MARKET SUSPENSION PRICING SCHEDULE CONSULTATION

ISSUES PAPER

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

EXECUTIVE SUMMARY

Publication of this Issues Paper commences the first stage of the rules consultation process to consider amendments to the Estimated Price Methodology[1] under the National Electricity Rules (NER). Based on the outcomes of this consultation, AEMO will also update its Guide to the Market Suspension Pricing Schedule[2].

NER clause 3.14.5(e) requires AEMO to develop a methodology (called an 'estimated price methodology') to prepare and update schedules containing reasonable estimates of typical prices during the periods to which the schedules relate. These schedules are to be used during a period when the spot market is suspended and AEMO has determined it is not practicable to determine prices in accordance with the central dispatch process.

This Issues Paper highlights potential options to improve how well the current market suspension pricing schedules reflect typical pricing outcomes, and minimise any unnecessary volatility or adverse incentives during periods of system stress.

AEMO's initial analysis indicates the current estimated price methodology could be improved. AEMO is seeking stakeholder feedback on the specific questions raised throughout this Issues Paper, and in particular on the appropriateness of the options.

In accordance with the proposed consultation timetable, AEMO invites stakeholder feedback by 5.00 pm (Melbourne time) on 6 August 2018 to ori.agranat@aemo.com.au.

[1] Available here: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Data/MMS/2017/Estimated-Price-Methodology-Suspension-NER-3-14-5.pdf.
[2] Available here: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Data/MMS/2017/Guide-t o-Market-Suspension-Pricing-Schedule.pdf.

CONTENTS

1. STAKEHOLDER CONSULTATION PROCESS

AEMO is consulting on proposed amendments to the Estimated Price Methodology[3] in accordance with the *Rules* consultation procedures in National Electricity Rules (NER) clause 8.9.

AEMO's indicative timeline for this consultation is outlined below. Dates may be adjusted depending on the number and complexity of issues raised in submissions and any meetings with stakeholders.

STAGE	INDICATIVE DATES
Notice of Consultation and Issues Paper	29 June 2018
Submissions close on Issues Paper	6 August 2018
Draft Report published	31 August 2018
Submissions close on Draft Report	17 September 2018
Final Report published	12 October 2018

Before the submissions due date, stakeholders can request a meeting with AEMO to discuss the issues and proposed changes raised in the Issues Paper.

2. BACKGROUND

2.1 NER Requirements

NER clause 3.14.5(e) requires AEMO to develop a methodology (called an 'estimated price methodology') to prepare and update schedules containing reasonable estimates of typical prices during the periods to which the schedules relate. AEMO must publish each schedule at least 14 days before the first day of the period it relates to. The schedule will be used if the spot market is suspended during that period, and AEMO determines it is not practicable to determine dispatch and ancillary service prices in accordance with the central dispatch process.

2.2 Context for this Consultation

The existing estimated price methodology was devised in 2001, and is summarised as follows:

- A total of 90 datasets in a single schedule are produced each week representing all sets of:
  - Nine markets – one energy and eight FCAS markets.
  - Five regions.
  - Two day types – Weekday and Weekend/Public Holiday[4]
- Each schedule consists of 48 trading interval (TI) prices for that specific market-region-day type combination.
- Each price represents the average price for that market-region-day type and trading interval (TI) across the four-billing-week period (28 days) ending at midnight on the Saturday prior to the schedule's publication date.
- Schedules are determined and published weekly on a Sunday.

[3] Available here: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Data/MMS/2017/Estimated-Price-Methodology-Suspension-NER-3-14-5.pdf.
[4] Public holidays (for the majority of a region) are included in the weekend days.

