 22 September 2017.

255 The ABS conducts a major review of the CPI approximately every six years to take advantage of data from the updated Household Expenditure Survey (HES). ABS. 2017, http://www.abs.gov.au/websitedbs/d3310114.nsf/home/Consumer+Price+Index+FAQs#Anchor7, accessed 22 September 2017.

256 The CPI is an important economic indicator used in formulating monetary policy and in a wide range of business, economic and social analysis and decision-making. ABS, 2017, http://www.abs.gov.au/Ausstats/abs@.nsf/0/CFFA42B90CA68CD2CA25765C0019F281?OpenDocument, accessed 22 September 2017

5.6 Conclusion

Following consideration of stakeholder submissions to the issues paper, there is no evidence to suggest that there would be material benefit in a reassessment of the use of CPI for the annual indexation of the market price cap and cumulative price threshold. The Panel notes:

- There has not been a material change in the basket of goods and services used to calculate CPI.
- There have not been any significant changes in the methodology used to calculate CPI.
- A more preferable index has not become available and there has not been a change in the use of CPI as an official statistic.
- The continued use of CPI brings stability and predictability.

6 The administered price cap

This chapter describes:

- our draft recommendation on the administered price cap to apply from 1 July 2020
- the purpose of the administered price cap
- the criteria for assessing the administered price cap in this review
- stakeholders' views
- why we consider the administered price cap should be reassessed in this review (i.e. our materiality assessment)
- why we consider the current level of the administered price cap should remain unchanged.

6.1 Draft recommendation

The administered price cap is not automatically reassessed every review cycle.

The Panel's draft recommendations regarding the administered price cap are that:

i. The administered price cap should be subject to reassessment in this review as there is sufficient evidence that it may yield a material benefit.

ii. An administered price cap of $300/MWh in nominal terms should apply from 1 July 2020.

6.2 Purpose

The administered price cap is one of the reliability settings intended to limit market participants' exposure to sustained high prices. It is the maximum settlement price that can apply when the total of all settlement prices over seven consecutive days exceeds the cumulative price threshold ($212,800 in 2017/18).

The purpose of the administered price cap is to:

> …cap participant exposure to the potential of what could otherwise be high prices during an administered price period, while maintaining incentives for participants to supply energy [during that period].[257]

The administered price cap is currently set at $300/MWh.[258]

6.3 Criteria – Materiality

The guidelines establish that the level of the administered price cap should be subject to a materiality assessment at each review to determine whether it should be reassessed. Unless the Panel considers there may be material benefit in reassessing the

257 Guidelines, p. 8. The administered price cap also sets the limit for the administered floor price which is set at negative of the value of the administered price cap. Rules clause 3.14.1(b).

258 Rules clause 3.14.1(a). The same administered price cap will apply in relation to ancillary service markets where the sum of the ancillary service prices in the previous 2,016 dispatch intervals exceeds six times the cumulative price threshold in the national electricity market.

administered price cap, its level should remain as previously determined.[259] In making its decision, the Panel must consider factors including but not limited to:

1. Significant changes in the typical short-run marginal costs of generators in the national electricity market.
2. Compensation claims since the last review.[260]

6.4 Criteria – Determination of level

If the Panel decides to reassess the level of the administered price cap, the criteria we would apply are the considerations established in the rules and the framework the Commission used in the last determination on the administered price cap (conducted in 2008).

There are no specific provisions in the rules on requirements that *must be met* in determining the level of the administered price cap. As with the other reliability settings, the Panel *must have regard to* the potential impact of any proposed change on:

- spot prices
- investment in the national electricity market
- the reliability of the power system
- market participants.[261]

The Commission's 2008 determination on the level of the administered price cap offers additional guidance on assessment considerations. When the administered price cap was last reviewed in 2008, taking submissions and the national electricity objective into account, the Commission formed the view that the level of the administered price cap should 'strike a balance' between a number of competing objectives. The administrated price cap was to be set:

- sufficiently low to ensure overall market integrity
- sufficiently high so that the expected frequency and magnitude of compensation claims are kept to the minimum
- sufficiently high so as not to distort the incentive for supplying electricity during an extreme market event when the administered price cap is triggered.[262]

The Commission's particular concern regarding the risk of systemic financial collapse was the potential financial failure of a generator (depending on their hedging contract positions) in the event that it breaks down, resulting in exposure to periods of sustained high prices. The financial failure of a generator would also affect market customers who

259 Final guidelines, p. 8.

260 Final guidelines, p. 8.

261 Rules clause 3.9.3A (e)(3)

262 AEMC 2008, *Clarification of Schedule for the Administered Price Cap, Final Report*, 30 April 2008, Sydney, p. vii, p. 7.

were counterparties to agreements with the generators, as they would face full spot prices for large components of their loads.[263]

The Commission considered the above three criteria met the national electricity objective.[264]

6.5 Stakeholder submissions on the issues paper

Three submissions to the issues paper discussed the administered price cap; those from EnergyAustralia, ERM Power and Snowy Hydro.[265]

EnergyAustralia and ERM Power outlined several issues the Panel should consider when it applies the materiality threshold criteria, and argued for a stable policy environment. More generally, EnergyAustralia and Snowy Hydro consider the Panel should keep the administered price cap at its current level. ERM Power is against raising its level.

EnergyAustralia

In relation to changes to the short run marginal cost of generators, EnergyAustralia considered that:

> In determining whether the materiality threshold has been met for a reassessment of the administered price, a key issue is whether this price is appropriate given current gas prices and the effect on costs for gas peaking plant. During the transition from the previous high levels of baseload coal generation, there is likely to be a greater reliance on gas powered generation and higher volatility. This may see gas generators exposed to longer periods of administered pricing.[266]

At the same time, EnergyAustralia discussed several other matters, arguing for keeping all the settings at their existing levels. These matters were that:

> …the current standard and settings strike a good match between providing the correct price incentives in the market for new generation, while not creating unmanageable risk of exposure to extreme prices.[267]

And:

> With the level of change being considered in the market at present it would be difficult to confidently assess the impact of changing the standard and settings.[268]

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263 AEMC 2008, *Clarification of Schedule for the Administered Price Cap, Final Report*, 30 April 2008, Sydney, p. 4.

264 AEMC 2008, *Clarification of Schedule for the Administered Price Cap, Final Report*, 30 April 2008, Sydney, p. 8.

265 Four of the seven organisations commenting on the issues paper did not address the level of the administered price cap. They were Origin, Engie, the Australian Energy Council and the Public Interest Advocacy Centre.

266 EnergyAustralia submission, p. 3.

267 EnergyAustralia submission, p. 1.

268 EnergyAustralia submission, p. 1.

Finally, that:

> …we consider that any reassessment needs to factor in that stability is both important for consumer outcomes while also providing an appropriate investment environment.[269]

ERM Power

In relation to the criteria regarding compensation claims, ERM Power comments that:

> In assessing the potential for the lodgement of compensation claims under this provision of the rules into the future, the Panel should consider that only a small component of this claim was associated with the participant's marginal cost of production and due to a significant level of controversy regarding the claim, rules changes occurred to more clearly detail the areas that may be claimed following the processing of the claim.[270]

Regarding changes to short run marginal costs criteria, ERM Power noted:

> We believe that in assessing the appropriate value for the APC the Panel should consider if a structural increase in normal marginal costs has occurred for the higher cost generators in the NEM...
>
> In assessing this, we believe it would be beneficial for the Panel to refer to an independent assessment of the marginal costs for generators such as that used by AEMO for modelling in the National Transmission Network Development Plan.[271]

ERM Power does not support an increase to any of the reliability settings:

> In this current world of uncertainty, ERM Power does not support an increase to any of the NEM Reliability Settings and believes any increase to the Market Price Cap (MPC), Cumulative Price Threshold (CPT) or Administered Price Cap (APC) would potentially lead to poor outcomes for consumers. An increase in any of these settings would only increase the risk to all participants of operating in the NEM and would lead to further and unnecessary price increase[s] to consumers at a time when many consumers are struggling with significant increases in electricity costs.[272]

Snowy Hydro

Snowy Hydro supports keeping the administered price cap at its current level:

> Snowy Hydro submits that…[t]he CPT should remain at 15 times MPC and the APC set at $300/MWh.[273]

269 EnergyAustralia submission, p. 2.

270 ERM Power submission, p. 7, emphasis added.

271 ERM Power submission, p. 7.

272 ERM Power submission, p. 2.

273 Snowy Hydro submission, p. 3.

6.6 Analysis – Materiality

6.6.1 Changes in short-run marginal costs of generators in the national electricity market

The relevance of short-run marginal costs

Considering changes in the typical short-run marginal costs of generators in the national electricity market is fundamental to evaluating whether a reassessment of the administered price cap may yield material benefit. As discussed in the issues paper:

> An administered price period is associated with an extended period of high prices. High prices are connected to a tightening of the supply demand balance as increasingly high cost generation capacity is dispatched to satisfy demand. Having an administered price cap that is too low will discourage high-cost generators from bidding into the market potentially resulting in high cost generators choosing to not make a unit commitment decision. This would reduce available generation and potentially delay removal of the administered price period and return to normal market operations.[274]

The purpose of the administered price cap is to limit market participants' exposure to sustained high prices; it becomes the cap on prices while an administered price period is in effect. It should therefore be sufficiently low so as to maintain the overall financial integrity of the national electricity market during an extreme market event. At the same time, it should be set sufficiently high so as to incentivise market participants to supply electricity during administered price events.[275]

For a generator to be willing to continue generating, the administered price cap need only be set at the level sufficient to cover the marginal cost faced by that generator. The level of the cumulative price threshold is set so as to balance the reduction in risk of market participants' exposure to extreme prices over **prolonged** periods while still allowing peaking generators to have a reasonable expectation of recovering their capital investment in the period prior to the cumulative price threshold binding.[276] This means that the level of the administered price cap need only cover the marginal cost faced by the generator in order for the generator to be left financially whole and willing to generate. It should be noted that the administered price cap serves only as a default value; generators can claim for compensation for the short run marginal costs that are incurred above the administered price cap.

Drivers of change to short-run marginal costs

As outlined in the issues paper, the short run marginal cost of generation generally includes:

- the incremental cost of the fuel required to produce one more MWh
- any non-fuel variable operating and maintenance costs (such as water, chemicals and ash disposal) and bringing forward of maintenance.

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274 Issues paper, p. 67.

275 Issues paper, p. 67. The objective of minimizing compensation claims is discussed in the subsequent section.

276 This is discussed in more detail in section 7.1 of the Issues paper.

The marginal generation technology will vary over time and as such the nature of the short run costs will also vary. For example, if the marginal generator was considered to be a battery, the short run costs would include electricity purchased for storage, the round trip efficiency impact, and any cyclic costs associated with a charge/discharge cycle for the battery technology chosen.

Additionally, even where the marginal technology remains unchanged, changes to fuel costs and variable operating and maintenance costs can affect a generator's short run marginal costs.

Issues paper

In the issues paper, the Panel supported a reassessment of the administered price cap given the potential for changes in the short run marginal costs of generation technology. Our view was based on the potential cost effects of underlying inflation and fuel price increases since 2008, the year when administered price cap was last reviewed.[277]

We highlighted the following factors as important when setting the optimal level of the administered price cap for this review period:

- The impact of gas supply uncertainty and future price volatility on gas turbine short-run marginal costs.
- Whether the marginal generation will remain an OCGT.

Stakeholder feedback and Panel outcomes

Stakeholder feedback supports the view that the materiality threshold criteria on significant changes to short run marginal costs has been reached.

ERM Power proposed that the Panel should commission an independent assessment of changes to short run marginal costs, focused on identifying structural – versus temporary – increases in normal marginal costs for higher cost generators.[278]

EnergyAustralia's comments confirm the potential import of current and future gas prices increases on the marginal costs of peaking gas plants:

> In determining whether the materiality threshold has been met for a reassessment of the administered price, a key issue is whether this price is appropriate given current gas prices and the effect on costs for gas peaking plant.[279]

No stakeholders disputed the possibility (outlined in the issues paper) of changes to typical short run marginal generator costs – of approximately 20 per cent or to between $350 and $400/MWh since 2008 – due solely to increases in the underlying inflation based on changes in the consumer price index.

After considering the potential for significant changes in the typical short run marginal cost of generators in the national electricity market, the Panel's view is that reassessing the administered price cap may yield material benefit.

277 Issues Paper, pp. 68 – 69.

278 ERM Power submission, p. 7.

279 EnergyAustralia submission, p. 3.

6.6.2 Compensation claims since the last review

The relevance of compensation claims

In deciding whether there may be a material benefit in reassessing the administered price cap, the Panel must also consider compensation claims since the last review.

As discussed in the issues paper:

> If the administered price cap is too low and a high cost generator is nevertheless dispatched, it has the option of pursuing a compensation claim to ensure it recovers all eligible costs. However, this is likely to be an expensive and time consuming process. As such, ensuring that the administered price cap is sufficiently high to minimise the likelihood of triggering a compensation claim is highly desirable.[280]

One of the competing objectives in setting the administered price cap is to have it sufficiently high so as to reduce the likelihood of compensation claims by market participants following the application of an administered price cap.

Issues paper

The issues paper outlined that while there has only been one compensation claim pursuant to the application of the administered price cap (the Synergen power claim in 2010)[281], the success of the claim shows that by 2010, there were at least some generators in the national electricity market with a short run marginal cost materially higher than the administered price cap.[282]

Stakeholder views and Panel outcomes

We note that ERM Power suggested care be taken in assessing the significance of the Synergen claim in regards to its short run marginal costs, as 'only a small component of this claim was associated with the participant's marginal cost of production' as demonstrated by the subsequent rule change.[283]

The expert panel report to the AEMC assessing the Synergen compensation claim noted that the elements included were the direct costs incurred less spot market income where direct costs were comprised of fuel costs, variable operating and maintenance costs, and any ancillary service costs levied against the generator.[284] This approach remains consistent with the current approach to assessing compensation as outlined in the Commission's revised compensation guideline.

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280 Issues paper, pp. 67-68.

281 This claim was successful as it was found that the legitimate costs incurred by Synergen Power had exceeded the amount received under the administered price cap and that compensation in the amount of $130,486.94 was payable. See http://www.aemc.gov.au/Markets-Reviews-Advice/Compensation-claim-from-Synergen-Power

282 Note that under the rules compensation is only payable to certain types of entities. For example, it is payable to scheduled and non-scheduled generators and scheduled network service providers to maintain the incentive for these parties to supply energy during an administered price period (rules clause 3.14.6(c)). It is not currently payable to entities that provide demand reductions.

