RELIABILITY PANEL AEMC

REVIEW

Reliability Panel AEMC

ISSUES PAPER

Reliability Standard and Settings Guidelines

7 July 2016

Submissions due 11 August 2016. Reference: REL0059: Issues Paper

Inquiries

Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

E: aemc@aemc.gov.au
T: (02) 8296 7800
F: (02) 8296 7899

Reference: REL0059

Citation

AEMC Reliability Panel 2016, Reliability Standard and Settings Guidelines, Issues Paper, 7 July 2016, Sydney

About the AEMC

The AEMC reports to the Council of Australian Governments (COAG) through the COAG Energy Council. We have two functions. We make and amend the national electricity, gas and energy retail rules and conduct independent reviews for the COAG Energy Council.

About the AEMC Reliability Panel (Panel)

The Panel is a specialist body within the AEMC and comprises industry and consumer representatives. It is responsible for monitoring, reviewing and reporting on reliability, security and safety of 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.

Reliability Panel Members

Neville Henderson, Chairman and AEMC Commissioner

Murray Chapman, Group Manager Market Policy Development, AEMO

Trevor Armstrong, Acting Chief Executive Officer, Ausgrid

Gavin Dufty, Manager Policy and Research, St Vincent de Paul Society, Victoria

Richard Wrightson, General Manager Energy Portfolio Management, AGL Energy

Chris Murphy, Manager Commercial and Regulatory, Meridian Energy

Mark Collette, Executive Energy, EnergyAustralia

Lance Balcombe, Chief Executive Officer, TasNetworks

Royce De Sousa, General Manager - Energy & Sustainability, Visy

Miles George, Managing Director, Infigen Energy Ltd Generators

Contents

1 Introduction and background

The Reliability Panel (the Panel) has commenced consultation on developing the reliability settings and standard guidelines (the guidelines). The guidelines will describe the principles and assumptions the Panel uses when conducting its reliability standards and settings review (the review), which it undertakes every four years.

This Issues paper describes both the context and the matters that may be included in the guidelines. Stakeholders are invited to provide comment to the Panel on these matters and any other issues that should be considered as part of developing the guidelines.

The guidelines will provide information about how the Panel intends to approach each review. Setting an enduring methodology in the guidelines should allow the Panel to complete each review more quickly. Given the current degree of change in the National Electricity Market (NEM), the Panel also considers the guidelines must be sufficiently flexible to allow for consideration of new information and issues as they arise.

The Panel considers the guidelines should, therefore, set out the principles that will guide the Panel when it undertakes each review and a high level methodology for determining the settings and standard.

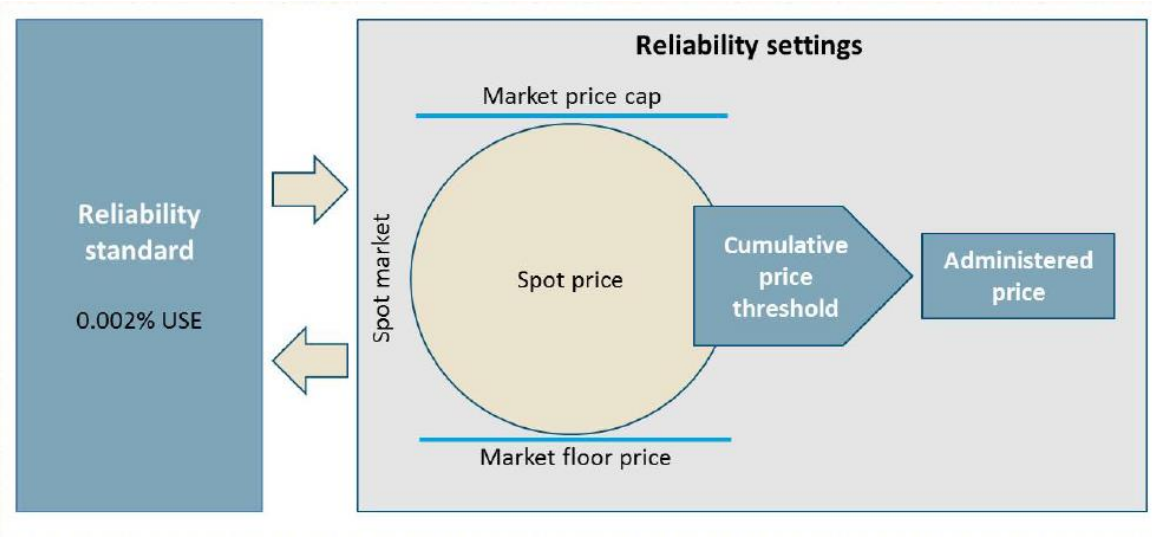
1.1 The reliability standard and settings

The National Electricity Rules (NER or rules) set out the reliability standard (the standard) and the reliability settings (the settings).