2.3 Concerns with the existing methodology

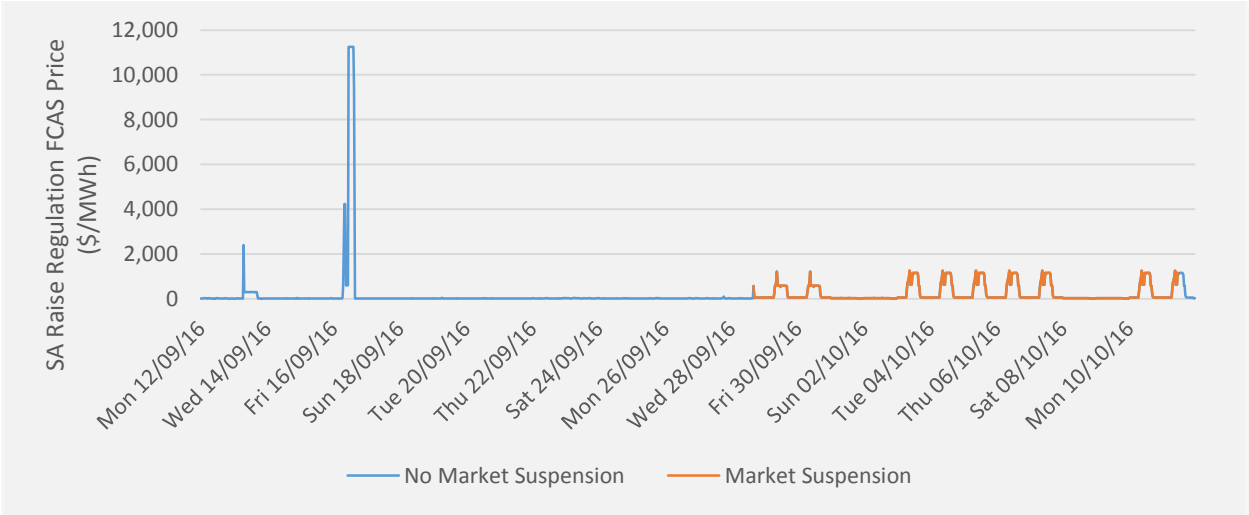
Following the 2016 South Australian black system event, AEMO convened a Market Suspension Working Group to seek industry input on potential changes to market suspension arrangements in the National Electricity Market (NEM).

The Working Group raised concerns regarding the existing estimated price methodology. In particular, the existing methodology applies an unfiltered four-week sample of prices for each region. As a result, calculations include any recent price spikes (and, in the case of the energy market, any negative prices). As a result, the schedules could produce atypical price outcomes.

For example, the schedules that applied during the South Australian market suspension between 28 September and 11 October 2016 contained some high frequency control ancillary service (FCAS) prices. These high prices were caused by local regulation FCAS requirements that occurred about two weeks before the market suspension, but were not reflective of FCAS requirements during the market suspension.

The impact of these prices is highlighted in Figure 1 below for SA Raise Regulation (SA Lower Regulation FCAS prices exhibited a similar impact).

Figure 1 South Australia Raise Regulation FCAS prices before and during the 2016 market suspension



3. PROPOSED CHANGES TO THE MARKET SUSPENSION ESTIMATED PRICE METHODOLOGY

In light of concerns with the existing methodology, AEMO considers that a review of the methodology is warranted to ensure that it best meets the requirements under NER clause 3.14.5(e)(1).

The following sections outline the pricing principles that AEMO considers it is reasonable to apply during a market suspension, and discusses possible improvements to the current methodology against these principles.

3.1 Principles for pricing during market suspension

In determining a revised approach to calculating the schedules, AEMO has devised the following set of principles which should apply during a market suspension event. These principles put in practise the practical requirements of the *Rules* (that schedules must reflect reasonable estimates of typical prices in the period to why they relate).

- Prices during market suspension should minimise the incentives for disorderly bidding.
  - This can occur when the schedules exhibit particularly high or low prices. At high schedule prices, generators are incentivised to bid their volume at very low prices (possibly the market floor price) to ensure dispatch while also being guaranteed the higher suspension spot prices. When the schedule prices are below generator short-run marginal costs, these generators are incentivised to bid their volume at very high prices, or even withdraw their generation, to avoid being dispatched.
- Prices during market suspension should minimise the need for intervention by AEMO.
  - This can occur when the schedules exhibit particularly low prices and generators respond by withdrawing capacity from the market. This could lead to insufficient supply, reserves, or other services such as system strength. This would increase the likelihood of AEMO intervention in the market to maintain system security or reliability.
- Prices during market suspension should minimise unnecessary price volatility.
  - Under these circumstances, generators may persistently rebid their volumes, causing changing dispatch outcomes. As a result, system security becomes more difficult to manage, at a time when the system is likely to be under considerable stress (due to the ongoing suspension).
- Prices during market suspension should minimise the impact on non-suspended regions.
  - This can occur when interconnector flows to or from a suspended region impact the dispatch and price of other regions. This is also a concern when FCAS services are co-optimised across region boundaries using a combination of suspended and un-suspended prices.