283 ERM Power submission, p. 7.

284 Expert panel recommendations to the AEMC, *Assessment of Synergen's claim for compensation*. 18 August 2010, Section 5.

As such, the Panel considers that the success of the Synergen compensation claim does support the potential materiality of reassessing the administered price cap.

6.6.3 Materiality – conclusion

The Panel will review the administered price cap in this 2018 review as we consider its reassessment may yield material benefit.

6.7 Analysis – Determination of level

The Panel commissioned EY to estimate the theoretical optimal level at which the administered price cap could be set over the review period**.** EY concludes retaining the current administered price setting of $300/MWh.[285] EY undertook analysis of the short run marginal cost of existing generators in the national electricity market. This assessment determined that six of 19 candidate generators (low capacity gas turbine and liquid or dual fuel generators with relatively high short run marginal costs) will require a wholesale market price higher than the present administered price cap in order to recover their short run marginal cost throughout most of the review period. A further seven generators present short run marginal costs relatively close to the administered price cap.

The Panel recommends retaining the current administered price cap of $300/MWh for the review period, for the following reasons:

- **No increase in short run marginal cost** – based on the assumptions used, there does not appear to be strong evidence of a substantial, permanent increase since 2008 in the short run marginal costs of low utilisation generators.
- **Minimise costs to consumers** – costs to consumers can be minimised by using the compensation mechanism for those generators that are dispatched during an administered price period with a short run marginal cost above the administered price cap, rather than exposing all consumers to prices close to the highest short run marginal cost of generators.
- **Address fuel price volatility through compensation** – generators can recoup the real costs of temporary increases in fuel prices through compensation.
- **Promote predictability and stability** – leaving the administered price cap unchanged provides predictability and stability to the national electricity market, promoting efficient investment.

The Panel considers in the current context retaining a $300/MWh administered price cap reflects an appropriate trade-off between competing objectives, as explained in the following sections.

6.7.1 No substantial increase in short run marginal costs

From an economic perspective, an increase in the level of the administered price cap may be warranted if there was evidence of a significant increase in the typical short run marginal cost of the marginal generation technology.

The Panel signalled the potential for an increase in the short run marginal cost of OCGTs in the issues paper. However, this is not borne out by the EY assessment for

285 EY report, p. 6.

high cost OCGTs based on the assumptions used. EYs modelling confirmed that the highest marginal cost generators in the national electricity market continue to be OCGTs. There are currently 19 OCGT power stations in the national electricity market with the highest marginal costs, being those that potentially use liquid fuel and/or any particularly low efficiency gas-fuelled generator.[286] At present, all of these generators were assessed to have short run marginal costs under $300/MWh (June $2017).[287] By comparison, in 2008 the short run marginal cost of the six highest cost generators ranged from $258 – $307 ($2008/09).[288]

While the underlying assumptions regarding fuel prices differ, the Panel considers both sets of assumptions are appropriate for their respective periods of interest. The 2008 calculations appear to be based on a delivered liquid fuel price of $30/GJ[289], while EY based its assumptions on a delivered liquid fuel equivalent fuel price of $18/GJ, as provided by the Panel. This $18/GJ price is based on Australia's Institute of Petroleum's published average diesel wholesale price.[290] The lower current fuel price reflects the decline in traded oil prices to a recent range of USD50 to USD60 per barrel from around USD100 in 2008, reflecting the impact of the US shale gas and oil revolution that has dramatically increased world oil supplies in recent years.

The Panel considers that the expected magnitude and frequency of compensation claims with a nominal value $300/MWh (non-inflation indexed) administered price cap for the review period is reasonable, given the need to strike a balance with other competing objectives.

EY assessed that, based on modelling cost inflation assumptions out to 2024, six of the 19 candidate generators will require a market price higher than the present administered price cap throughout most of the period.[291] Therefore, if an administered price period were in place and those generators were dispatched during that period, six generators could be candidates for compensation.[292] In regards to magnitude of potential claims, EY notes that this represents less than 2 per cent of dispatchable capacity in the national electricity market. The Panel notes EY's results that a further

286 The Panel notes that it is not only high gas prices but also the potentially high cost of 'as needs' shipping, that may mean it is more economical for some peaking generators to use liquid fuel.

287 EY report, p. 19.

288 AEMC 2008, *Clarification of Schedule for the Administered Price Cap, Final Report*, 30 April 2008, Sydney, pp. 9-10.

289 ACIL Tasman, *Fuel Resource, New Entry and generation costs in the NEM, Report 2 – Data and documentation*, 6 June 2007, p45. The report states: '[w]e have assumed a $30/GJ price for petroleum products (constant in real terms) for each of the stations above which is reasonably consistent with the assumed international oil price of US$80/bbl in the long-term (roughly $1.20/litre of product).'

290 EY report, p. 17.

291 In the modelling study, the APC is kept consistent with today's nominal value of $300/MWh. As EY's market projections are in real terms, with a base of 1 July 2017, EY de-escalates the value such that it can be applied in real terms. Using an assumed CPI of 2.5%, the adjusted APC values are as follows: $278 (2020-21), $271 (2021-22), $264 (2022-23), and $258 (2023-34), in June 2017/$MWh, levels lower than the short run marginal cost of six candidate generators.

292 In 2008 the Commission determined in favour of the administered price cap that was below the estimated short run marginal cost of four generators' with a total capacity of 177 MW in 2008/09. AEMC 2008, *Clarification of Schedule for the Administered Price Cap, Final Report*, 30 April 2008, Sydney, pp. 9 - 10.

seven generators require a market price very close to the administered price cap by 2023-24.[293]

However, the modelling outcomes show that administered price periods (and thereby opportunities for compensation claims) are likely to be rare under normal market conditions. In all the iterations modelled for the most likely (base) scenario, EY forecasts the cumulative price threshold will be exceeded only four times during the review period, and states:

> Under normal market conditions, the CPT has a very low probability of being breached and therefore the application of the APC is highly unlikely.[294]

This is broadly consistent with historical experience whereby administered price periods are uncommon; there have only been five such periods since the inception of the national electricity market.

EY notes that, should the assumptions underpinning the market price cap scenarios be borne out in reality (for instance, high demand, significant thermal retirement and high technology costs), then the administered price cap could apply about 15 trading intervals per year in each of the modelled regions.[295] EY also highlights the administered price period is only likely to occur in one region at any point in time and therefore the relative impact on the market is contained to customers and generators in that region.[296] The Panel notes that this frequency of administered price periods reflects the potential upper bound of compensation, given the assumptions and also given the potential for claims depends on the particular generators dispatched. We do not consider this upper bound unreasonable in light of the other objectives that need to be balanced in setting the level of the administered price cap.

6.7.2 Minimising cost to consumers

The Panel recognises that minimising costs to consumers should carry particular weight in this review given, as articulated by ERM Power, 'many consumers are struggling with significant increases in electricity costs'.[297] Under the rules the Panel must consider the impact of any changes to the administered price cap on spot prices, and thereby the potential impacts on consumers.

The level of the administered price cap affects consumer prices as it is the maximum wholesale price faced by retailers during times of sustained high prices. The administered price cap, currently a fraction (just over 2 per cent) of the market price cap, limits wholesale prices.

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293 Progressively more generators require a price that is close to or exceeds the administered price cap throughout the Period. This is an outcome of all assumptions being held constant in real terms, while the present administered price cap is defined as nominal and thus declines in real terms.

294 EY report, p. 20.

295 EY report, p. 20. If the MPC is increased or decreased (but the CPT kept the same), the number of APC-capped periods also increases or decreases, respectively. These scenarios speak to the point made by EnergyAustralia about gas peaking plants exposed to longer periods of administered pricing. EnergyAustralia submission, p. 3.

296 The administered price cap can be applied to neighbouring regions if they are exporting electricity into the region where the administered price period applies. EY report, pp. 20-21.

297 ERMPower submission, p. 2.

Additionally, there is an inherent asymmetry in the cost impacts of the administered price cap on consumers as opposed to generators; all customer demand is exposed to the administered price cap while only generators whose short run marginal costs exceed the administered price cap are potentially impacted (through the risk of financial loss if their compensation claim is not successful). EY articulates the disproportionate impact of the level of the administered price cap on consumers as follows:

> [c]ompensation is based on only the extent to which the APC prevents a generator from receiving at least its SRMC from the wholesale market. However, all customer demand is exposed to the wholesale electricity market price. As such, the potential amount of compensation claimed will always be considerably less than the additional amount paid to the market if the APC was increased to cover the SRMC of all generators.[298]

Given these relative cost impacts, on balance the Panel considers it preferable to lessen customer exposure to extended high price periods by retaining the current administered price cap and requiring generators to lodge compensations claims for real costs incurred (as needed).

The Panel recognises the importance of setting the cap high enough so as to incentivise continued supply during an administered price period. We note EY's view that given the relatively low impact of the administered price cap on generators, retaining the administrative price cap's current level is unlikely to compromise the incentives to offer generation into the market.

6.7.3 Address fuel price volatility through compensation

The Panel proposes that volatility in fuel prices during the review period should be addressed through the compensation mechanism. EnergyAustralia reiterated that we should assess the impacts of higher gas prices on the costs of gas peaking plant in setting the administered price cap. The Panel recognises that fuel prices may exceed the $18/GJ assumption used in this review. However, we would consider such price increases to be temporary rather than structural. On this basis we propose to adopt the approach proposed by ERM Power:

> [T]here may be from time to time some level of short term volatility in marginal cost for these generators, in which case the APC should remain at its current level and the existing compensation provisions should be used to cover any short-term volatility in marginal costs.[299]

298 EY report, p. 20.

299 ERM Power submission, p. 7.

6.7.4 Promoting stability and predictability

Stability in market frameworks is important for promoting efficient investment in electricity services in the current environment.

The Panel is to be guided by the principle of providing a stable, predictable and flexible regulatory framework.[300] In EnergyAustralia's view, the Panel's reassessment should 'factor in' the importance of stability for consumer outcomes and investment.[301] ERM Power and EnergyAustralia both commented that any material benefits potentially derivable from changing the administered price cap are overshadowed by larger uncertainties in the investment environment. The Panel has not received sufficient evidence that changing the administered price cap would advance the national electricity objective.

6.8 Conclusion

Following consideration of stakeholder submissions to the issues paper, the Panel's view is that a reassessment of the administered price cap could yield material benefit.

Having conducted this reassessment, the Panel's draft recommendation is to retain the present administered price cap setting of $300/MWh. Informed by stakeholders' views and EY's assessment, we have given detailed consideration to: the expected short run marginal costs of high marginal cost, low utilisation generators; potential impacts on consumers; fuel price volatility; the benefits of stability in promoting efficient investment; the compensation framework; and the need to ensure continued supply during an administered price period. The Panel concurs with EY's conclusion that a $300/MWh administered price cap:

> …appears to strike a reasonable balance between limiting price risk for customers whilst limiting the risk of need for compensation to relatively few generator suppliers with an SRMC that exceeds this value.[302]

The Panel notes EY's comments on the potential future need of indexation of the administered price cap to address its effective decline in real terms. In 2016 the Panel determined that indexation of the administered price cap should not be considered in this and future four yearly reviews.[303] We hold that factors other than inflation may have a greater impact on the appropriate level of the administered price cap. The administered price cap can be reviewed every four years and as such can be adjusted if the Panel at that time so decides.

300 Final guidelines p. 3.

301 EnergyAustralia submission, p. 2.

302 EY report, p. 6.

303 Reliability Panel, Guidelines, p. 9: 'It is confirmed in these guidelines that MPC and CPT are subject to annual indexation and the MFP and APC are not subject to indexation. This will not be opened for reconsideration in future reviews.'

7 The market floor price

This chapter describes:

- our recommendation on the market floor price
- the purpose of the market floor price
- the materiality threshold criteria the Panel must consider in deciding whether the market floor price should be reassessed in this review
- stakeholders' views
- why we consider the market floor price should not be reassessed in this review.

7.1 Draft recommendation

The market floor price is not automatically reassessed every review cycle.

The Panel recommends the market floor price should not be subject to reassessment in this review (i.e. it should remain as previously determined) as there is not sufficient evidence that its reassessment may yield a material benefit. The Panel notes the market floor price will remain unchanged at -$1,000/MWh, from 1 July 2020.

The Panel will maintain a watching brief on the effect of the market floor price on the viability of storage technologies.

7.2 Purpose

The market floor price serves as the minimum acceptable bid price and therefore the minimum settlement price and is currently -$1,000 /MWh. The issues paper states that:

> [i]ts purpose is to prevent market instability by imposing a negative limit on the total potential volatility of market prices. The market floor price bears on the clearing of supply and demand at times of low demand and excess generation.[304]

As discussed in detail in section 7.5.2, during low demand periods there may be multiple generators competing to remain online (dispatched).[305] Generators are able to differentiate themselves according to the value they place on being dispatched by bidding at negative price levels. This allows the market to determine which generators should be turned off to maintain demand/supply balance. The market floor price should be set a level so that it does not interfere with this efficient outcome.

304 Reliability Panel, *Reliability standard and reliability settings review 2018*, Issues paper, 6 June 2017, p. 17.

305 Thermal generation units (such as coal and gas generators) incur significant costs when they are operated (cycled) at varying load levels in response to system demand, including on/off and low load.

7.3 Criteria – Materiality

The guidelines establish that, at each review, the level of the market floor price be subject to a materiality assessment. The level of the market floor price should remain as previously determined unless the Panel considers there may be material benefit in reassessing it.[306]

In making its decision, the Panel must consider factors including but not limited to:

- The number and frequency of trading intervals where the market price has been equal to, or has approached, the level of the market floor price.
- Whether there have been significant changes in the generation fleet, such that average generator cycling costs have changed significantly.[307]

7.4 Stakeholder submissions on the issues paper

The subject of the market floor price was addressed in four of the seven submissions received on the issues paper: ERM Power, EnergyAustralia, Engie and Snowy Hydro.[36] None of the four submissions commented on whether either of the two materiality threshold criteria had been met. Instead they outlined their support (or not) for the current level of the market floor price, and provided reasons for their views. Two stakeholders (ERM Power and EnergyAustralia) supported the current level. Engie stated the market floor price should be reviewed, but did not state a view on whether it should be raised or lowered. Snowy Hydro argued for a lowering of the market floor price. Their reasons are discussed below.

Reasons given for retaining the current market floor price

ERM Power

In relation to retaining the current market floor price, ERM Power considers that:

> The Market Price Floor (MPF) which is currently set at -$1,000 is sufficiently low for its intended purpose and ERM Power has not observed any changes in the market that would warrant a change to the value of the MPF and therefore does not support any change to its current value.