The standard, expressed as a probability of unserved energy (USE), measures the adequacy of electricity generating systems and transmission interconnectors to meet consumer demand. It is also used to evaluate whether there is sufficient investment in generator capacity and demand side response so that supply can meet consumer demand. Setting the reliability standard involves balancing the value that consumers place on the supply of reliable electricity with the costs required to deliver this level of reliability.

The settings are price mechanisms that are designed to incentivise sufficient generation capacity and demand-side response to deliver the reliability standard, while providing limits that protect market participants (and consequently, consumers) from periods of extended high prices. The reliability settings consist of a: market price cap (MPC), a market floor price (MFP), a cumulative price threshold (CPT), an administered price cap (APC), and an administered floor price (AFP). The structure of the settings is described in Figure 1.1.

Figure 1.1 Reliability standard and settings



1.2 The *Governance Arrangements and Implementation of the Reliability Standard and Settings* rule change

In 2015, the AEMC made a rule as part of the *Governance Arrangements and Implementation of the Reliability Standard and Settings* rule change (the governance rule change).[1] The governance rule change made a number of changes to way the Panel undertakes its reviews of the reliability standard and settings.

Prior to this rule change, the Panel had direct responsibility for determining the standard. The Panel was also responsible for reviewing and potentially recommending changes to the settings. The AEMC was responsible for determining and publishing the settings in a market schedule.

The governance rule change moved both the standard and settings into the NER, with the AEMC having final responsibility for determining the structure and level of both. The Reliability Panel was made responsible for undertaking a 4 yearly review of both the standard and settings and, if it considered any change was required, to submit a rule change request to the AEMC.[2] The rule change also redefined the APC as one of the reliability settings and included it in the matters that the Panel must consider in each review.

The governance rule change also introduced a requirement for the Panel to develop and publish guidelines that set out the principles and assumptions the Panel will use in each review. The Panel must develop the guidelines through the rules consultation procedure and must have a set of Guidelines in place by 1 January 2017.[3]

---

1 AEMC, *Governance Arrangements and Implementation of the Reliability Standard and Settings - Final determination*, 17 March 2015.

2 Noting that any other party can also submit a rule change request to the AEMC.

3 These requirements are set out in NER clauses 3.9.3A and 11.78.3. The rules consultation procedure is set out in NER clause 8.9.

1.3 The 2014 reliability standard and settings review

In 2014 the Panel completed the most recent review of the reliability settings and standard (the 2014 review).[4] The Panel determined to retain the current form and level of the standard[5] and made no change to the MPC or CPT in real terms and that the MFP should remain at its nominal value.[6]

The Panel's considerations were informed by modelling undertaken by ROAM Consulting. ROAM's modelling:

- considered the relationship between the level of the settings and standard with levels of reliability;
- included input assumptions related to gas prices, demand forecasts, the large scale renewable energy target (LRET), capital costs, a carbon price and levels of demand side participation; and
- assessed the sensitivity of the standard and the level of the settings to varying the value of these inputs.

In the final report of the 2014 review, the Panel also recommended:

- developing a methodology for future reviews, including what market modelling should be used and how outcomes of modelling should be treated;
- a review of the form of the CPT mechanism;
- a review of the approach to indexation of MPC and CPT; and
- developing a methodology for estimating the value of customer reliability (VCR) for use in determining the efficient reliability standard, having regard to any VCR values delivered by the Australian Energy Market Operator (AEMO).

By developing these Guidelines, the Panel will address the recommendation for development of a methodology for future reviews.

The guidelines will also consider the roles of the various reliability settings and the standard, including the form of the CPT and the approach to indexation. However, any changes to the structure of either will require a rule change request. This is most appropriately considered as part of a review. The next review is scheduled to commence in 2017 (the 2017 review).