AEMO also notes the methodology for calculating the schedules should be consistent with both 30-minute settlement (the current regime) and 5-minute settlement (to be introduced in 2021).

Question for consultation

1. Are there any additional or modified principles that should be considered?
2. Are these proposed principles appropriate for assessing the merits of market suspension pricing methodologies?

3.2 Scope of review

This Issues Paper considers the following changes to the current methodology:

- The averaging horizon (currently four weeks).
- The averaging resolution (currently TI-based pricing).
- The treatment of days (currently weekdays and weekends/ public holiday).
- The treatment of outliers (currently all prices are included).
- The frequency of publication (currently published on a weekly basis).
- The use of the same approach across all nine markets (currently same approach used).

For the purpose of this Issues Paper, AEMO has only considered options that are within the current scope of the NER. However, AEMO is willing to consider proposing rule changes if necessary (for example, publishing the schedules one week in advance).

Question for consultation

3. Are there any further changes to the current approach that should be considered?

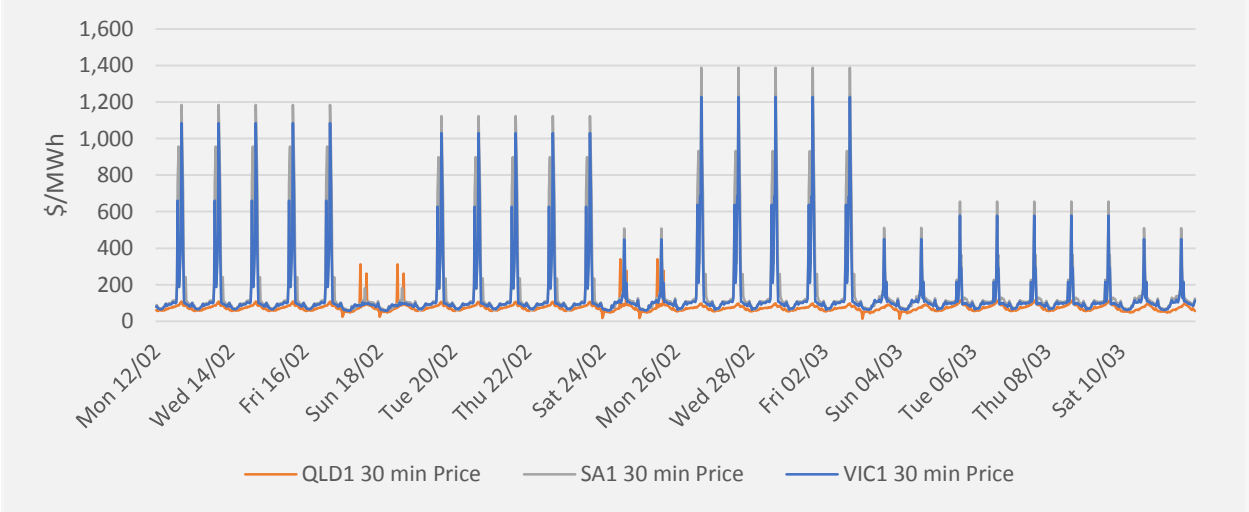
3.3 Possible methodologies

To compare outcomes under the current estimated price methodology with alternative options, AEMO has used sample schedule periods between Monday 12 February 2018 and Sunday 11 March 2018 across all regions, in the energy market only.

3.3.1 Current methodology

The existing methodology produces schedules as shown in Figure 2 below. New South Wales and Tasmanian energy prices have been removed from Figures 2-6, as these regions did not exhibit volatile prices during the sample period, and thus, for the purposes of this Issues Paper, are less impacted by the choice of methodology.

Figure 2 Market suspension price schedules for energy – current methodology



The 28 days used to produce the first schedule (12-18 February 2018) commenced on 31 December 2017. During this four-week period, there were particularly high and low prices across multiple regions. In particular, South Australian and Victorian prices exceeded $2,000 a megawatt hour (MWh) for 12 TIs and 8 TIs respectively. These high prices were a result of particularly high demand in South Australia and Victoria, with a Lack of Reserve (LOR) 2 flagged in Victoria. The average prices produced for the schedules were therefore very high, even though there were no LOR conditions in the periods the schedules relate to.