ERM Power has indicated they are not aware of sufficient evidence to justify changing the level of the market floor price. However, it does not specify the change(s) it would have deemed sufficient nor why. ERM Power also supports the view the Panel offered in the issues paper; that there may be merit in retaining the current market floor price level to provide regulatory certainty.

A further argument put forward by ERM Power for retaining the current market floor price relates to the compromised effectiveness of the reliability settings given current levels of uncertainty in the market and the provision of 'off-market subsidies, such as the Renewable Energy Target'. ERM Power considered that altering the level of any of the reliability settings may not translate to what the Panel expects would be positive changes in investment outcomes, given the current levels of market uncertainty.[308]

306 Guidelines, pp. 7 - 8.

307 Guidelines, p. 8.

308 ERM Power submission, p. 7.

EnergyAustralia

EnergyAustralia supports retaining the existing level of the reliability standard and all the reliability settings. It stated:

> the current standard and settings strike a good match between providing the correct price incentives in the market for new generation, while not creating unmanageable risk of exposure to extreme prices.[309]

EnergyAustralia's view is that the current level of the market floor price does not expose participants to unmanageable risk from low (negative) prices.

EnergyAustralia's submission echoes a sentiment expressed by ERM Power regarding the difficultly of the task of accurately assessing the potential impacts of changes to the reliability settings; noting that with the extent of change 'being considered in the market at present it would be difficult to confidently assess the impact of changing the standard and settings'.[310] The submission also promotes the importance of policy stability for consumer outcomes and investment.[311]

Reasons given for reviewing the market floor price

Engie

Engie proposes the market floor price be reviewed, but does not provide a view on whether it should be raised or lowered. The submission states that:

> The impact of the current arrangements is that the burden of reducing output falls on conventional plant and yet this plant is also relied upon to provide market services such as inertia and system strength.
>
> …generators providing a range of system services are being financially penalised and are likely to reduce the number of available plants.[312]

Engie considers that to 'maintain equity between participants, technological neutrality and economic efficiency' arrangements for 'dealing with excess generation' need to be examined. Engie recommends that the Panel review the market floor price and also 'initiate a review of the whole market arrangement dealing with excess generation'.[313] Arrangements of concern include:

- That semi-dispatchable wind is curtailed in dispatch only in the event of network constraints.
- Pricing policies (such as subsidies and fixed feed-in tariffs) for renewable technologies.

309 EnergyAustralia submission p. 1.

310 EnergyAustralia submission, p. 1.

311 EnergyAustralia submission, p. 2.

312 Engie submission, p. 5.

313 Engie submission, pp. 4-5.

- Absence of financial recognition for the provision of system security services.[314]

Reasons given for lowering the market floor price

Snowy Hydro

Snowy Hydro supports a lowering of the market floor price, for a range of reasons. Arguing:

> … increased intermittent generation will require the MFP to be progressively negative so as to allow economic cycling.
>
> The large potential hourly variation of wind means firm generators will be required to more frequently cycle for short intervals.[315]

Snowy Hydro appears to be arguing that the market floor price should be lower (ie. more negative) to allow more efficient signalling of the cost of cycling.[316] Other reasons given for a lowering of the market floor price include:

- Setting the market floor price low enough to ensure that thermal plant stay on line to ensure these provide important ancillary services such as system inertia.[317]
- To avoid generation being constrained off and as a result not being able to sell hedge products' given market price cap indexation in line with rises in the CPI.[318]

Snowy Hydro also proposes the Panel set the market floor price using a new method that:

> entail[s] assessing what level the MFP has to be to encourage new entrant technologies that could alleviate excess generation. These technologies may be pump storage, storage batteries etc. The concept is that the MFP has to be sufficiently low to provide an appropriate pricing signal to these new entrant technologies.[319]

Snowy Hydro is proposing the Panel align the methodology for setting the market floor price with that of the market price cap, that is, a move away from cycling cost approach to assessing what level of market floor price is required to encourage investment in new technologies (loads) that would ensure excess generation is absorbed. Snowy Hydro also suggests that the market floor price should in future be indexed in a manner similar

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314 Engie also states that "Battery storage technologies may assist to further *hinder the operation of the NEM* during excess generation periods depending on the price signals and control arrangements for storage technology." p. 5, emphasis added.

315 Snowy Hydro submission, p. 6.

316 Snowy Hydro submission, p. 5. Earlier on the same page, Snowy Hydro provides an excerpt of the one hour cycling costs for the 2014 Review and states it 'believes ROAM's analysis, which indicates that the current MFP is approximately at the right level, continues to be appropriate.'

317 Snowy Hydro submission, p. 7.

318 Snowy Hydro submission, pp. 6 - 8.

319 Snowy Hydro submission, p. 7.

to the market price cap. The reasons given are increased intermittent generation and the static level of the market floor price level since its inception.[320]

7.5 Analysis - Materiality

7.5.1 Occurrences where the market price has been, or has approached, the market floor price

Analysis of the occurrence of low price events is fundamental to evaluating if there may be material benefit in reassessing the level of the market floor price. As mentioned earlier:

> The market floor price…limits market participant's exposure to very low, negative prices and total market price volatility so as to prevent market instability. In setting the market floor price, the principle to be observed is that it should not interfere with efficient outcomes being achieved.[321]

Examining the recent incidence (and trends) of negative price events can indicate the extent to which the current negative bound of the floor price allowed generators to sufficiently differentiate themselves according to the value they place on remaining dispatched.[322] From an economic perspective, a greater incidence of trading intervals in which the market floor price is reached could imply the need to lower (make more negative) the market floor price to satisfy the principle of not interfering with the efficient operation of the market.

Influences of the market floor price on generator behaviour

The market floor price influences a number of important behaviours in the national electricity market, including:

- strategic re-bidding, where the market floor price forms the lowest possible negative price at which constrained-off generators rebid capacity, in order to maximise dispatch[323]
- the ability of generators with alternative revenue streams (for example, renewable energy certificates or hedge contracts) to rebid capacity at negative prices to maintain dispatch.

The Panel acknowledges these two interactions with the market floor price. However, in both cases, the interaction with the market floor price is a function of there being a market floor price, rather than the specific level of the floor price. Any such issues

320 Snowy Hydro submission, p. 1.

321 Issues paper, p. 72.

322 Issues paper, p. 72.

323 While a dispatch price is determined for each five minute dispatch interval, settlement - the transfer of money for electricity supplied to the market and consumed by end users - is calculated on a 30 minute basis (i.e. for each trading interval). The settlement price is the time-weighted average of the six dispatch prices that occurred during any given trading interval. Participants are settled on the basis of the half hourly settlement price and their aggregate production or consumption during the respective half hour.

should be addressed through policy measures rather than changing the level of the market floor price.

Issues paper

The position presented in the issues paper was there has not been a sustained increase in the low price events (lower than -$900/MWh) over recent years and that, therefore, there is insufficient evidence to indicate that the existing level of the market floor price is interfering with efficient market outcomes. The study in the issues paper of low price events revealed that since 2012 there has been:

- No sustained trend in the total number of low price events.[324]
- An increasing proportion of low price events occurring in the same trading interval as a high price event (>$12,000/MWh), such that in 2016 over 40 per cent of trading intervals with a low price event occurred in conjunction with a high price event.[325]

Setting aside low price events occurring in the same trading interval as a high price event —on the basis that they are likely to reflect strategic re-bidding[326]— the key findings were that:

- There has been no sustained increasing trend in the number of low price events driven by an excess of generation.
- Low price events appear more evenly dispersed throughout 2016 than they were in 2012, suggesting that low price events are isolated events, from which the market quickly returns to normal.[327]

Stakeholder views on the issues paper

None of the four submissions commented explicitly on the number of low price events. However, ERM Power concurred with the view that there were no changes in the market that warranted a change to the market floor price. On the question of whether the market floor price should be raised (for instance given the current incidence of low price events) EnergyAustralia considered the current level did not expose market participants to unmanageable risk (an argument against raising it). Neither Engie nor Snowy Hydro commented on the incidence or frequency of low price events.

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324 Issues paper, p. 75.

325 Issues paper, pp. 75-76.

326 Strategic re-bidding is observed when generators attempt to maximize dispatch following a price spike event leading to excess generation supply. It arises from the misalignment of operational dispatch and settlement. A recent example of strategic re-bidding in the national electricity market occurred on 8 November 2016 during the trading interval ending 3.30pm, following a trip of three generators at the Braemar 2 Power Station in New South Wales. In the first dispatch interval, the price reached the market price cap. In the second and third dispatch intervals prices returned to normal levels as generation started to come online in response to the price. In the fourth and fifth dispatch intervals prices approached zero as generators attempted to maximise dispatch. In the sixth dispatch interval, the price fell to the market floor price as further generation entered the market. The trading price in New South Wales for the trading interval was $2,191/MWh.

327 Issues paper, pp. 76 - 77.

Analysis

Market prices at or approaching the market floor price have been analysed to understand whether there have been issues associated with efficiently clearing excess generation.

The conclusions set out in the issues paper were based on data available up to 7 March 2017. We have updated this analysis to include outcomes up to 18 October 2017, but our conclusions remain unchanged. Namely:

- There has not been a *sustained* increase in the number of dispatch intervals with low price events (less than -$900/MWh), Figure 13. The number of low price events in 2016 and 2017 has been:
  - higher than in the period from 2013 to 2015, but
  - markedly lower than in the period from 2010 to 2012.
- The materiality threshold criteria focus on examining low prices during *trading intervals*. In the past eight years, there has not been a clear increase in either of the following:
  - *The number of trading intervals that include a low price event (see Table 10, second row)* – the total for 2017 seems unlikely to reach the levels seen in 2010 and 2012.
  - *The number of trading intervals with low price events driven by excess generation (see Table 10, fourth row)* – there has not been a sustained increase over time in the number of low price events that occur in a trading interval unaccompanied by a high price event. In 2017 there have been 33 such events, which is well short of the number seen in 2010 and 2012.

These conclusions are current as of 18 October 2017.

Figure 13: Low price events in the national electricity market (2007- 18 October 2017)

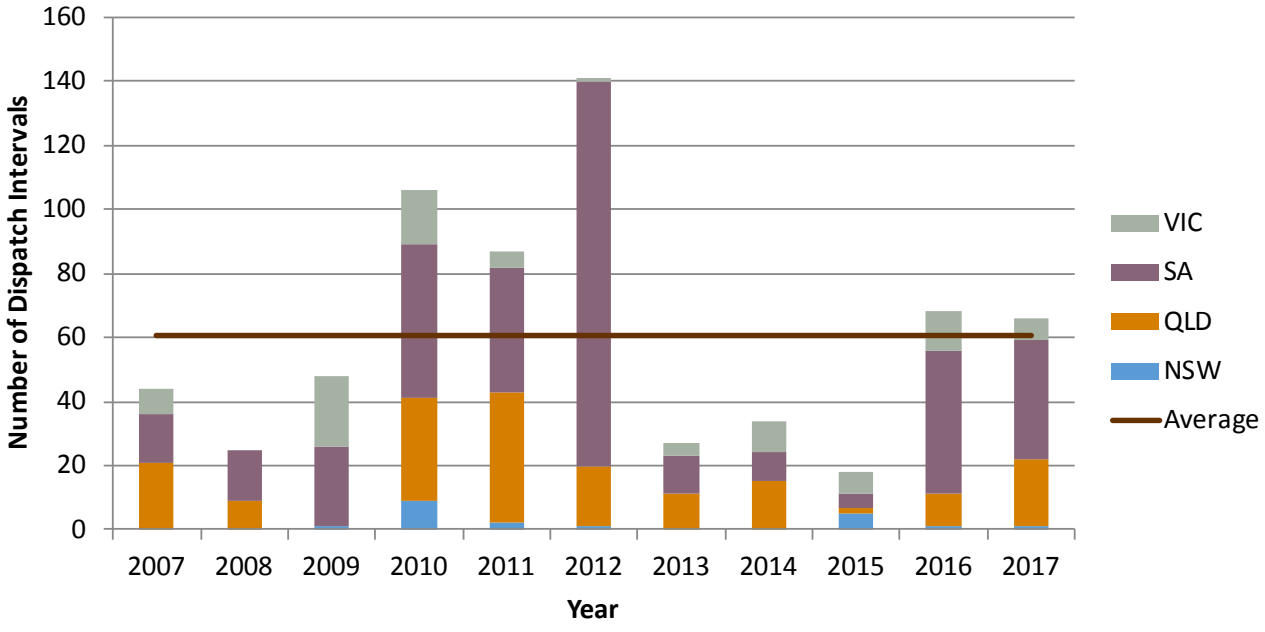


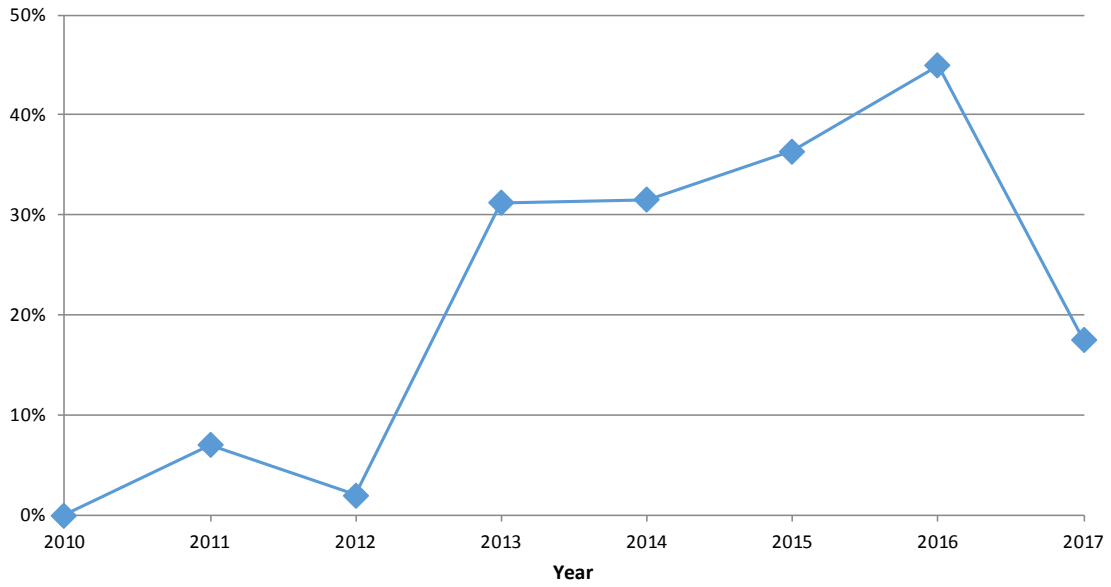
Table 10: Low and high price events in the national electricity market (1 January 2010 – 18 October 2017)

	2010	2011	2012	2013	2014	2015	2016	2017
No. of trading intervals with a high price event	7	35	18	72	57	108	114	119
No. of trading intervals with a low price event	50	43	50	16	19	11	40	40
No. of trading intervals with a low and high price event	0	3	1	5	6	4	18	7
No. of trading intervals with a low price event without a high price event	50	40	49	11	13	7	22	33

Figure 14 shows the proportion of trading intervals containing both a low price event and a high price event from 1 January 2010 to 18 October 2017. This proportion has decreased in 2017 year-to-date versus 2016.