---

4 Reliability Panel AEMC, *Reliability Standard and Reliability Settings Review 2014*, 16 July 2014

5 The Panel did not include consideration of the APC in the 2014 review. This is because the APC (and by inference the AFP) was only defined as one of the reliability settings during the governance rule change, which was not completed until 2015. This is discussed in further detail in section 2.2.1.

6 Only the CPT and MPC are indexed by the CPI each year. To date, all other settings are set as nominal values.

There is no longer a need to derive an independent measure of VCR, as AEMO's VCR measure can be used.

1.4 Timetable for completion and submissions to this Issues Paper

The Panel must develop the guidelines in accordance with the rules consultation procedures.[7]

A timetable for completion of this Guidelines consultation is set out below.

Table 1.1 Timetable for completion of Guideline consultation

Milestone	Date
Publish issues paper and notice	7 July 2016
Submissions due to issues paper	11 August 2016
Publish draft Determination and draft Guidelines	October 2016
Submissions due on draft determination and draft guidelines	Late October 2016
Publish final determination and guidelines	December 2016

The Panel invites comments from interested parties in response to this issues paper by 11 August 2016. Unless they contain confidential information, all submissions will be published on the AEMC website.

The Panel is seeking feedback from a range of end users of electricity, including small and larger users. Customers value reliability differently and the Panel is conscious that its determination of the reliability standard and settings will impact the prices these customers pay. Stakeholder engagement will, therefore, be a key focus of the Panel in its development of these guidelines.

Electronic submissions must be lodged online through the AEMC's website www.aemc.gov.au using the link entitled "lodge a submission" and reference code "REL0059". The submission must be on letterhead (if submitted on behalf of an organisation), signed and dated.

Upon receipt of the electronic submissions, the AEMC website will issue a confirmation email. If this confirmation email is not received within three businesses days, it is the submitter's responsibility to ensure the submission has been delivered successfully.

7 The rules consultation procedures are set out in NER clause 8.9.

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

Reliability Panel

Australian Energy Market Commission

PO Box A2449

SYDNEY SOUTH NSW 1235

Or by fax to (02) 8296 7899.

As per the rules consultation procedures, stakeholders are welcome to request a meeting to discuss specific issues in more detail, if they consider this would help in the process of consultation.

2 Matters to be included in the proposed guidelines

This section summarises the matters that may be included in the guidelines, including:

- an analytical framework to inform the Panel's determination of the standard and settings in each review;
- the matters that will be considered in the guidelines; and
- a methodology for the modelling the Panel would use when undertaking the review.

Stakeholders are invited to comment on these matters. A number of consultation questions have been included at the end of each section to guide stakeholder comment. Stakeholders are also welcome to raise additional issues not identified in this issues paper.

2.1 Analytical framework

When reviewing the form and level of the standard and settings, the Panel will be guided by the national electricity objective (NEO), which 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."

In developing the guidelines, the Panel proposes to focus on delivering a reliable supply of electricity at an efficient price for consumers.

The guidelines will describe the factors the Panel will consider in order to meet the NEO. These will require the Panel to consider the optimal trade-off between sometimes competing factors, including:

- Maintaining stable and consistent regulatory frameworks, while allowing sufficient flexibility to account for changes in the market.
- Sending effective price signals to drive efficient investment, while maintaining adequate protection for market participants from sustained high prices.
- Delivering an acceptable level of reliability, at a price that matches the value that consumers place on reliability.

Each of these factors is discussed in more detail below.

2.1.1 Stability and flexibility

Efficient investment is supported by stable regulatory frameworks. Changes to the settings and standard that are predictable and well justified will support investment to deliver reliability.

However, regulatory frameworks must be capable of adapting to changing market conditions. The settings and standard may need to change from time to time, to reflect material changes in these conditions.

The Panel considers the guidelines should establish principles that it will use to balance the provision of stability with flexibility in determining the standard and settings.

2.1.2 Investment and risk management

The reliability settings determine the maximum possible spot price in a trading interval and the maximum cumulative price in a given period. Prices in the form of spot prices and hedge prices are important signals which guide operational and investment decision making in the market. This includes signals to invest in and maintain capacity in the market to reliably meet demand, while also signalling when it may be efficient for capacity to exit the market.