3.3.2 Averaging horizon

The averaging horizon of the schedules is an important component, requiring a trade-off between relevance of data considered (a shorter horizon) and smoothing of price volatility (a longer horizon).

In general, a shorter horizon will consider data that is more recent, and therefore more likely to be relevant to the schedule period (including recent trends in weather and system/ market operation), however it will be more prone to price volatility (as it will be strongly impacted by recent high/ low price events).

AEMO has considered four alternatives to the current averaging horizon of four weeks:

1. An averaging horizon of less than four weeks.
2. An averaging horizon of 13 weeks (approximately one season).
3. An averaging horizon of 52 weeks (approximately one year).
4. An averaging horizon based on three representative weeks in the most recent two years (the week before the schedules relate to, the week that the schedules relate to, and the week after the schedules relate to).

AEMO considers that the first alternative would result in schedules that are too susceptible to short-term or event-based volatility in prices, which is an unfavourable outcome.

Figure 3 and Figure 4 below show the representative price outcomes using the second and third alternatives. Compared with the current methodology (**Error! Reference source not found.**2), these a lternatives do result in less price volatility (peak South Australian prices of $507/MWh and $252/MWh, for the 13- and 52-week approaches respectively, compared to $1,387/MWh for the current four-week approach). This is considered a favourable outcome, as it is likely to minimise the incentives for generator rebidding and significant changes in dispatch outcomes during the suspension period when the system is likely already under stress.

The 52-week approach captures price impacts that occurred up to a year ago, which may not be at all relevant to the suspension period (for example, in Figure 4, Queensland has high suspension prices due to outcomes in Q1 2017). By contrast, the 13-week approach captures price impacts that are more likely to be relevant to the suspension period, as market conditions generally follow a seasonal pattern.

The final approach (representative weeks in the most recent two years) will have similar issues to the 52-week approach – price impacts that occurred in the past may not be relevant to the suspension period. This could be a result of a change in government policy, a change in generation mix, or a change in demand response behaviour.

Figure 3 Market suspension price schedules for energy – 13 weeks of data

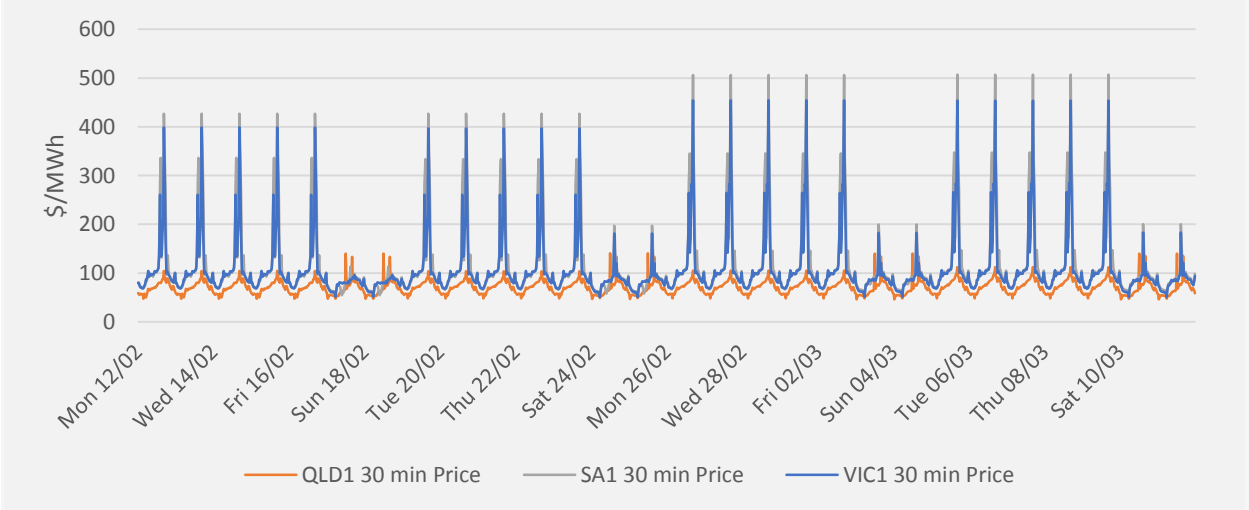
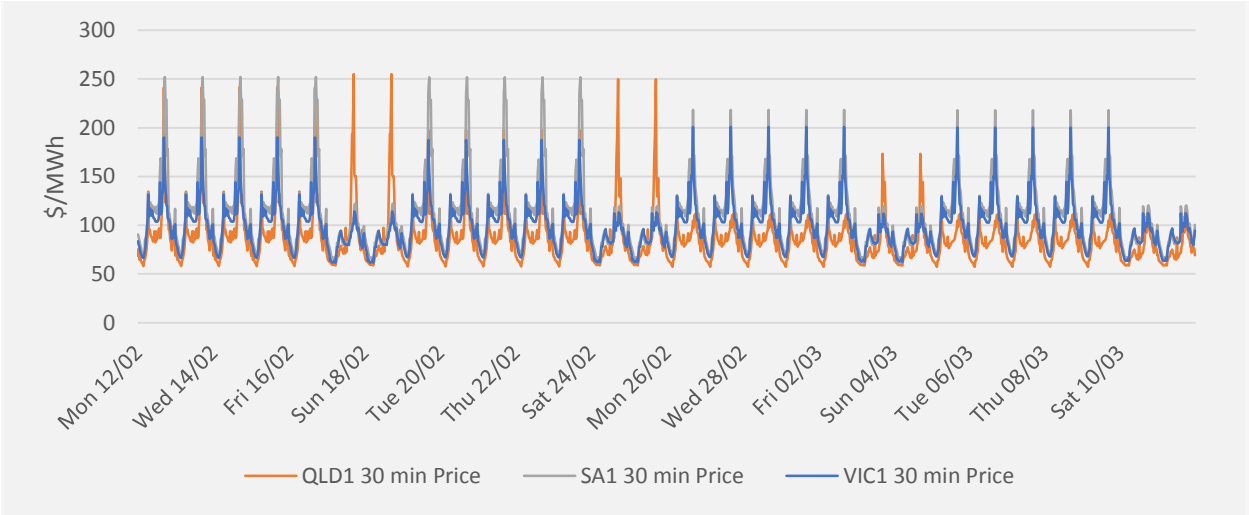