In other words, in 2017 low price events are generally occurring because of excess generation, rather than generators responding to high prices. This does not alter our conclusions, but is worthy of note.

Figure 14: Share of low price trading intervals that include a high dispatch interval price



7.5.2 Changes in the generation fleet impacting generator cycling costs

Cycling costs, negative bids and market efficiency

The Panel is required to consider whether there have been significant changes in the generation fleet, such that average generator cycling costs have changed significantly. This materiality threshold relates to the principle of setting the market floor price at a level that should not interfere with achievement of efficient market outcomes.

Thermal units incur considerable costs when they are required to cease generation or are operated at varying levels ('cycled') in response to system demand.[328] By allowing generators to bid at negative price levels, the market determines which generators remain dispatched in periods of excess generation (to avoid cycling costs) and which should be turned off to maintain demand/supply balance. Generators use negative bids to differentiate themselves according to the value they place on being dispatched and avoiding cycling.

If the market floor price was not at a sufficiently low level to allow thermal generators with different cycling costs to differentiate themselves through their negative bids, a lower (more negative) market floor price would in theory, reduce distortion and enable the market to clear without intervention for a larger proportion of the time. This matter was explored in the previous section through an examination of the number and frequency of low price events.

In relation to changes in the generation fleet, the issues paper explained that:

> A significant change in the nature of the generation fleet such that *the range of generator cycling costs had decreased* could result from the retirement of ageing thermal units. Generators would be able to use bids to differentiate themselves (according to the value they place on being dispatched), over a narrower price range. Holding all other factors constant, this would imply the need to raise (make less negative) the market floor price so that participants do not bear unnecessary risk; tightening the price envelope and reducing potential volatility.[329]

Issues paper

The analysis in the issues paper concluded that the cycling costs have not materially changed since the 2014 Review. Key points discussed were:

- Adoption of cycling costs from 2012 for the 2018 Review was recommended by Oakley Greenwood and actioned by AEMO in the *2016 National Transmission Development Network Plan*.

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328 As stated in the issues paper, the incremental costs attributed to cycling fall into the following categories: increases in maintenance and overhaul capital expenditures; forced outage effects, including forced outage time, replacement energy, and capacity; cost of increased unit heat rate, long-term efficiency and efficiency at low/variable loads; cost of start-up fuels, auxiliary power, chemicals; and additional manpower required for unit start-up. APTECH Engineering Services, 'The Cost of Cycling Coal Fired Power Plants', Coal power magazine, Winter 2006, accessed at http://www.pserc.cornell.edu/empire/100_coalpowerwintermag16-20.pdf. Hydro, solar and wind generators have negligible cycling costs

329 Issues paper, p. 74.

- The future withdrawal over time of the ageing thermal generators may narrow the range of generator cycling costs in the national electricity market.
- The per cycle cost of some conventional thermal units may increase due to more frequent cycling given the growth in intermittent renewable technologies.

Stakeholder views on the issues paper

Snowy Hydro was the only stakeholder to discuss cycling costs in response to the issues paper. Snowy Hydro states that the analysis for the 2014 Review of the cost requirements of for each cycling class for one hour cycling 'continue to be appropriate'.[330] However, it proposes that the high penetration of intermittent renewable generation, particularly wind in South Australia, necessitates a lower market floor price. Snowy Hydro states:

> At times of high wind, intermittent technologies continue to run even if there is excess generation. South Australia, which is sourcing almost half of its electricity from intermittent generation, was the state which achieved the highest frequency of low price events in 2016. A lower market floor would be required to allow more efficient signaling of the cost of cycling. We note that the MFP has been -$1,000/MWh since December 2000 despite significant changes in the energy market.
>
> The increased intermittent generation will require the MFP to be progressively negative so as to allow economic cycling….The large potential hourly variation of wind means firm generators will be required to more frequently cycle for short intervals.

Snowy Hydro's key argument for a lower market floor price is that the market floor price needs to be lowered to allow for stronger market signals to ensure the market allows sufficient scope for generators to differentiate themselves; and thus both allow high cycling cost generators to be dispatched and signal the value of new load such as storage.

Analysis

The ROAM report for the 2014 Review expressed the efficiency principle relating to the level of the market floor price this way:

> The efficient operation of the market allows generators with the highest cycling costs to continue to operate during periods of low demand.[331]

For the 2014 Review, which reassessed the level of the market price cap, ROAM found that the generators with the highest cycling costs for startup/shutdown would still be incentivised to cycle if the price floor of -$1000/MWh was sustained for one hour (rather than solely for a five minute interval).[332] This means, it makes economic sense for these high cycling cost generators to incur the costs associated with cycling rather

330 Snowy Hydro submission, p. 5.

331 ROAM consulting, R*eliability Standard and Settings Review, Modelling approach*, Final report, report to the AEMC, Brisbane, 2014, p. 12.

332 ROAM consulting, R*eliability Standard and Settings Review, Modelling approach*, Final report, report to the AEMC, Brisbane, 2014, pp. 65-69.

than remain generating and pay a price of -$1,000/MWh for an hour. Table 11 from ROAM's final report shows the range of market floor price required within each cycling class for one hour cycling to be beneficial.[333] In other words, this table shows the negative prices that would need to be reached for different generator classes such that these generators, from an economic standpoint, would prefer to cycle rather than pay the spot price for an hour. Considering the existing level of the market floor price, the Panel recognised prices can already fall sufficiently low to give an economic signal to every generator (from the lowest cost to cycle to the highest cost to cycle).

Table 11: Market floor price requirement for 1 hour cycling

Cycling Class	Minimum MFP	Maximum MFP
Small sub-critical coal	-594	-299
Large sub-critical coal	-758	-342
Supercritical coal	-674	-444
CCGT	-240	-81

The costs of startup/shutdown for large coal fired generators (which incur the highest costs of startup/shutdown) are a function of their design and will not have moved greatly from the values determined in 2014. More frequent cycling is unlikely to increase the cost per cycle (although it would increase the total costs associated with cycling). Gas fired plants have a lower cost of cycling and their owners may prefer a less negative floor price for competitive advantage, such that the ability of market prices to send economic signals is diminished and these gas generators are not required to cycle.

A further reason provided by Snowy Hydro for lowering the market floor price is that conventional plant needs to cycle for shorter periods due to the growth of intermittent renewable technologies. The argument appears to be that a lower (more negative) price floor would better reflect the economic costs of shorter shutdown periods. As outlined above, the costs associated with paying the current market floor price are expected to exceed the costs of any plant to shut down for an hour. A shut down period of less than one hour in duration (say 30 minutes) is not possible for large coal fired units, the technology with the highest cycling costs, as the shutdown and startup procedures would then overlap in time. Even one hour is likely to be less than the achievable cycle time for hot starts of large units. Hence, it is practically impossible to incentivise large coal fired units to cycle for shorter periods than one hour.

The optimal operation of the market requires that generators with the smallest negative breakeven points should cycle off first, thus reducing the need for others with much more negative breakeven points to cycle. This should be the desired efficient market outcome. The case for adopting a lower market floor price is therefore not justified as the current level of the market floor price does not impede the efficient cycling of generators - it allows thermal generators with different cycling costs to sufficiently differentiate themselves through their negative bids.

333 The ROAM table was reproduced in the Snowy Hydro submission.

This analysis addresses the concern raised by Snowy Hydro that the market floor price should be set low enough to ensure that thermal plant can stay on line to ensure they can provide important ancillary services such as system inertia.

7.5.3 Other matters

A number of other matters warrant consideration in the Panel's evaluation of whether there may be material benefit in reassessing the market floor price, either because the Panel raised them in the issues paper and/or they were raised by stakeholders in response to the issues paper. Some of these factors are addressed in this section:

- policy stability and uncertainty
- effect of the market floor price on the viability of storage technologies.

There were several matters that Snowy Hydro and/or Engie proposed that the Panel consider which are being addressed by the AEMC in other work programs and/or are outside the scope of this review. These matters are discussed in Appendix A:

- changing the methodology from a cost of cycling approach to a method analogous to the market price cap to provide appropriate price signals to new entrant (storage) technologies
- non-scheduled and semi-scheduled status of renewable generation
- pricing policies (such as subsidies and fixed feed-in tariffs) for renewable technologies
- absence of financial recognition for the provision of system security services.[334]

Stability and predictability

The guidelines stipulate that in making its decision, the Panel is to be guided by the principle of providing a stable, predictable and flexible regulatory framework.[335]

With present levels of uncertainty in the market, providing stability to market participants may support efficient investment and operational decisions by participants. This was a view supported by ERM Power and EnergyAustralia. EnergyAustralia stated that:

> Stability is more beneficial to consumers until such time as the distortionary effects of policy instability are reduced.[336]

334 Engie also states that 'Battery storage technologies may assist to further *hinder the operation of the NEM* during excess generation periods depending on the price signals and control arrangements for storage technology.' Engie submission, p. 5.

335 Guidelines Determination, section 2.

336 EnergyAustralia submission, p. 2.

Several stakeholders also commented that any material benefits potentially derivable from reassessing the settings including the market floor price are overshadowed by larger uncertainties in the investment environment. For example, EnergyAustralia notes that:

> [M]ultiple factors, other than price, are creating large distortions in the appropriate signals that are impeding the effectiveness of the standards and settings to drive investment.
>
> With the level of change being considered in the market at present it would be difficult to confidently assess the impact of changing the standard and settings.[337]

Origin commented that 'adjustment to the reliability standard and settings cannot be effectively and efficiently used as a means of addressing some of the underlying issues facing the market'.[338]

A number of stakeholders support the Panel setting a high standard for the strength of evidence before reassessing the market floor price. The adequacy of the overall market and regulatory frameworks in supporting a reliable supply of electricity as the power system transforms to include more variable, intermittent generation and demand-side innovation, will be examined in the AEMC's Reliability frameworks review.

Effect of the market floor price on the viability of storage technologies

Storage can affect the market's ability to clear during times of low demand

Since the last review of the reliability settings, there have been significant changes in the national electricity market. Among these is the emergence of a range of low-cost energy storage technologies.

Storage devices can be valuable at times when there is excess generation. During a period where there is excess generation (and prices are negative), storage technologies can charge and so increase the headroom for generation to remain online. The stored energy can be discharged later when there is more demand (and prices are positive) yielding a profit to the owner of the storage device.

The availability of storage can therefore affect the ability of the market to clear during low demand periods. It follows that the availability, cost, and financial viability of storage are relevant to the setting of the market floor price, given that the stated purpose of the market floor price is to:

> … allow the market to clear during low demand periods, while preventing market instability by imposing a negative limit on the total potential volatility of market prices.[339]

Consideration of storage in the setting of the market floor price

Storage technologies are very different from other forms of generation. They do not produce energy – indeed they are net consumers of energy – but rather shift its

337 EnergyAustralia submission, p. 1.

338 Origin submission to the Issues Paper, p. 1.

339 Guidelines, p. 8.

availability from one-time period to another. As a result, storage does not have any single unit cost of producing energy – the cost depends on the price of energy at the time of charging.

The market floor price is therefore an important parameter for sending price signals to storage technologies. In the same way that a *higher* market price cap increases the profitability of conventional generators, a *lower* market floor price can increase the profitability of storage technologies.

To provide value at times of excess generation, storage technologies must be able to offer a cheaper alternative than cycling conventional generation. The process for setting the market floor price should therefore consider cycling costs of conventional generation, costs of operation of storage, and indeed anything that bears on the ability of the market to clear during low demand periods.

At this stage, as indicated by the analysis there is no evidence that the current level of the market floor price is distorting the efficient clearing of market at times of low demand. However, as storage technology continues to mature, we anticipate that consideration of the interplay between storage and cycling of conventional generation will become increasingly important to the setting of the market floor price.

7.6 Conclusion

Following consideration of stakeholder submissions to the issues paper, the Panel considers there is no evidence that there may be a material benefit in reassessing the market floor price in the 2018 Review. Market floor price events (and low price events more generally) related to excess generation occur infrequently in the market, with 2016 and 2017 estimated to be close to the average for the past eight years. Nor is there evidence that changes in the generation fleet are causing a significant change in the range of generator cycling costs.

Abbreviations and defined terms

AEMC/Commission	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
APC	Administered price cap
CCGT	Closed cycle gas turbine
COAG	Council of Australian Governments
CPI	Consumer Price Index
CPT	Cumulative price threshold
ESB	Energy Security Board
ESOO	*Electricity Statement of Opportunities*
EY	Ernst & Young
EY report	EY, *Reliability Standard and Settings Review 2018, Modelling Report, DRAFT*, November 2017, Brisbane
FCAS	Frequency Control Ancillary Services
Guidelines	*Review of reliability standard and settings guidelines, final guidelines, 2016*
Guidelines determination	*Review of reliability standard and settings guidelines, final determination, 2016*
Issues paper	*Review of reliability standard and settings, issues paper*
LOR	Lack of reserve
MFP	Market floor price
MPC	Market price cap
NEM	National Electricity Market
OCGT	Open cycle gas turbine
Panel	Reliability Panel
PV	Photovoltaic

Review	*Review of reliability standard and settings, 2018*
Review period	1 July 2020 – 1 July 2024
Rules	The National Electricity Rules
SRMC	Short run marginal cost
USE	Unserved energy
WACC	Weighted average cost of capital

A Appendix – Summary of stakeholders' comments on the issues paper

Stakeholder comments: Modelling			
Stakeholder	**Issue raised**	**Panel response**	**Ref no.**
Australian Energy Council (AEC), p.2	• The modelling should take into account past and anticipated market changes including: further retirement of coal fired generation; increasing intermittent generation; recommendations of the Finkel Review; behind the meter battery storage; wholesale market design changes including an inertia ancillary services market and five minute settlement; higher gas prices and demand interaction.	Noted and addressed. The modelling commissioned by the Panel has addressed anticipated market changes including future retirement, increasing intermittent generation and behind the meter battery storage. The Panel regards modelling future rule changes and some policy developments as problematic. Our approach to addressing potential and future policy changes is outlined in chapter 1. In relation to ancillary markets, the interaction between the energy and ancillary markets are not considered for this Review. Revenue from ancillary services markets has not been modelled for the RSSR review as the reliability settings are primarily driven by outcomes in the energy market, due to its relative size. (The revenue generators currently earn for providing ancillary services is small compared to revenue from electricity sales. In 2015, the total value of FCAS in the NEM was $112 million, being 1.4 per cent of the $8.3 billion traded on the energy market in the NEM.)	1.
EnergyAustralia, p.3	• Modelling should consider in particular, outcomes at peak demand times, times of network constraints or supply shortages. • EnergyAustralia agrees that the modelling should consider the "growing disconnect between reserve, demand and price and the increasing penetration of intermittent energy resources".	Noted and addressed. The modelling commissioned by the Panel addresses the factors raised by EnergyAustralia, for example it has run sensitivities and scenarios using high demand forecasts, it models network constraints and has run sensitivities in relation to generator outages.	2.
EnergyAustralia, p.4	• Modelling future changes to the NEM and related impacts on financial markets should be done in a transparent manner.	Noted and addressed. The EY report articulates the modelling approach used to address potential changes in the NEM and financial market impacts.	3.