By defining price limits, the settings protect market participants from exposure to sustained periods of high prices. Limiting the degree of price risk also helps manage the cost of financing new investment, with implications for reliability over the long term.

The Panel considers the guidelines should establish principles for assessing how to balance sending efficient investment signals with management of participant risk.

2.1.3 Value of reliability and cost to customers

The value that customers place on reliability will differ between customer groups, reflecting the way they use electricity. Residential customers using electricity for powering appliances may value reliability differently to large customers who use it to run a smelter or production line.

However, in all cases there is a direct trade-off between the level of reliability and the price that customers are willing to pay for that reliability.

The Panel considers the guidelines should establish principles for assessing how to balance the value of providing a reliable electricity supply against the cost of providing that reliability. In this assessment, consideration will be given to AEMO's VCR measure and AEMO's VCR Application Guide. VCR will be a central input into the modelling undertaken by the Panel during a review. This modelling is discussed in more detail in section 2.3.

Question 1 Analytical framework

1. **Do these the factors discussed above represent an effective analytical framework to support the Panel's determination of the standard and settings?**

2. **Are there other trade offs or factors that should be considered for inclusion in the analytical framework?**

3. **What factors in addition to VCR should be considered in valuing a reliable electricity supply?**

2.2 Matters to be considered

There are a number of matters that may be included in the guidelines, including:

- the level and form of the standard and settings;
- risks and impacts associated with changing the standard or settings;
- changes in the generation mix;
- interactions with gas markets; and
- impact of the CPT and MPC on frequency control ancillary services markets.

The guidelines should include the principles the Panel will use when assessing these matters.

These matters do not represent a definitive list of everything to be included in the guidelines. The Panel may choose to include new matters, or decide that some should not be included. Stakeholders are welcome to suggest any additions or deletions to the matters to be included in the guidelines.

Each of these matters are discussed in more detail below. Many are also relevant to the approach taken by the Panel to modelling, as discussed in section 2.3.

2.2.1 Level and form of the standard and settings

The structure of the standard and settings have various implications for reliability and the price customers pay for reliability. Changes to the standard and settings can only be made through changes to the NER. Any rule change requests will be made by the Panel, following the completion of each review process.

The guidelines are to outline the matters the Panel will consider at each review, when deciding whether to recommend changes to the standard and settings. Some of these matters include the:

- level and form of the reliability standard;
- level and form each setting, including a particular focus on:
  - the level and form of the CPT
  - the level of the APC; and
  - indexation of the MPC and CPT

Level and form of the reliability standard

The form of the standard has traditionally been an output-based measure, expressed in terms of the expected maximum USE. It is expressed as a percentage of the annual energy consumption for the associated region or regions.

The Panel has undertaken extensive historical analysis of the form of the standard.[8] In each review, it identified no benefits to the market or consumers of changing the form of the standard. Given its role as a fundamental market parameter, opening the form of the standard to reassessment could create significant uncertainty. As such, the Panel is only likely to reconsider the form of the standard if this will result in clear and material benefits.

Changing the level of the standard may also have market impacts, however these may be less material and are less likely to create uncertainty than changing the form of the standard. The level of the standard is currently 0.002% of USE for each region of the NEM in each financial year.

The guidelines are to set out the Panel's assumptions and proposed approach to the form and level of the standard, including the basis for whether either will be open to consideration as part of future reviews. Generally, the Panel considers a key principle is that the standard would only be changed where this is likely to lead to clear and material benefits.

Level and form of each setting

The Panel considers that the guidelines should provide information on the approach the Panel will take to determine the level and form of each setting.

This could include providing better explanations of the purpose of each setting, as the NER currently provides only limited guidance.

8 As well as the 2014 review, the Panel has considered this issue as part of the reliability settings and standard review that was completed in 2010, and the Comprehensive Reliability Review, which completed in 2007. See: AEMC Reliability Panel, *Comprehensive Reliability Review - Final report*, December 2007.

For example, clause 3.14.1 of the NER describes the detailed calculation of the CPT, but does not provide any guidance as to its purpose or key function. It is not clear whether the CPT is intended to function as:

- a risk management device;
- an investment signal in itself; or
- a risk management device that is also designed to not impede the investment signals sent by the MPC.

Similarly, the NER do not provide detailed guidance on the purpose of the MPC, MFP, APC and AFP. The guidelines could provide the market with more information on the purpose of each setting, to supplement any definitions in the NER.