Figure 4 Market suspension price schedules for energy – 52 weeks of data



A further consideration in relation to the averaging horizon is what occurs during an extended suspension to the spot market. Under the current methodology, the 1st week's schedule prices will be used as inputs to calculate the 7th week's schedule prices. This will result in schedule prices trending towards an average as an event continues. Alternatively, schedule prices could be locked in at the start of an event (i.e. each suspension week has identical schedule prices), thereby ensuring schedule prices are not considered in determining other schedule prices.

Question for consultation

4. Which method do you believe is the appropriate horizon for market suspension pricing schedules, or is an alternative method preferable, and why?
5. During an extended event, do you believe schedule prices should be included as inputs to latter weeks' schedule prices, or you believe schedule prices should be locked in at the beginning of an event?

3.3.3 Averaging resolution

The averaging resolution of the schedules offers a trade-off between reduced volatility (longer discrete periods) and maintaining typical price 'shape' during the day (shorter discrete periods).

AEMO has considered four alternatives to the current averaging resolution of TIs (48 discrete periods per day):

1. An averaging resolution of one day (one discrete period per day).
2. An averaging resolution based on peak/ off-peak periods in a day (two discrete periods per day) [5].
3. An averaging resolution based on peak/ shoulder/ off-peak periods in a day (three discrete periods per day).
4. An averaging horizon of DIs (288 discrete periods per day).

[5] Peak is defined as 7am to 10pm (market time) on business days, off-peak is defined as all other times. This is in accordance with the ASX Energy definition, available here: https://www.asxenergy.com.au/products/overview_of_the_australian_el.

Although a whole of day average would minimise price volatility, it would also remove all typical price shape elements. This may remove necessary price signals for high-demand times of the day, and thus increase the possibility of interventions by AEMO to maintain power system security and reliability.

As shown in Figure 5 below, daily peak/off peak average pricing also results in a decrease in maximum price and price volatility compared to the current approach. However, AEMO notes this approach could result in insufficient generation being offered during the peak demand periods (late afternoon/ early evening), thereby increasing the possibility of interventions by AEMO.

This issue could possibly be improved by adding an average 'shoulder period' price, but in the absence of a broadly-accepted industry definition of these times, AEMO has not considered this option further at this stage.