Engie, p.5	• The cap defender approach is highly distortionary and misprices generation output. • Modelling should model caps at their expected value based on a model without cap contracts in place • Modelling should assume that cap contracts may serve to smooth costs and revenues but should not assume that contracts change behaviour.	Noted and addressed. The Panel has not used the cap defender approach in this review. In regards to the modelling approach to cap contracts, cap contracts (and all other contracts) affect participant behaviour and the incentive to exercise short-term market power.	4.
ERM Power, p.8	• ERM believes that the Panel should publish its cost input assumptions used in the modelling prior to the commencement of the modelling. Achieving agreement on those key assumptions would be a good way to avoid some of the disagreements that would arise with regards to the modelling outcomes.	Noted. The Panel considered and agreed to the assumptions prior to the modelling commencing. Stakeholders will have an opportunity to provide input on the assumptions through this round of consultation.	5.
ERM Power, p.8	• Modelling should consider the Finkel review recommendation requiring intermittent generators to provide controllable output.	Noted. The Generator Reliability Obligation was not considered in the modelling as the recommendation is not at the stage of an agreed, detailed policy. This is being considered through the Commission's Reliability Frameworks Review.	6.
ERM Power, p.8	• The value of retirement should not exceed the value placed on new investment.	Noted. No direct relationship has been established in advance between the value of retirement and the value of new investment. Rather, the modelling approach used is to calculate the revenue required for every generator individually (both for existing and new entrant investment) based on assumed capital and operating costs.	7.
ERM Power, p.2, 5	• A NEM-wide approach should be taken to assessing the potential changes in the relationship between high price events and demand, and the individual causes of past events should be analysed on a case-by-case basis. • It should be acknowledged that demand response is occurring well below the MPC.	Noted and addressed. The modelling results enabled a NEM-wide view of the relationship between high price events and demand. The EY report outlines how demand-side participation (both non-disclosed and disclosed) has been incorporated into the model, including in relation to the MPC.	8.
ERM Power, p.3	• A number of gas-fired intermediate and peaking duty generators have dual fuel (both gas & liquid) capability.	Noted and addressed. The Panel considered dual-fuel plants in relation to the level of the APC and fuel prices used for the MPC scenarios.	9.
Public Interest Advocacy Centre, p.6	• The Panel should undertake an interim review in 2020 in light of extensive market developments between now and the end of the review period in 2024.	Noted. The modelling approach addresses emerging trends and uncertainties in the market. Additionally, the Panel recognises there are policy developments currently being considered that could impact on the required reliability settings.	10.

		Additionally, AEMO is scheduled to review the VCR. The Panel will consider appropriate responses to these developments in its final report. While the Panel can see benefits in an interim review prior to 2022, we also note it may introduce additional uncertainty to entities seeking to make investment decisions, offsetting some of the potential benefits.	
Snowy Hydro, p.7, 8	• The modelling should take into account: increasing levels of intermittent output; higher gas prices; interaction between prices and demand; removal of firm generation; increased penetration of batteries behind the meter and; possible wholesale market design changes (inertia ancillary services market).	Noted and addressed. See Panel comment #1.	11.

Stakeholder comments: Reliability standard			
Stakeholder	**Issue raised**	**Panel response**	**Ref no.**
EnergyAustralia (p.1,2), Engie	• Support for the reliability standard to be kept at current level.	Noted and addressed. The Panel considers that there would be no material benefit in reassessing the level of the reliability standard, and so the draft recommendation is to retain the reliability standard at its current level.	1.
Australian Energy Council (AEC), p.1	• Concerns with AEMO's VCR report: self-evident age of the report, the small sample size, exclusion of high-profile customers and inadequacy in capturing low probability but high impact supply interruptions. • AEC believes that the VCR needs to be reviewed in light of technology and market changes, as well as reliability issues.	Noted. The Panel notes AEC's concerns with the VCR report. However, it considers that AEMO, rather than the Panel, would be best placed to conduct a review of VCR. The publication of a new AEMO VCR study in 2019 could be a trigger for the Panel to consider a future reassessment of the reliability standard at or prior to the next four yearly review, if the study reveals material changes in VCR. Stakeholders did not present any other measures of VCR that may be more appropriate for the Panel to consider. See the analysis section of chapter 2.	2.
EnergyAustralia, p.1,2	• Does not consider it likely that threshold for reassessment has been met. • Stability is more beneficial to consumers until such time as the distortionary effects of policy instability are reduced. • Considers that highlighting the potential costs to consumers of embedding a higher reliability standard would be useful in guiding governments and regulators when they seek to intervene.	Noted and addressed. The Panel considers that there would be no material benefit in reassessing the level of the reliability standard, on the basis of factors including stability and the costs of a higher reliability standard. See the analysis section of chapter 2.	3.

Engie, p.2	• Supports keeping the reliability standard at its current level. • Economically the standard is a pragmatic benchmark. However if there is not a consensus policy direction then a trading arrangement other than the Energy Only Market will be needed.	Noted and addressed. The Panel considers that there would be no material benefit in reassessing the level of the reliability standard, and so the draft recommendation is for the reliability standard to remain at its current level.	4.
ERM Power, p.3, 4	• Do not believe change in reliability standard is warranted at this time. • The changes in how consumers use electricity in regards to new technology are only just starting to emerge, so any forecasts of changes in customer reliance on the grid may be subject to significant revision. • Regarding VCR: There are significant levels of demand management, either via consumption reduction or behind the meter generation, which are readily observable at times where a RRP exceeds values as low as $5,000/MWh. This indicates that some consumers are prepared to accept lower supply reliability from the grid in return for lower cost outcomes. Also, regional VCRs were not a fixed value but reduced with the length of a supply interruption, suggesting VCR may not be a static number but decrease as the level of unserved energy (USE) increases. • Note that primary consideration for customers installing batteries is to allow a continuation of reliable supply following the loss of grid supply, and integrated battery and solar PV installations are permitted to be installed to achieve this outcome (contrary to what is stated in the Issues Paper that behind the meter batteries still rely on grid supply).	Noted and addressed (points 1 -3). The Panel considers that there would be no material benefit in reassessing the level of the reliability standard, and so the draft recommendation is for the reliability standard to remain at its current level. See chapter 2 for discussion of points two and three. The Panel considers that the expected uptake of battery systems that can operate independently of an energised grid is unlikely to be sufficiently high such that a large number of consumers place a lower value on reliable supply from the grid during this review period. See the analysis section of chapter 2 for a detailed discussion.	5.
Origin, p.1	• Origin supports the Panel considering the appropriateness of the reliability standard in a manner that weighs the cost of any additional generation and interconnection capacity against the cost of unserved energy. • They agree with the Issues Paper that for a change to the reliability standard to be considered, there would need to be significant variance between the Panel's VCR and that calculated by AEMO under its 2014 study.	Noted. As the Panel is not proposing to review the reliability standard, the points raised by Origin cannot be actioned. See the analysis section of chapter 2	6.

Public Interest Advocacy Centre, p.2	• PIAC supports current reliability standard and does not see merit in moving away from the value of 0.002% USE at this time. • PIAC agrees with the Panel's assessment that many batteries aren't currently able to operate in islanded mode, but that this may change with technology innovation and more deployment.	Noted and addressed. The Panel considers that there would be no material benefit in reassessing the level of the reliability standard, and so the draft recommendation is for the reliability standard to remain at its current level. In regards to batteries, see analysis section of chapter 2.	7.
Snowy Hydro, p.2	• Believe USE figure should not change, especially in the event of short-term withdrawal generators returning to market.	Noted and addressed. The Panel considers that there would be no material benefit in reassessing the level of the reliability standard, and so the draft recommendation is for the reliability standard to remain at its current level.	8.

Stakeholder comments: Market price cap			
Stakeholder	**Issue raised**	**Panel response**	**Ref no.**
Australian Energy Council (AEC), p.1	• The MPC should be reviewed in light of the recent increase in use of AEMO directions powers. AEC notes that since 1st Dec 2016, AEMO has issued generator directions seven times. AEMO is also seeking expressions for the supply of reserve contracts as a Long Notice Reliability and Emergency Reserve Trader. • Supports a modelling approach that examines the impacts of recent changes in the market on the level of the market price cap.	Noted and addressed. In the past year AEMO has issued five interventions relating to the scarcity of energy or FCAS. As part of its review, the Panel has considered these interventions and whether they have any consequences for recommended setting of the MPC and the CPT. See section 3.5.1 and Appendix E. The modelling approach addresses emerging trends and uncertainties in the market. See section 1.4.	1.
EnergyAustralia, p.2	• There is an inherent stability benefit from not changing the MPC. • The recent history of AEMO directions should be examined. However, as many of them relate to system security, they do not necessarily indicate that the MPC are working as intended. • The MPC should be set at a level that ensures a strong level of participation in financial markets. It should also be set to ensure sufficient investment in generation capacity. • The MPC should be set to provide suitable investment signals while preventing unmanageable long term prices.	Noted and addressed. The Panel recognises setting the level of the MPC involves making a trade-off between protecting market participants' exposure to high prices and allowing for efficient price signals in the wholesale market. Also, the level of the market price cap should allow the market price to create incentives for participants to manage price risk. The Panel has recognised the benefits of stability in recommending no change to the MPC, and has considered the relevance of recent AEMO interventions (chapter 3) and potential impacts on the contract market (chapter 4).	2.
Engie	• The MPC should be set with reference to: - a 'two-sided market' and should not be set as a mechanistic derivative of VCR; - impact on demand response; - plant life and WACC; - changing load/demand shape; - gas supply arrangements; - transmission risks and non-firm transmission rights; - intermittent and dispatchable generation;	Noted and addressed. See EY's modelling report on methodology used for market price cap analysis and the assumptions underpinning the market price cap scenarios.	3.

	- storage; and - the capital cost of existing plant (that may require refurbishment) and not just new entrant plant.		
Engie	• A lower MPC will result in less contracting by reducing demand for contracts.	Noted. The Panel's draft recommendation is that the MPC remain unchanged. The impact of changes to the MPC and CPT on contracting is discussed in Chapter 4.	4.
Engie	• The MPC should be set at the level determined from modelling plus an uncertainty margin	Noted. See EY's modelling report for detail on how uncertainty has been considered in the modelling approach. The Panel considered the level of the market price cap in the context of an uncertainty margin through WACC of 10 per cent and 12 per cent, and reduced asset life of plant, but is proposing not to recommend an increase to the market price cap. See Chapter 3.	5.
ERM Power, p.3,4	• A higher MPC would not have avoided the involuntary load shedding event in SA on 8 Feb 2017. ERM believes that according to AEMO's report on the matter, this should be dealt with by improving the quality of AEMO's forecast.	Noted and discussed in section 3.5.1.	6.
ERM Power, p.3	• ERM notes that a number of the gas fired intermediate and peaking duty generators in the NEM have dual fuel (both gas and liquid) capability. In assessing the impact of gas prices and secure gas supplies on electricity price outcomes, ERM considers that even at a relatively high gas or liquid fuel price of $30/GJ, which is above the price outcomes observed in the winter of 2016, the equivalent generator marginal cost remains sub $450/MWh, which is well below the current MPC value.	Noted. A number of cost sensitivities were considered in the market price cap modelling scenarios and with high gas price also used ($18/GJ). The $18/GJ price is based on Australia's Institute of Petroleum's published average diesel wholesale price (see section 6.7.1). The Panel also notes that the market price cap is set at a sufficiently high level such that generators have the potential to recover their capital costs not just marginal operating costs.	7.
ERM Power, p.5	• While the MPC acts a default bid, ERM believes that it is possible to observe that price sensitive loads do in fact reduce consumption at prices as low as $5000/MWh. These loads are not scheduled and their price sensitivity is therefore not visible to the market.	Noted. While both demand side participation and pumped storage projects have the potential to reduce unserved energy, EY considered that there is 'insufficient information on the cost of implementing new demand side participation or pumped storage projects to comment on the potential for these types of projects to become a marginal source of reducing unserved energy to within the reliability standard' (EY report, p. 16).	8.
ERM Power, p.6	• ERM challenges the Issues Paper claim that increasing the MPC may increase generators' incentives to contract. ERM believes	Noted and examined. See contracts discussion in section 4.5.3.	9.

	that increasing the MPC may reduce the supply of contracts, as generators may decrease their exposure to the contacts market to avoid unfunded CFD payments arising from a rise in a contracted generator risk exposure from unplanned outages.		
ERM Power, p.7	• ERM believes that the MPC, CPT and APC need to be set together.	Noted and addressed. The optimal market price cap has been examined as has been the impact of various administered price cap levels on the market price cap. See section 4.5.2 of this report and section 6.3 of the EY report.	10.
Origin, p.2	• The task of determining the MPC is more challenging than in previous reviews. While the MPC is important in providing efficient price signals for future investment, other important factors such as the lack of a sound and coherent policy framework, continues to be the primary issue dampening investor confidence. The Panel should be cognisant that changing the MPC and other settings cannot effectively and efficiently be used as a means of addressing some of the underlying issues facing the market. • The Panel should examine recent instances of when AEMO has used its intervention powers and the reasons for AEMO doing so. It should not be assumed that AEMO's intervention is due to reliability issues.	Noted. The Panel is proposing to recommend leaving the MPC unchanged in part in recognition of the need for stability. AEMO interventions: noted and addressed. See section 3.5.1.	11.
Public Interest Advocacy Centre, p.1,2	• PIAC believes that 2014 modelling showed that the current MPC delivered a far smaller USE than 0.002% in all states except SA, and that therefore, the MPC and CPT has not been lowered sufficiently in the past. PIAC believes that the wholesale market is being ' "gold plated" with a much higher level of reliability than consumers are prepared to pay for'.	Noted. The Panel notes the actual level of generation capacity in the market at any point in time reflects historical investment in long life assets, together with the impact of the investment signal sent by the reliability settings and other policies such as feed in tariffs for roof top solar PV and Large-scale Generation Certificates (LGC or LREC). The settings are not intended to be a tool for signalling generation to leave the market. Critically, the MPC is a maximum setting for prices. In circumstances where there is excess generation capacity in the market, it would be expected that average whole market prices would be lower than where there is a tighter supply demand balance irrespective of the level of the MPC.	12.