In developing these explanations of purpose, the Panel may also consider whether the MPC remains principally a signal for new investment, or also signals for the retention of existing capacity. While the NEM currently faces some oversupply, the rapid exit of large volumes of capacity could have implications for system security and reliability. In such an environment, the Panel may consider the impact of the level of MPC on exit decisions.

Specific considerations on the form of the CPT

The guidelines may also provide further description of an approach to calculating and applying the CPT. These are respectively described in NER clauses 3.14.1 and 3.14.2 and include:

- the initial starting value of the CPT;
- the process for yearly indexation of the CPT;
- the period of time before the CPT is breached and an administered price period (APP) commences; and
- the criteria for terminating a periodic application of the APP.

Furthermore, the CPT has traditionally been set at a ratio of approximately 15 times the MPC.[9] This ratio reflects the relative starting values of the MPC and CPT prior to 1 July 2012.

The Guideline is to include principles for assessing the form of the CPT, which may include consideration of the following:

- the ratio of CPT to MPC;

9 The CPT in 2016/17 will be $201,100/MWh. A correcting factor is applied to the calculation of MPC, which results in MPC being rounded to the nearest $100. This can result in slight year to year variations, however the 1:15 remains broadly accurate.

- how to determine the number of trading intervals before the CPT is breached and an APP commences; and
- the units of measurement of CPT.[10]

Special consideration of the level of the APC

In the 2015 governance rule change, the APC was formally defined as one of the settings and was included in the matters that the Panel must consider in each review.

Prior to this, the APC was determined by the AEMC and included in a separate schedule. It was last reviewed in 2008 where it was set at $300/MWh.[11] The AEMC decided that a value of $300/MWh was likely to maintain incentives for generators to continue to supply during an APP, while managing participant exposure to high prices. The value of the APC has not changed since it was determined in 2008.

The guidelines are to establish principles for assessing the level of the APC (and, by inference, the AFP) in each review.[12] These principles are likely to be based on consideration of the kinds of units that are called on during an APP, their short run marginal costs and considerations of how best to manage price risk during an APP.

Indexation of the CPT and MPC

Both the MPC and the CPT are increased year to year to match movements in the Consumer Price Index (CPI).[13]

The approach taken to the indexation of MPC and CPT is relevant to the investment signalling and risk management functions of each. The guidelines will establish principles for assessing an indexation approach which may include consideration of whether:

- the CPI remains the appropriate basis for indexation;
- different base years and/or timeframes should apply to indexation; or
- indexation should be applied to settings other than the MPC and CPT.

10 Currently, NER clause 3.14.1(e) describes the CPT in terms of a dollar price. However, the cumulative energy prices that it represents are measured in $/MWh. It may therefore be more appropriate to measure the CPT in terms of the same units of measurement, ie, $/MWh.

11 AEMC, *Determination for schedule of administered price cap*, 20 May 2008.

12 The AFP is defined in NER clause 3.14.1(b) as the negative of the APC.

13 The current mechanism for indexation ensures that, for each financial year, the values of the MPC and CPT are adjusted to reflect the change in the CPI between the calendar year 2010 (the base year) and the calendar year commencing 18 months before the start of the financial year in question (the indexed year). However, the MPC and CPT can increase, decrease or remain the same over time depending on the circumstances and the Panel's decision at each review.

2.2.2 Risks and impacts associated with changing the standard or settings

The Panel's main focus in each review is maintaining efficient levels of reliability in the NEM. However, the Panel also considers other impacts of changing the standard and settings.

In the 2014 review, the Panel identified a range of other impacts relevant to its consideration of the MPC. These are broadly applicable to consideration of the other settings as well as the standard. The guidelines may include consideration of the following issues:

- **Short and long term consumer impacts:** Reducing the level of MPC or CPT may reduce spot prices and final prices for consumers, in the short term. However, this also reduces revenue for generators and dampens investment signals, potentially leading to supply shortfalls and higher prices for consumers in the long term.

- **Impact on contract markets:** The level of the standard and settings affects investors' future expectations of pool price outcomes. This may lead to changes in electricity contract prices, affecting decisions made by market participants and potentially liquidity in the market for electricity contracts. Lower settings could also reduce incentives for customers to purchase contracts and therefore reduce contract premiums, potentially impacting levels of investment.