As shown in Figure 6 below, DI based pricing is likely to result in an increase in maximum price, decrease in minimum price, and increase in overall price volatility, compared to the current approach. This is due to the price fluctuations within a TI (with prices generally spiking in the first or last DI). This option may warrant a further consideration when 5-minute settlement commences in the market, and pricing trends at a 5-minute resolution possibly change.

Figure 5 Market suspension price schedules for energy – peak/ off-peak pricing

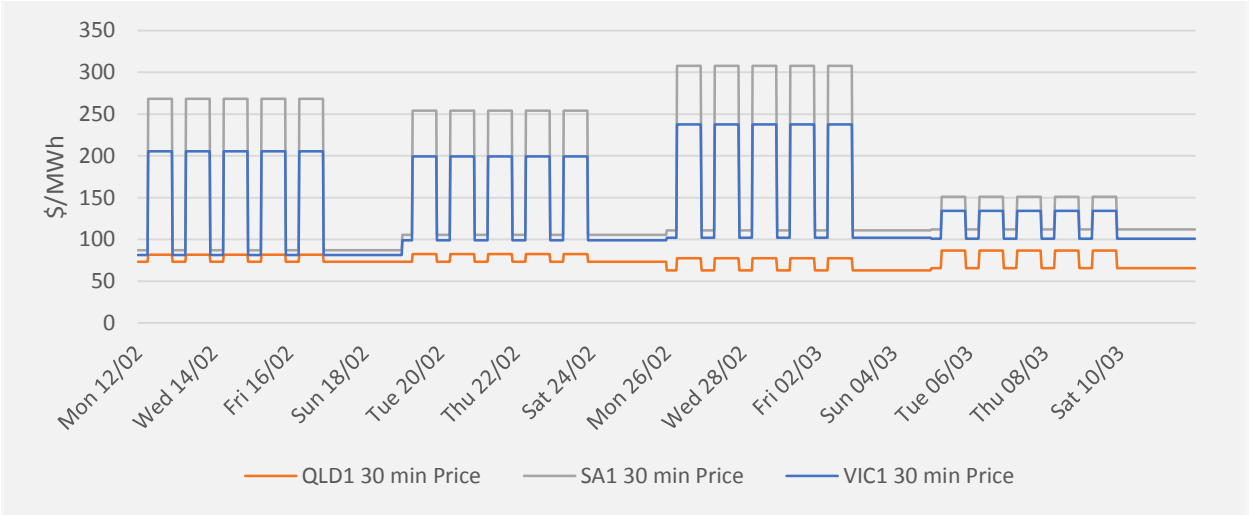
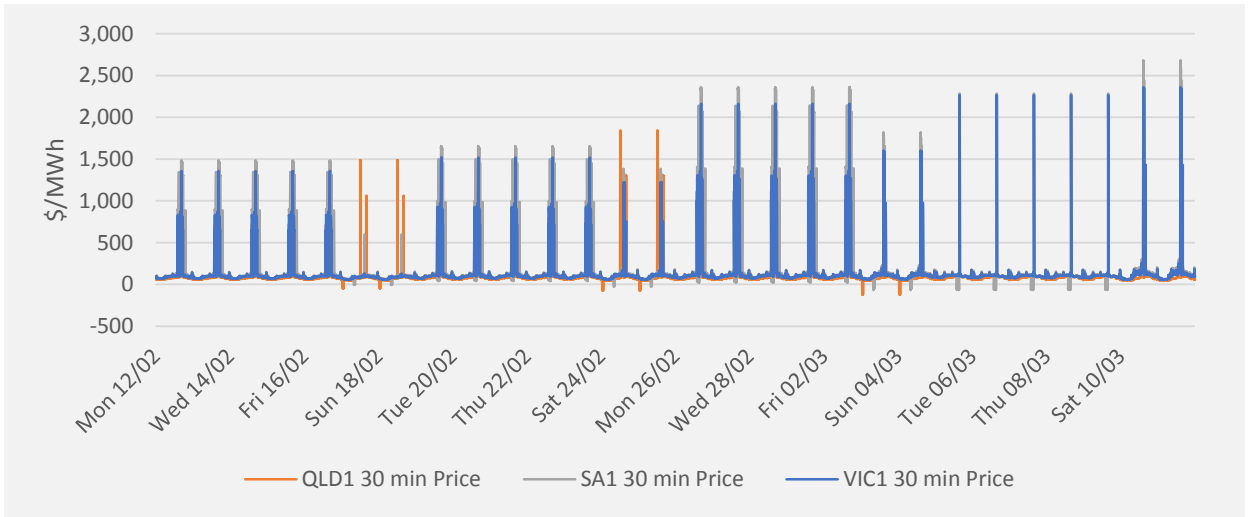