Public Interest Advocacy Centre, p.3	• The MPC is no longer setting signals for new investment, particularly in light of other factors such as "fuel prices, renewable energy incentives, and the lack of long term carbon policy". • The MPC should focus more on managing the risk exposure of market participants, particularly in light of strategic bidding behaviour and gaming by generators.	Noted. The Panel notes that in almost all circumstances, the MPC does have a marginal impact on investment and capacity and notes the broader uncertainty in the market. The Panel has focused on the role the MPC serves in managing risk exposure. The use of strategic bidding and wider market issues are beyond the scope of this review and being addressed through other work streams.	13.
Public Interest Advocacy Centre, p.4	• Demand response is viable at a price level that is much lower than the MPC. • Setting the MPC or CPT to incentivise new generation would appear to be misguided. The price of DR should be considered as an alternative to capacity.	The Panel notes that demand response should be included as a factor in forecasting demand. See comment 8.	14.
Public Interest Advocacy Centre, p.4	• Any demand response procured by AEMO through the RERT should not be considered "AEMO intervention" for the purposes of setting the MPC or CPT.	The Panel disagrees. The AEMC is required to set the standard, based on a recommendation from the Panel. The Panel's recommendation is required to consider the RERT as an AEMO intervention (rules clause 3.9.3(f)(1)).	15.
Public Interest Advocacy Centre, p.4	• The creation of new markets (including markets for ancillary services) means that potential capacity can recover costs through means other than the energy market. This should be reflected in the valuation of the MPC and CPT	Noted. The modelling for this review has not incorporated revenue from existing and future ancillary service markets. The EY report explains: 'The revenue generators currently earn for providing ancillary services is small compared to revenue from electricity sales. In 2015, the total value of FCAS in the NEM was $112 million, being 1.4 per cent of the $8.3 billion traded on the energy market in the NEM. The 2018 Review tasks are focussed on the reliability settings in the NEM. These settings are primarily driven by outcomes in the energy market due to its relative size. For this reason the interaction between the energy and ancillary markets are not considered for this Review. ' EY report, section 7.1.1.	16.
Public Interest Advocacy Centre, p.6	• MPC and CPT should vary by region. This will incentivise investment in generation capacity in particular regions.	Noted. The Guidelines state that only the level of the MPC and CPT is to be examined in this review. Consideration of varying the MPC/CPT by region is outside the scope of this review. See Guidelines pp. 6 - 7, and Guidelines determination, pp. 26 - 27.	17.

Public Interest Advocacy Centre, p.6	• The contract market is a means to an end. It should only be preserved to the extent that it serves the long-term interests of consumers.	Noted and addressed. Assessment of the impacts on the contract market has been undertaken subsequent to the modelling to ascertain the theoretical optimal MPC.	18.
Public Interest Advocacy Centre, p.6	• The indexation of the MPC and CPT is supported except when there are reasons to believe that the MPC and CPT should decrease over time. The indexation of the MPC and CPT appears to create a kind of ratchet effect leading only to ever higher settings for the MPC and CPT.	Noted. The application of indexation per se to the MPC is not subject to review.	19.
Snowy Hydro, p.1	• Snowy supports the current framework for determining the MPC. • The MPC should continue to be indexed to CPI.	Noted.	20.
Snowy Hydro, p.4	• There is no evidence that the MPC at current level is not providing sufficient incentives for new investment. Available evidence shows that the MPC has been a signal for new investment and has allowed the reliability standard to be met without AEMO intervention (i.e. Directions and the use of the RERT).	Noted and addressed. The Panel is proposing to leave the MPC unchanged.	21.

Stakeholder comments: Cumulative price threshold			
Stakeholder	**Issue raised**	**Panel response**	**Ref no.**
Australian Energy Council (AEC), p.1	• The CPT should be reviewed in light of the recent increase in use of AEMO directions powers. AEC notes that since 1st Dec 2016, AEMO has issued generator directions 7 times. AEMO is also seeking expressions for the supply of reserve contracts as a Long Notice Reliability and Emergency Reserve Trader	Noted and addressed. The Panel has examined the reasons for AEMO's interventions and whether they indicate a need for changing the MPC or CPT See section 3.5.1 and Appendix E.	1.
EnergyAustralia, p.2	• There is an inherent stability benefit from not changing the CPT.	Noted and addressed. The Panel is proposing to leave the CPT unchanged.	2.
EnergyAustralia, p.2	• The recent history of AEMO directions should be examined. However, as many of them relate to system security, they do not necessarily indicate that the CPT is working as intended. • The CPT should be set to provide suitable investment signals while preventing unmanageable long term prices.	Noted and addressed. See comment (1) in relation to the Panel's examination of AEMO interventions. The Panel considers retaining the current CPT will provide suitable investment signals while preventing unmanageable long term prices.	3.
Engie, p.4	• The MPC and CPT should be decoupled. CPT should be set with reference to the risk tolerance of the market as a whole.	Noted. The Panel has considered the EY modelling outcomes that shows the MPC and CPT are inherently linked and should be set together.	4.
Engie, p.4	• The CPT should be set to ensure that it does not undermine the MPC or truncate "peaking plant" revenue during "extreme events"	Noted and addressed. The Panel has considered the influence of the MPC on the CPT, and their combined impacts on revenue.	5.
ERM Power, p.3,4	• A higher CPT would not have avoided the involuntary load shedding event in SA on 8 Feb 2017. ERM believes that according to AEMO's report on the matter, this should be dealt with by improving the quality of	Noted and addressed. The Panel has examined the reasons for AEMO's interventions and whether they indicate a need for changing the MPC or CPT, including the 8 February event. See section 3.5.1.	6.

	AEMO's forecast. The presence of spare capacity in the form of Pelican Point reinforces this belief.		
ERM Power, p.6	• There is little reason to increase the CPT. Historically; the CPT has not been triggered particularly often in the energy market.	Noted and addressed. The Panel is proposing to leave the CPT unchanged.	7.
ERM Power, p.6	• The recent increase in the CPT being triggered in FCAS markets in SA reflects a set of temporary and local circumstances. There is no reason to increase the CPT at present.	Noted and addressed. The Panel is proposing to leave the CPT unchanged.	8.
ERM Power, p.7	• ERM believes that the MPC, CPT and APC need to be set together.	Noted and addressed. The Panel has considered the level of the MPC in relation to the CPT and also examined how varying the APC affects the optimal MPC. See section 4.5.2 and the EY report section 6.3.1.	9.
Public Interest Advocacy Centre, p.1,2	• PIAC believes that the CPT has not been lowered sufficiently in the past, and that the wholesale market is being '"gold plated" with a much higher level of reliability than consumers are prepared to pay for'.	Noted. The Panel notes PIAC's concern that if the market price cap is set so as to result in a level of expected unserved energy far lower than the reliability standard, then the market price cap may be set 'too high'. The issue is discussed in section 3.5.3, *the market price cap and consumer prices*.	10.
Public Interest Advocacy Centre, p.4	• Demand response is viable at a price level that is much lower than the MPC. • Setting the MPC or CPT to incentivise new generation would appear to be misguided. The price of DR should be considered as an alternative to capacity.	Noted. The method for considering demand response in this review is discussed in section 3.5.3. The MPC/CPT are to be set so as to allow for sufficient investment through price signals in the market, not to incentivise investment.	11.
Public Interest Advocacy Centre, p.4	• The creation of new markets (including markets for ancillary services) means that potential capacity can recover costs through means other than the energy market. This should be reflected in the valuation of the MPC and CPT	Noted. See response in Chapter 3.	12.

Public Interest Advocacy Centre, p.6	• MPC and CPT should vary by region. This will incentivise investment in generation capacity in particular regions.	Noted. See response in Chapter 3.	13.
Public Interest Advocacy Centre, p.6	• The contract market is a means to an end. It should only be preserved to the extent that it serves the long-term interests of consumers.	Noted and addressed. See response in Chapter 3.	14.
Public Interest Advocacy Centre, p.6	• The indexation of the MPC and CPT is supported except when there are reasons to believe that the MPC and CPT should decrease over time. The indexation of the MPC and CPT appears to create a kind of ratchet effect leading only to ever higher settings for the MPC and CPT.	Noted. The Panel notes that the MPC and CPT are subject to annual indexation and the MFP and APC are not subject to indexation. (See guidelines pp. 8-9).	15.
Snowy Hydro, p.1	• Snowy supports the current framework for determining the CPT. • The CPT should remain at 15 times MPC.	Noted and addressed. The Panel is proposing to leave the CPT unchanged at approximately 15 times the MPC.	16.
Snowy Hydro, p.3	• The CPT has only be activated on 5 occasions which provides a clear indication that it is set at the right level.	Noted and addressed. The Panel is proposing to leave the CPT unchanged at approximately 15 times the MPC.	17.

Stakeholder comments: Administered price cap			
Stakeholder	**Issue raised**	**Panel response**	**Ref no.**
EnergyAustralia, p.3	• As part of materiality assessment a key issue is whether the APC is appropriate given current gas prices and the effect on costs for gas peaking plant. During the transition from the previous high levels of baseload coal generation, there is likely to be a greater reliance on gas powered generation and higher volatility. This may see gas generators exposed to longer periods of administered pricing.	Noted and addressed. In supporting a reassessment of the APC, the Panel factored in the potential for changes in gas prices and availability to impact on the costs of gas peaking plant. The assessment of the APC then considered the short run marginal costs over the review period of high marginal cost, low utilisation generators. The MPC scenarios examined the frequency of CPT events, and the impact of increases to the MPC on generators' exposure to periods of administered pricing. See Chapter 6. EY's modelling has examined the number of cumulative price threshold events	1.
ERM Power, p.2,7	• Does not support an increase to any of NEM reliability settings as this may lead to poor outcomes for consumers. • In assessing the potential for the lodgement of compensation claims under this provision of the rules into the future, the Panel should consider that only a small component of the one past claim was associated with the participant's marginal cost of production. Also, due to a significant level of controversy regarding the claim, rules changes occurred to more clearly detail the areas that may be claimed. • Would support a review of the APC if there is evidence of a structural increase in normal marginal costs has occurred for the higher cost generators in the NEM. • In that the CPT and APC work together to limit participants' financial exposure to the wholesale spot market during prolonged periods of high prices, that the APC is also interrelated to the MPC and CPT and these three setting should be reviewed together.	Noted and (largely) addressed. The Panel: • is making a draft recommendation that the level of the APC remains unchanged • addressed ERM Power's comments on the need to assess structural changes in marginal costs • assessed the MPC, CPT and APC together • differed from ERM Power, on its views regarding the marginal costs associated with the Synergen compensation claim.	2.
Snowy Hydro, p.5	• Supportive of leaving the administered price cap at current level	Noted and addressed. The Panel's draft recommendation is that the APC remain at its current level.	3.

Stakeholder comments: Market price floor			
Stakeholder	**Issue raised**	**Panel response**	**Ref no.**
EnergyAustralia, p.3	• Does not consider there is likely to be material benefit in reassessing the market price floor.	Noted. The Panel agrees that there would not be material benefit in a reassessment of the level of the market price floor.	1.
Engie, p.5	• The Panel should initiate a review of the whole market arrangement dealing with excess generation.	Noted. The Panel notes this could be addressed in the AEMC's current Reliability Frameworks Review.	2.
Engie, p.5	• Pricing policies (such as subsidies and fixed feed-in tariffs) for renewable technologies are inequitable for conventional plant.	Noted. The Panel considers these policy issues are outside the scope of the 2018 Review.	3.
Engie, p.5	• Non-responsiveness of wind generation to wholesale spot prices and the fact that output is only curtailed in the event of network constraints contributes to the 'burden of reducing generation fall[ing]… on conventional plant'.	Noted. The AEMC has recently considered two rule changes (from Snowy and Engie) on altering the threshold for scheduling generation and requiring load to be scheduled. The AEMC published a draft determination, that there was no benefit at the moment from imposing the cost associated with altering the requirements for market participants to participate in the central dispatch process.	4.
Engie, p.5, Snowy Hydro, p. 6	• Absence of financial recognition for the provision of system security services provided by thermal plants threatens their commercial viability and power system security.	Noted. The Panel notes these issues are being addressed in the AEMC's system security work program.	5.
ERM Power, p.2,7	• ERM has not observed any changes in the market that would warrant a change to the floor price. Therefore ERM does not support any change to the current MFP value. • ERM notes that changes to the value of any of the reliability settings may not translate to what the Panel believes would be positive changes in investment outcomes given the current levels of market uncertainty. ERM states investment signals have also been muted by	Noted. The Panel considers that there would not be material benefit in a reassessment of the level of the market price floor.	6.

	off market subsidies, such as the Renewable Energy Target.		
Snowy Hydro, p.6,7	• Support use of an analogous methodology to that applied to the MPC for the determination of MFP. This would entail assessing what level the MFP has to be to encourage new entrant technologies that could alleviate excess generation. These technologies may be pump storage, storage batteries etc.	Noted. The Panel is not aware of any evidence that the current level of the market floor price impedes the efficient entry of storage technology, based on the infrequent incidence of low price events. Additionally, using the market floor price to incentivise particular technologies to enter the market represents a change in the approach to and potentially the function of the market floor price outlined in the guidelines. The guidelines state that the level of the reliability settings, and not their purpose or form, is to be subject to review. [340]	7.
Snowy Hydro, p.6,7	• To avoid generation being constrained off and as a result not being able to sell hedge products, the market floor price will need be lower if the market price cap was to continue to increase due to CPI.	Noted. The Panel's analysis of the market price cap in this review has examined the impact of increases to the cap in line with the CPI.	8.