- **Prudential requirements:** A change in the reliability settings may change the prudential requirement and credit limit for both generators and market customers operating in the NEM.

- **Impact on demand side participation:** A reduction in the MPC or CPT could reduce the incentive for participants to engage in demand-side management activities. Such a reduction in demand side participation could also equate to an increase in demand, potentially requiring a higher MPC or CPT to facilitate investment in additional generation to continue to meet the standard. Therefore, the level of CPT, MPC and the quantity of demand side participation in the market are closely related.

The impact of the MPC and CPT would also depend on the behaviour of generators (and providers of demand-response). As such, it is important that the guidelines establish a modelling approach that reflects different types of generator behaviour. Section 2.3 provides more detail on the Panel's proposed approach to modelling generator behaviour.

2.2.3 Changes in the supply and demand mix

The NEM is currently undergoing a period of faster change than in the past, both on the supply and demand sides of the market. Changes in fuel and technology costs, levels and patterns of consumer demand and various environmental policies are all changing the way that electricity is supplied and used in the NEM.

It is not the role of the Panel to comment on the design of environmental policies, the relative merits of new technologies or how the demand side can be incorporated into market function. However, all of these matters can result in changes in the mix of supply and demand, with implications for reliability and the level of the standard and settings.

The proposed guidelines should, therefore, consider potential changes in the supply and demand mix. This may include matters such as:

- **Integration of new generation types:** Increased penetration of variable intermittent generation could result in more frequent dispatch of (formerly) peaking generators. For example, open cycle gas turbine (OCGT) units could be called upon more frequently to match intra-day variations in output from wind or solar generators. This could be relevant to the levels and form of the MPC and CPT.

- **Integration of batteries:** Integration of battery storage may also be relevant to the structure and level of the MPC and CPT, in as much as it contributes to smoothing or shifting of load, or supplying energy at times of peak demand.

- **Thermal unit retirement:** Retirement of large volumes of thermal generation (such as coal fired generators) could also have significant impacts on security and reliability of the power system.

- **Increased demand side participation:** Increasing levels of demand side participation could be relevant to levels of demand and/or price at the margin. This may be relevant to the level of the MPC and CPT.

These changes in the supply and demand mix are to be considered in the guidelines, particularly in regards to the modelling approach. This is discussed in section 2.3.

2.2.4 Interactions with gas markets

In recent years, the east coast gas market has become increasingly interconnected, facilitated by multiple trading markets in each state. Establishment of liquified natural gas export facilities in Queensland has also impacted east coast gas prices and flows.

The extent to which gas markets impact on electricity reliability depends on the extent to which electricity is generated from pipeline connected gas fired generators.

At present, approximately 9000MW of installed capacity in the NEM is fuelled by natural gas.[14] Many of these units provide peak services, with some taking supply from natural gas pipelines. Reliability of the gas markets and pipelines could, therefore, have implications for NEM reliability, particularly as these generators are likely to be dispatched during high demand periods. Any reliability issues would be

14 AEMO registration and exemption list, viewed 23 June 2016.

compounded if large volumes of coal fired generation capacity is retired in the medium term and replaced with combined cycle gas fired generation.

The Panel proposes to consider how gas market issues may be relevant to the Panel's consideration in each review.

2.2.5 Impact of the CPT and MPC on frequency control ancillary services (FCAS) markets

FCAS is used to maintain power system frequency within defined limits.[15] These services are typically provided by generators (and potentially large loads), who have the capability to change their output (or their consumption) in response to changes in system frequency. The price determined for FCAS is co-optimised with the energy market, to maintain incentives to offer FCAS when energy prices are high.

The price of FCAS is subject to the MPC and the CPT.[16] These settings, therefore, play a role in sending signals for both operation of and investment FCAS services.

As FCAS has historically been provided as a service complementary to energy, the Panel has not given separate consideration to the role of the MPC and CPT in FCAS markets. However, this may no longer be the case if significant changes occur in the generation mix. Entry of significant volumes of intermittent generation coupled with retirement of thermal units, could result in a generation mix where there is a high demand for FCAS but fewer plant that can offer it, particularly when particular regions are isolated from the main power system. Under such a scenario, there may be a need for different investment and operational signals in FCAS markets. However, it is also necessary to consider what other impacts could flow from different settings between FCAS and energy markets, and under what specific scenarios this might be warranted.