Figure 6 Market suspension price schedules for energy - 5-minute pricing



Questions for consultation

6. Which method do you believe is the most appropriate resolution for market suspension pricing schedules, or is an alternative method preferable, and why?
7. If you consider an additional 'shoulder' period should be included in the averaging approach, what times of the day should a shoulder period apply to, and why?

3.3.4 Treatment of days

The current methodology produces separate schedules for weekdays and weekends/ public holidays. However, consistent with the option of changing to peak/ off-peak pricing (as opposed to TI-based pricing), the weekday and weekend distinction would no longer be required, as all non-business days are categorised as off-peak periods.

Question for consultation

8. What treatment of days do you believe is most appropriate, and why?

3.3.5 Treatment of outliers

The treatment of price outliers in the Schedules determines the impact of prior (possibly exceptional) high or low price outcomes.

AEMO has considered two alternatives to the current approach, which includes all prices in the averaging period:

1. Excluding all outliers – prices above $300/MWh and prices below $300/MWh[6].
2. Minimising the impact of outliers – capping all prices at $300/MWh and flooring all prices at $0/MWh.

Figure 7 below shows the representative prices outcomes when prices in the averaging period are excluded if they are above $300/MWh or below $0/MWh. This method does result in decreased price volatility, with schedule prices having strict bounds of $0/MWh and $300/MWh. However, the potential still remains for prices during peak demand periods to be insufficiently high.

Figure 7 below shows the representative prices outcomes when prices in the averaging period are capped at $300/MWh and floored at $0/MWh. This method has a similar impact to the exclusion of outliers method, however has a lesser suppression on schedule prices. As a result, the potential for prices during peak demand periods to be insufficiently high still remains, however is not as severe as the exclusion of outliers method.

Furthermore, AEMO notes that the requirement to produce typical prices during market suspension does not necessarily require atypical prices to be removed from the dataset used for calculation.

[6] A capped price of $300/MWh has been used in accordance with the ASX Energy strike price for cap contracts (as these contracts are typically an indicator of expected price volatility). Historical analysis has shown that a price of $300/MWh approximately relates to the 99th percentile of spot prices across multiple regions. As such, the 1st percentile of spot prices across multiple regions ($0/MWh) has been chosen for the floored price.