340 Guidelines , p. 5. However, given the rapidly increasing role of storage in the NEM, it is possible that future versions of the Guidelines may reconsider the relationship between the market floor price and storage technologies.

Stakeholder comments: Other issues			
Stakeholder	**Issue raised**	**Panel response**	**Ref no.**
ERM Power, p.1	• General comment that perceptions of difficulty in achieving reliable supply to consumers have occurred before, generally driven by forecasts of ever increasing peak demand which failed to materialise. • The Panel should consider both the potential negative and positive aspects of changes in the settings, as this is a challenging time to be reviewing the settings.	Noted. The modelling for the review has considered both strong and neutral demand forecasts. The Panel acknowledges the significant uncertainty and the change underway in the national electricity market and as required by the rules has considered the impacts of the changes to the settings on: • spot prices • investment in the NEM • the reliability of the power system, and • market participants.	1.

B Appendix – Summary of principal assumptions

The key market assumptions used in the base scenario are shown in Table 12 below.

Table 12: Base scenario assumptions[341]

Assumption	Description	Source
Assumptions affecting demand / energy consumption		
Electricity consumption	Annual forecasts of energy and seasonal peak demand by NEM region	AEMO, 2017 ESOO Neutral scenario
Rooftop PV	Annual energy forecast from rooftop PV generation	AEMO, 2017 ESOO Neutral scenario
Electric vehicles and behind-the-meter storage	Annual energy forecast for electric vehicles and behind-the-meter battery storage	AEMO, 2017 ESOO Neutral scenario
Demand-side participation	DSP has a significant role in preventing unserved energy	AEMO, 2017 ESOO
Assumptions regarding market policies		
Drivers of large-scale renewable capacity	The present legislated LRET target of 33,000 GWh is met by 2020, plus additional drivers from GreenPower and state Government renewable energy auctions.	Present legislated LRET target and additional drivers.
Emissions reduction	No explicit or implicit policy to reduce emissions from the electricity sector (aside from the LRET).	As agreed in consultation with the Panel.
Assumptions affecting generation supply		
Non-renewable generator developments	The committed and likely changes to generator capacity, including large-scale storage, are taken into account.	Based on public announcements, and agreed in consultation with the Panel.
Outage rates - generators	Outages are in two categories: Forced outage rates depict the probability of different types of generators experiencing an unplanned full or partial outage. Planned outages are specified as an average number of days a generator is unavailable due to planned maintenance every year.	AEMO, 2017 ESOO
Fuel prices	The price for natural gas and coal is a key influence on market prices, influencing the short-run costs and bidding strategies of thermal generators.	AEMO, 2016 NTNDP
Network constraint equations	AEMO publishes a data set of network constraint equations annually. These are used to constrain generation at particular times to ensure the system is operated in a secure state with respect to transmission network limitations.	AEMO 2015 constraints data set

341 EY report p. 23-24.

Assumption	Description	Source
Technology capital costs	Capital costs for new entrant generators of different types are used to assess the economic viability for new capacity.	AEMO, 2016 NTNDP, except: Adjustments for large-scale wind and solar PV CSIRO/Jacobs Neutral trajectory (from 2016 AEMO NEFR) for large-scale storage
Technology parameters	These parameters include heat rates, economic lifetime, annual energy expectations (wind and solar) and loss factors	AEMO, 2016 NTNDP EY annual energy expectations Loss factors for 2017-18 from AEMO
WACC	The WACC is used to evaluate the annualised repayments of capital costs for each generator. 8% pre-tax real was used.	IPART Review of Regulated Retail prices, adjusted by EY in consultation with the Panel

A number of sensitivities to the base scenario were simulated to explore the impact of different assumptions on the unserved energy forecast. Table 13 lists the sensitivities modelled, including which assumptions are different to the base scenario for each and the motivation for exploring the impact of those assumptions.

Table 13: Base scenario sensitivities[342]

Sensitivity	Assumptions that differ from Base Scenario	Motivation
Base w High Demand	Uses AEMO's high demand scenario (from the 2017 ESOO Strong scenario).	Explores the impact of high demand and to compare with AEMO's modelled high demand in the 2017 ESOO report.
Base w HighD and EY FORs	Uses AEMO's high demand scenario (from the 2017 ESOO Strong scenario) and EY's upper bound of full FORs[343] for existing coal generators.	To explore the impact of EY's upper bound FORs in isolation to other assumptions.
Base w HighD and ESOO Dispersed	Uses AEMO's high demand scenario (from the 2017 ESOO Strong scenario), plus adopts the complete generator capacity mix used in the 2017 ESOO Dispersed Renewables scenario.	To explore the impact on USE from an alternative generation mix, which is chosen to be the 2017 ESOO dispersed renewables scenario. Aside from wind and solar capacity, the 2017 ESOO dispersed renewables scenario also has different assumed thermal capacities, such as Smithfield power station not retiring and half of Torrens A not being replaced by Barker Inlet.

342 EY report, p. 25.

343 For more details see EY report, Appendix A.10.

Table 14 outlines the assumptions made for the two market price cap scenarios to achieve an unserved energy outcome greater than 0.002%.

Table 14: Overview of market price cap scenarios[344]

Scenario	Assumptions differing from the Base Scenario
MPC Scenario 1	► AEMO high demand forecast[345] ► EY's coal outage rates[346] ► Early retirement of 1,040 MW of thermal capacity in South Australia
MPC Scenario 2	► AEMO high demand forecast ► EY's coal outage rates ► VRET 5150 MW scheme[347] ► Early retirement of 2,600 MW of thermal capacity in Victoria

Table 15 summarises the different assumptions used in the Base costs and each of the High costs sensitivities for the market price cap outcomes. The Base costs are used in the base scenario as well as both MPC Scenarios. The High costs sensitivities are only used for the MPC Scenarios. Figure 15 shows the levelised cost of energy (LCOEs) for the key contending generator technologies.

Table 15: Assumptions that differ between the Base costs and High costs sensitivities[348]

Assumption	Base costs	High costs			
		High	Cap defender	12% WACC	Half lifetime
WACC (pre-tax real)	8%	10%	10%	12%	10%
Economic lifetime for OCGTs	30	30	30	30	15
Bidding strategy of marginal OCGT*	SRMC	SRMC	$270/MWh#	SRMC	SRMC
Capital costs** – wind and solar PV	EY market research	2016 NTNDP			
Capital costs** - Storage	CSIRO/Jacobs Neutral	CSIRO/Jacobs Strong			
Gas fuel price	2016 NTNDP	$18/GJ			
Include CCGTs as potential new entrant	Yes	No			

* This is equivalent to the cap defender strategy employed in the 2014 Review.
** The same capital costs for OCGTs and CCGTs were used in the Base and High costs sensitivities as these are considered stable and more certain for the Period than with the other technologies.
# As described above the nominal $300/MWh APC is estimated to be $270/MWh in real terms for the purpose of the modelling. This estimate is equally applied to the $300/MWh cap contract on the basis that this standard contract is also effectively nominal.

344 EY report p. 36.

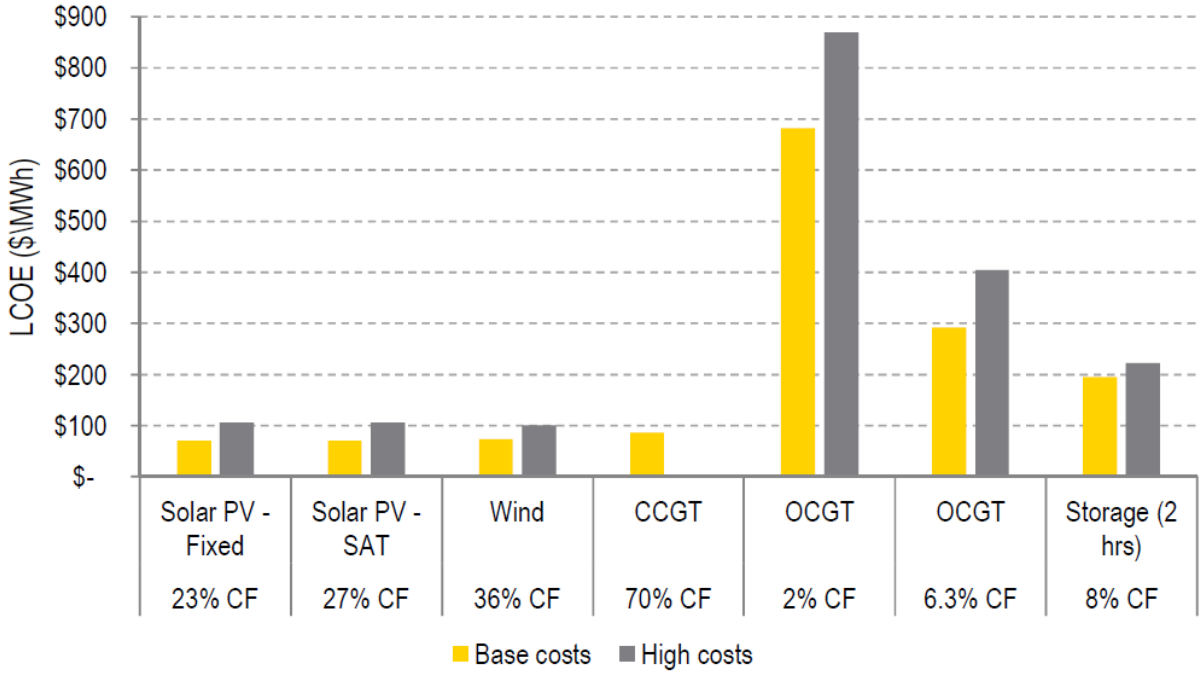
345 From Strong scenario in AEMO's 2017 ESOO. This includes higher demand, rooftop PV, EV and behind-the-meter battery uptake compared to the Neutral scenario (as used in the base scenario in this Review).

346 EY analysed historical availability of national electricity market coal generators to estimate an upper bound for their forced outage rates.

347 Involves 700 MW of renewable capacity in addition to the LRET installed in Victoria in each year in the Period (Source: https://www.energy.vic.gov.au/renewable-energy/victorias-renewable-energy-targets).

348 EY report, p. 37.

Figure 15: LCOEs for key technologies using the Base costs and High costs assumptions (SAT = single access tracking)[349]



349 EY report, p. 38.

C Appendix – Comparison with 2017 ESOO

In September 2017 AEMO published the 2017 Electricity Market Electricity Statement of Opportunities (ESOO). As required under clause 3.13.3(q) of the rules, the ESOO includes projections of aggregate demand and energy requirements for each region, generating capabilities of existing and planned units, anticipated plant retirements and operational and economic information. In the ESOO, AEMO also provides forecasts of unserved energy for the regions of the NEM for a 10-year period from 2017-18 to 2026-27.

Forecasting of electricity supply and demand is a complex process the outcomes of which depend on the overall purpose, modelling approach, input data, assumptions, and scenarios and sensitivities tested.

Differences between the rationales for the Panel's review and ESOO scenarios

In effect, the September 2017 ESOO presents three base scenarios, covering the period from 2017–18 to 2026–27. The scale and distribution of new generation capacity is the crucial difference between each of the three ESOO scenarios. The following table summarises each scenario and its underpinning rationale as stated in the ESOO.

Table 16: ESOO scenarios summary

ESOO scenario	Description	Rationale
Scenario 1 Committed capacity	This first scenario relates to the requirement in the rules to provide information about 'generating units for *which formal commitments have been made for construction or installation'* (rule 3.13.3(q)(2)). The scenario 'incorporates all existing generation in the NEM and new generation that meet AEMO's commitment criteria'[350] The forecast is based on AEMO's definition of committed new generation projects. AEMO's commitment criteria are set out in the table below. Committed projects are those that meet all five of the commitment criteria.	Required under the rules.
Scenario 2 Concentrated renewables	This scenario 'assumes potential additional development after 2020 are geographically concentrated particularly in Victoria, driven by the Victorian Renewable Energy Target (VRET).'[351] According to the ESOO: '[t]he Concentrated renewables pathway's goal is to deliver renewable capacity from the federal Largescale Renewable Energy Target (LRET) and the VRET[out to 2025] only.' The scenario includes capacity 'built beyond AEMO's commitment criteria' to meet the targets but the model does not assess whether any of this new entrant capacity is commercially viable.	'[M]odelling renewable generation builds to meet proposed and existing renewable targets in the NEM' and 'to capture **a broad range of possibilities** that could occur in the NEM in the next 10 years.' [352]
Scenario 3 Dispersed renewables	This scenario focuses on examining capacity under a national renewables target. It: 'includes the LRET as above, but further assumes any additional renewable capacity incentivised from 2021 onwards is driven through nationally set (or at least co-ordinated) targets, rather than state-based schemes. No such	

350 AEMO, *ESOO*, September 2017, p. 7

351 AEMO, *ESOO*, September 2017, p. 7

352 ESOO p. 6, 7, emphasis added. Both Scenario 2 and Scenario 3 are not required by the rules.

ESOO scenario	Description	Rationale
	national target currently exists. For modelling purposes, this pathway targeted 45% renewables by 2029–30, a mid-point of the proposed outcomes announced by the Queensland and Victorian governments.' [353] The forecast includes capacity 'built beyond AEMO's commitment criteria' to meet the targets but the model does not assess whether any of this new entrant capacity is commercially viable.	

While both EY's modelling for the Panel's review and the ESOO forecast unserved energy for the national electricity market for the period 1 July 2020 – 1 July 2024, the rationale for the Panel's base scenario differs fundamentally from the rationales for the ESOO scenarios. Put simply, the scenarios in the Panel's review and those in the ESOO have different purposes; they are not seeking to examine comparable 'futures'.

In contrast to the Panel's review, none of the three ESOO scenarios seek to reflect the **likely outcomes** for the national electricity market in the review period (see section 2.5.2 of this report, rationale for the base scenario). Rather, in relation to new capacity AEMO either seeks to forecast unserved energy outcomes, should only very well progressed generation projects proceed (scenario 1), or forecasts and compares the unserved energy outcomes under **'a broad range of possibilities' regarding policies on renewable targets** (scenarios 2 and 3).

The generation project commitment criteria used by AEMO are outlined below.