The Guidelines are to include consideration of the role of the settings in supporting efficient operation of and investment in FCAS services.

Question 2 Matters to be considered

1. **Are the matters discussed in this section appropriate for consideration in the guidelines?**

2. **Are there other matters that should be considered?**

15 FCAS consists of regulation services, which are used to manage small frequency changes during system normal conditions, and contingency services, which are used to manage the frequency impacts of an unexpected event, such as an unplanned trip of a large load or generator.

16 The CPT is breached in FCAS markets once the price in a dispatch interval has exceeded 6 times the CPT in the preceding 2016 dispatch intervals)

2.3 Market modelling

Modelling is a key analytical tool used by the Panel during each review. While important, it is only one of the inputs used by the Panel to inform its final determination. The guidelines will provide information on the approach, inputs and sensitivities the Panel will use, as well how this modelling fits into the Panel's overall determination of the standard and settings.

As with the guidelines generally, the modelling methodology should not be overly prescriptive. An overly detailed modelling methodology may not be able to account for changing market conditions, and may need to be reconsidered prior to each review (ie, every four years). The guidelines will therefore define the approach to be taken to modelling, with the model itself being developed as part of each review.

This section provides a short summary of the modelling issues identified in the 2014 review. It then describes some of the issues proposed to be addressed in the guidelines, including the:

- general approach to modelling wholesale market outcomes;
- range of inputs to be included in any modelling; and
- potential sensitivities to be considered in any modelling.

2.3.1 Approach to modelling issues identified in the 2014 review

In the 2014 review, the Panel utilised two different approaches to modelling. These two approaches differed in terms of the assumed bidding strategies of the marginal generator and the level of MPC to achieve a given standard.

These two general approaches were the:

- **'Extreme peaker' approach:** The extreme peaker approach assumes a peaking OCGT unit offering its units for dispatch at MPC. It is designed to determine the relationship between achieving a given reliability standard and the MPC required for the new entrant generator to profitably operate in such a system.

  A criticism of this approach is that it fails to recognise that peaking generators typically source at least some of their revenue through cap contracts and are therefore unlikely to only offer their units for dispatch at MPC.

- **'Cap defender' approach:** In response to this criticism, the Panel also utilised the cap defender approach. This approach assumes a peaking unit operates as a notional 1 MW OCGT unit that is fully contracted at a $300/MWh cap contract and bids its entire capacity at $300/MWh.

  The cap defender approach allows the new entrant OCGT to recover its capital investment in periods in which the price is below the MPC, but above

$300/MWh. This allows the cap defending marginal generator to profitably operate with a lower MPC than required under the extreme peaker approach.

In the 2014 review, the Panel decided it did not have enough data to decide whether either model was preferable. It therefore utilised both for determining the level of the MPC that would be applicable from 1 July 2016.

2.3.2 General approach to modelling

No market model can perfectly replicate or predict market outcomes. However, modelling can provide insights to interactions within the market and impacts of various factors on market outcomes. In developing the principles for modelling, the Panel may consider the following issues.

Consistency and predictability

Given the importance of modelling to the Panel's determination of the standard and setting, frequent or unpredictable changes in how this modelling is undertaken could create uncertainty in the market. The form of the modelling used by the Panel should, therefore, be as consistent and predictable as possible.

The Panel proposes to consider the importance of stability and predictability when considering modelling approaches, particularly whether there is merit in using approaches other than the extreme peaker and cap defender.

Assumptions about expected participant behaviour

Different approaches to modelling can be used to reflect different assumptions and expectations of participant behaviour.

For example, in the 2014 review, the cap defender approach was designed to be more reflective of how a typical participant would be expected to invest in and operate a peaking unit. This is based on the assumption that most investors will only build a new entrant OCGT unit if its output is contracted and offered into dispatch at the strike price.

In contrast, the extreme peaker approach was considered to be more theoretical, reflecting less likely participant behaviour. This is based on the assumption that investors would not build an OCGT that was not fully contracted and was only offered into dispatch at MPC.

The Panel considers that any modelling should reflect reasonable or expected participant behaviours. The results of different approaches can be weighted and aggregated, to reflect the extent to which certain behaviours are more or less expected.

It may also be that assumptions of 'reasonable' participant behaviour need to be adjusted for the purposes of modelling. New types of market participant may face different incentives, and therefore, exhibit different behaviours. A core market assumption has been that a marginal generator is incentivised to maximise market

revenue and bids accordingly. To date bidding strategies have been based on assumptions of SRMC which primarily included fuel costs. In future, SRMC assumptions and participant behaviour will also need to consider costs and actions associated with meeting emissions and renewable energy targets.

The Panel proposes to consider what principles can be included in the guidelines on how different modelling approaches can reflect different assumptions about participant behaviour.

Nature of the marginal unit

Historically, the marginal unit has been assumed to be an OCGT unit. However, this may not be accurate going forward, especially if there is significant uptake of technologies like grid scale storage. The nature of the marginal unit will be relevant to considerations of the potential MPC and CPT needed to signal for investment.

The approach to modelling will also need to consider how a marginal unit will earn revenue. For example, under the extreme peaker approach, a marginal unit will only earn revenue during periods when the spot price is at MPC, while under the cap defender approach, revenue will be earned when the price is above $300/MWh. Differences in revenue potential may be relevant to the level of the MPC.

It is also necessary to consider whether the marginal unit remains a generator, or how a demand side participant could respond to the MPC.

Projections

In previous reviews, the Panel has used historic data to inform its projections of inputs, particularly levels of solar PV penetration.

Given significant growth in uptake rates of these technologies, for future reviews the Panel may consider using modelled projections as an input, particularly modelling related to projected uptake of battery storage and solar PV. AEMO develops such projections for its Electricity Statement of Opportunities (ESOO).[17]Different projections may be used to undertake different sensitivities and explore alternative scenarios.

2.3.3 Range of inputs and assumptions to be considered in the modelling

The guidelines are to describe the various inputs and assumptions that will be used in the modelling. As a guide, these assumptions and inputs may include:

- average and peak demand projections for each region;
- expected load profiles;
- government mandated schemes for encouraging renewable energy technologies;

- sectoral or economy wide mechanisms designed to address climate change, such as a sectoral emissions intensity trading scheme or an emissions trading scheme;
- gas price trajectories;
- costs for marginal generating units;
- demand side participation quantities and price thresholds;
- expected changes in the large scale generation fleet, particularly thermal unit retirement; and
- growth rates for small scale distributed generation, particularly rooftop PV and battery storage.[18]

2.3.4 Scenarios and sensitivities

The guidelines are to describe the range of sensitivities that will be used in the modelling. As a guide, these may include:

- high and low capital cost assumptions for marginal plant;
- alternative MPC / CPT ratios;
- high and low peak demand and average demand growth forecasts;
- changes in load profiles, including withdrawal of large industrial loads;
- different emission reduction and renewable target settings;
- high and low gas price projections;
- potential changes in the level of demand side participation;
- different projections in the price of distributed energy and emerging technologies, including solar PV and battery storage; and
- different large scale generation retirement timelines.

Combinations of these various sensitivities may be used to develop different modelling scenarios.

When developing scenarios for analysis, the Panel will be most interested in considering boundary or outlier scenarios, representing extreme outcomes in terms of market participant behaviours or the exogenous environment.

---

17 AEMO develops such projections in relation to rooftop PV and integrated storage systems as part of its National Electricity Forecasting Report and then uses these forecasts in analyses such as the ESOO and the National Transmission Network Development Plan.

18 To the extent possible, the Panel will consider how the usage of such technologies would change over the period in question.

The Panel is aware that the potential exit of large industrial loads may be relevant to considerations of the value of reliability. The Panel may, therefore, include considerations of exit of large industrial loads in its scenarios.

Question 3 Modelling

1. **Do the approaches, inputs and sensitivities discussed in the section form an appropriate basis for the Panel's modelling?**

2. **Are there other matters that should be included in the Panel's approach to modelling?**

Abbreviations

AEMO	Australian Energy Market Operator
AFP	administered floor price
APC	administered price cap
APP	administered price period
CCGT	combined cycle gas turbine
CPT	cumulative price threshold
LRET	large scale renewable energy target
MFP	market floor price
MPC	market price cap
NEM	National Electricity Market
NEO	national electricity objective
NER or rules	National Electricity Rules
OCGT	open cycle gas turbine
USE	unserved energy
VCR	value of customer reliability