Table 17: Generation project commitment criteria354

Category	Criteria
Site	The project proponent has purchased/settled/acquired (or commenced legal proceedings to purchase/settle/acquire) land for the construction of the project.
Major components	Contracts for the supply and construction of major plant or equipment components (such as generating units, turbines, boilers, transmission towers, conductors, and terminal station equipment) have been finalised and executed, including any provisions for cancellation payments.
Planning consents/construction and connection approvals/EIS	The proponent has obtained all required planning consents, construction approvals, connection contracts (including Generator Performance Standard agreement from AEMO in the form of the 534A letter), and licences, including completion and acceptance of any necessary environmental impact statements.
Finance	The financing arrangements for the proposal, including any debt plans, must have been concluded and contracts executed.
Final construction date set	Construction of the proposal must either have commenced or a firm commencement date must have been set.

Refer to Appendix C of EY's modelling report for a comparison of unserved energy outcomes as forecast by EY for the Panel's review and AEMO in the ESOO.

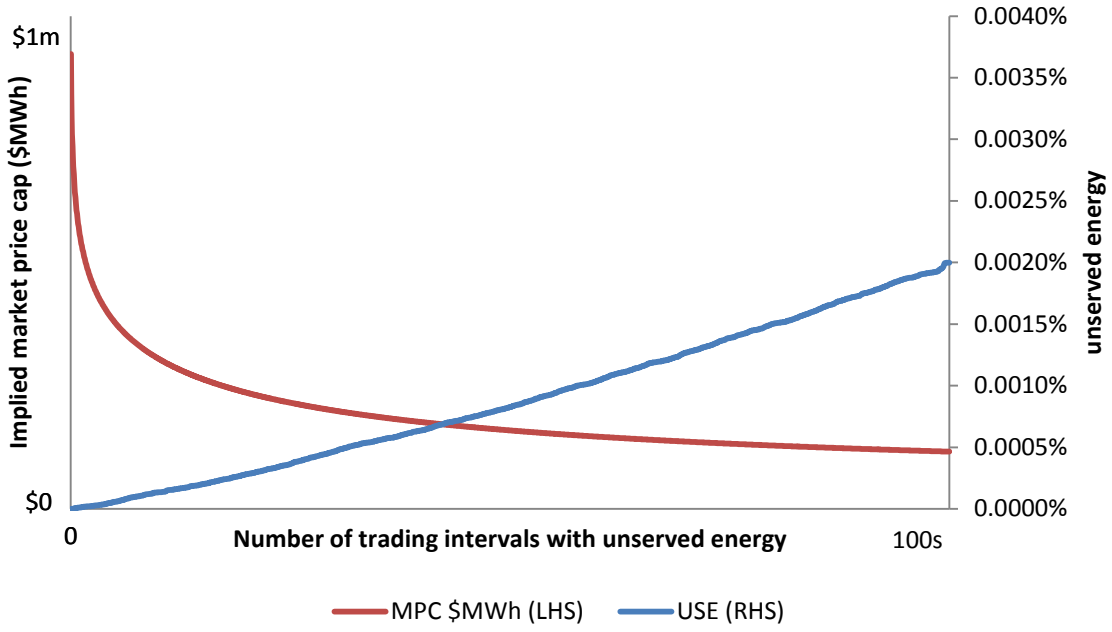
353 AEMO, *ESOO*, September 2017, p. 10

354 AEMO's commitment criteria are presented in the "Background Information" worksheet at https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information

D Appendix – Market price cap and bidding behaviour

Chapter 2 (section 2.6.3) presented an analysis of increases in wholesale energy costs associated with the reduction of unserved energy to zero in the EY modelling. This analysis is based on the additional expected revenue needed to be captured by a new entrant generator. We would expect that, in terms of the incremental value (and price) that is needed to support such investment, the market price cap would need to be substantially increased. For example, a new entrant generator with a business case that was based on expected operations of two hours a year would need a market price cap in the order of $100,000/MWh. This relationship between annual expected hours of operation and required price is critical in that as we approach zero unserved energy the expected hours of operation for a new entrant decreases with a proportional required increase in the market price cap. This relationship is highlighted in Figure 16.

Figure 16: Relationship between implied market price cap and unserved energy



It is not clear what the impact of bidding behaviour outcomes would be over the course of a year given a higher market price cap and higher level of generation capacity. One outcome might be that the impact of the higher market price cap was to drive up average prices to an even greater extent than that required to deliver the revenue to support the new entrant generator. Conversely, the additional capacity in the market may result in lower prices at times when demand was more moderate due to the competition between market participants.

However, what we can expect is that at a minimum, total revenue will increase sufficiently to support the new entrant generation (presumably off the back of supply contracts signed prior to market entry).

E Appendix – AEMO interventions and the reliability settings

This appendix describes the five interventions, outlined in Chapter 3, related to reliability and considers whether they have any consequences for the setting of the market price cap (and the cumulative price threshold).

The Panel notes that it is AEMO's role to determine how each event is defined. That is, AEMO determines whether any unmet demand is defined as unserved energy in relation to the reliability standard.

1 December 2016 directions (South Australia)

The events on 1 December 2016 were highly technical – for a comprehensive accounting of those events the Panel refers readers to the material published in AEMO's reviewable operating incident report.[355]

On 1 December 2016 at 0016 hours, a single phase to earth fault occurred on the Moorabool-Tarrone 500 kV transmission line, causing the trip of that line. The trip of that line severed the interconnection to South Australia via the Heywood interconnector, and left the Portland Aluminium Smelter (APD) connected to the South Australian network. Load shedding was triggered in South Australia. Shortly after the initial fault, the emergency APD Potline tripping scheme disconnected the APD load from South Australia.

Immediately after the incident, AEMO sought to stabilise the islanded South Australia network and restore the lost loads. During the separation, the need to manage frequency in the islanded South Australian network led AEMO to issue four directions. The directions were required to manage the requirements for 6 second raise and 6 second lower FCAS in the islanded region.

For the purposes of this review, an important observation is that AEMO's efforts to obtain FCAS were potentially hindered by the binding of the cumulative price threshold for FCAS. Although there was a scarcity of FCAS, the prices remained at $300 per MWh for the duration of the intervention event.

Application of the cumulative price threshold to FCAS, but not to energy may have created an incentive for participants to reduce their availability of FCAS to increase their ability to offer energy – a service whose price was not limited by the triggering of the cumulative price threshold.

The Panel considers that this does not highlight a problem with the *level* of the cumulative price threshold, but rather with the arrangements for its application. The problem was not caused by the level of the cumulative price threshold, but rather the relationship between energy and FCAS prices at the time, which is beyond the scope of this review. A higher cumulative price threshold would not necessarily prevent such an event again in the future, though it would make it less likely.

355 AEMO, *Final Report – South Australian Separation Event - 1 December 2016*, 2017

8 February 2017 (South Australia)

Our review in this section draws heavily on the material published in AEMO's system event report for this intervention.[356]

Early February of 2017 saw the NEM experience an extended heatwave. On 8 February 2017, AEMO issued a direction to ElectraNet to interrupt supply to 100 MW of customer load in South Australia. Key details are as follows:

- At 1500 hours, pre-dispatch Projected Assessment of System Adequacy (PD PASA) indicated a forecast LOR 1 for the South Australian region from 1630 to 1900 hours.
- At 1725 a constraint managing the flow on Murraylink was violated. Murraylink's flow exceeded its limit of 78 MW by over 100 MW. The power system was therefore not in a secure operating state.
- At 1803 hours, AEMO declared an LOR3 condition for the South Australia region and issued a direction to ElectraNet to reduce load by 100 MW to reduce the flow on Murraylink and restore system security.
- At 1820 hours, the market price cap was applied in South Australia from the dispatch interval ending 1825 hours.
- At 1830 hours, AEMO advised ElectraNet to start restoring load.
- At 1850 hours, the market price cap pricing was removed and at 1900 hours the LOR3 condition was cancelled.

The Panel has considered whether this intervention event suggests a need to alter the market price cap and/or cumulative price threshold.

ERM Power's view is that the 8 February load shedding event was not due to a shortfall in investment generation and thus would not have been solved had the market price cap been higher:

> In assessing the events in South Australia on 8 February 2017, with regard to considering the potential for USE events in the future, we believe the Panel needs to consider that additional generation remained available for commitment, based on sufficient notice being provided, should AEMO have indicated to the market or determined this additional generation was required. A higher level of MPC or CPT would in all likelihood not have changed this outcome…
>
> The Panel should also consider that the AEMO, Market Event Report, indicated that the 16:00 predispatch revision indicated a higher level of output from wind farms located in South Australia and a lower level of forecast demand for South Australia. Combined, these errors totalled approximately 250 MW when compared to actual outcomes. Had AEMO's forecasts been more accurate at the 16:00 revision, this involuntary load shedding event may well have been avoided as the LOR2 notice would have been issued one hour earlier than actually occurred [providing sufficient time for the available 240MW capacity second Pelican Point generator unit to return to service].
>
> Currently, the rules do not set requirements regarding the bounds of accuracy for AEMO's demand and semi-scheduled generator forecasts; this is an area the Panel may

356 AEMO, *System Event Report – South Australia – 8 February 2017*, 2017

consider as part of this review due to the impact of AEMO forecasts on supply reliability and market intervention.[357]

The key observation made by ERM Power is that adequate generation capacity was available on 8 February, but not ultimately committed in time because of forecasts of wind and demand suggested that capacity would not be required. Given commentary regarding forecasting, it appears that the load shedding on 8 February was not the result of inadequate remuneration for available generation. It follows that this event does not lead the Panel to believe that there is a need to reconsider the level of the market price cap.[358]

9 February 2017 (South Australia)

Our review in this section draws heavily on the material published in AEMO's system event report for these interventions.[359]

The day following the 8 February 2017 intervention, another intervention occurred in South Australia. AEMO issued a direction to Pelican Point to synchronise and dispatch at minimum load. Key details are as follows:

- From 2130 hours on 8 February until 1505 hours on 9 February, all PDPASA runs forecast LOR2 conditions in South Australia between 1700 hours and 1830 hours on 9 February.
- At 1505 hours, AEMO issued a direction to Engie to synchronise and dispatch GT12 at Pelican Point power station to its minimum load of 160 MW.
- At the same time, AEMO issued counter-action instructions to two other gas-fired generators in South Australia, i.e.: Mintaro gas turbine was instructed to reduce output from 69 MW to its minimum load of 30 MW, and two of the Dry Creek units were instructed to reduce output from a combined output of 75 MW to their combined minimum load of 10 MW. The aim of this counter-action was to minimise the market impact of the direction, as required by clauses 3.8.1(b) and 4.8.9(h)(3) of the rules.
- The reduction in generation due to the counter-action was 158 MW, which was close to the 160 MW of generation directed on at Pelican Point. But the advantage of the configuration of the system achieved by the direction was that it made more capacity available to meet increasing demand, alleviating the LOR2 condition.
- AEMO cancelled the LOR2 condition at 1600 hours, and the direction was cancelled at 1900 hours. The direction remained in place during this period because of the minimum run time of 4 hours for Pelican Point's GT12.

The Panel has considered whether this intervention event suggests a need to alter the market price cap.

Once again, the Panel notes that adequate generation capacity was available. The question is why that generation capacity was not made available without the need for a direction, and specifically whether a higher market price cap would have avoided the need for a direction.

357 ERM Power, p3-4.

358 Over the course of the entire day, prices were at (or near) the market price cap for 2 hours and 25 minutes. At no point was the cumulative price threshold triggered, nor was it close to being triggered – the level of the cumulative price threshold was not relevant to the event.

359 AEMO, *NEM Event – Direction to South Australian Generator – 9 February 2017*, 2017.

The Panel considers that this is not the case, and considers that the expected revenue provided by the market price cap is adequate to provide an incentive for the unit to be made available.

10 February 2017 (New South Wales)

This section draws heavily on the material published in AEMO's system event report for this intervention.[360]

Following the two interventions in South Australia on 8 and 9 February 2017, another intervention for reliability occurred in New South Wales on 10 February. In this case, AEMO directed TransGrid to shed a Tomago potline. Key details are as follows:

- Extreme temperatures led to high demand conditions in New South Wales. Coupled with the forced outages at the Tallawarra and Colongra power stations (totalling over 1000 MW of generation), at 1650 hours the state reached an LOR3 condition.
- At 1658, AEMO issued a direction to TransGrid to maintain power system security. The direction was to shed a Tomago potline, which represents a large load.
- The New South Wales dispatch price was set to the market price cap from dispatch interval ending 1710.
- At 1801, AEMO directed TransGrid to restore the Tomago potline to service, and the potline was returned to service at 1807.

The Panel has considered whether this intervention event suggests a need to alter the market price cap.

The Panel notes the extreme nature of the conditions on the day in question. Temperatures at Bankstown reached 42.9 degrees in the early afternoon. These high temperatures, falling on a weekday in the middle of February – ie, beyond the summer holiday period when demand tends not to reach as high levels because many businesses and schools are shut down – represent an extreme demand event.

On the supply side, there were also a large number of coincident outages on the day in question, i.e.:

- Two of Liddell's four units (over 800 MW of generating capacity) were unavailable.
- At 1630 Tallawarra tripped, reducing available capacity in New South Wales by over 400 MW.
- From around 1515, all four of Colongra's units were unavailable, reducing available capacity by more than 600 MW.

It follows that both the supply and demand conditions in New South Wales on 10 February 2017 were extreme, low probability events. The Panel considers that such conditions are an example of the *type of situation* where we might expect to see load shedding, and where such an outcome is efficient – the costs of investing in additional capacity to prevent load shedding in these circumstances would outweigh the reliability benefits provided.

The Panel therefore does not consider that the event on 10 February suggests a need to lift the level of the market price cap.

360 AEMO, *System Event Report – New South Wales – 10 February 2017*, 2017.

1 March 2017 (South Australia)

This section draws its information from market notices published on 1 March 2017, as well as analysis of actual generation outcomes from the MMS database.

On 1 March 2017 in response to high temperatures in South Australia and a lack of declared availability, AEMO forecast an LOR2 condition for the evening peak and issued a direction to a generator. Key details are as follows:

- Direction was issued at 1639 hours to meet possible LOR2 conditions from 1730 to 1830 hours.
- LOR 1 condition ceased at 1825 hours, and the LOR 2 condition never eventuated because of higher than expected wind output.
- The direction ended at 1925 hours.

The Panel has considered whether this intervention event suggests a need to alter the market price cap, noting that in this circumstance that no LOR2 condition ever eventuated.

A question is why generation capacity was not made available without the need for a direction, and whether a higher market price cap would have avoided the need for a direction.

The Panel considers that the expected revenue provided by the market price cap was adequate to provide an incentive for the unit to be made available.