Figure 7 Market suspension price schedules for energy – removal of outliers

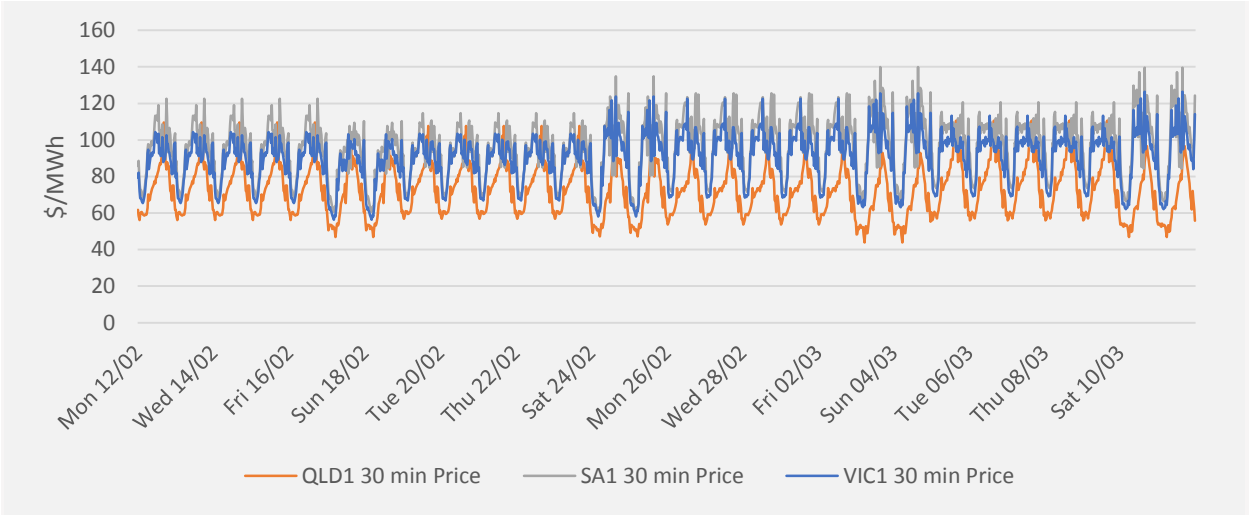
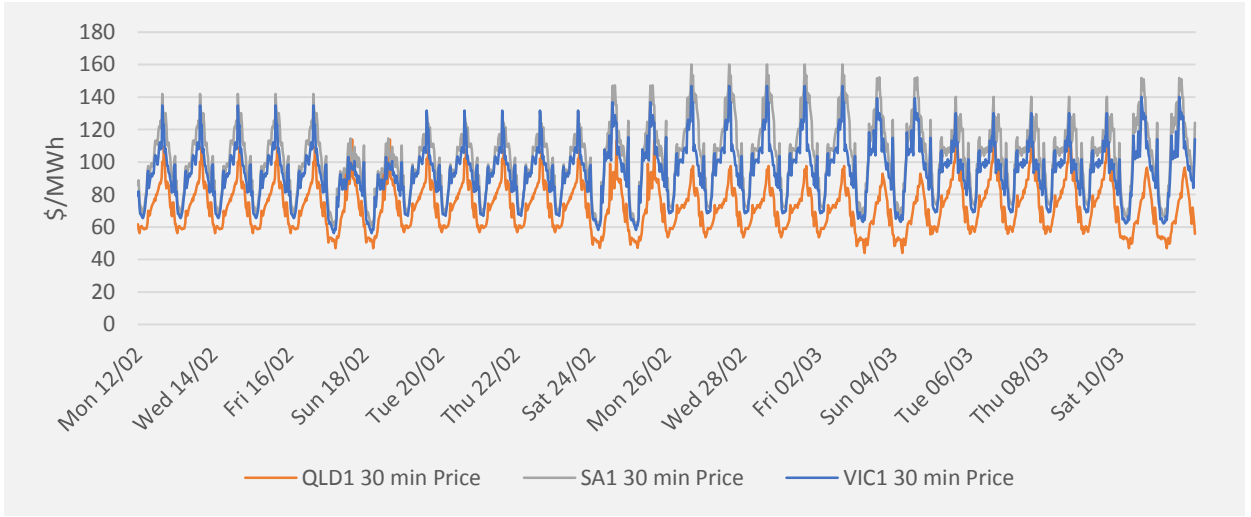


Figure 8 Market suspension price schedules for energy – minimising the impact of outliers



Question for consultation

9. Which method do you believe is the most appropriate treatment of outliers for market suspension pricing schedules, or is an alternative method preferable, and why?

3.3.6 Frequency of publication

The current methodology produces a new set of schedules each week, based on a rolling historical window. AEMO is not aware of any issues that would warrant a change to this frequency.

Question for consultation

10. What frequency of publication do you believe is most appropriate, and why?

3.3.7 Approaches used across the markets

The current methodology uses the same averaging and publication approach across all nine markets. The use of different approaches across the nine markets could unnecessarily increase complexity and reduce transparency.

Question for consultation

11. Do you believe that the same methodology should be used to determine market suspension pricing schedules for all nine markets, or are there benefits in adopting different approaches?

4. CONCLUSION

Under the NER, AEMO is required to develop a methodology to prepare and update schedules containing reasonable estimates of typical market prices to which the schedules relate, to be used when the spot market is suspended.

In 2017, AEMO convened a Market Suspension Working Group, to discuss a range of topics associated with Market Suspension. Through this group, several concerns were raised with the current approach used to produce Market Suspension Pricing Schedules. These concerns related to how well these Schedules reflected typical pricing outcomes, whether they result in unnecessary volatility during periods of system stress, and whether they incentivise adverse bidding behaviour in some situations.

AEMO has considered the issues raised against the current calculation methodology and believes improvements can be made. AEMO is seeking stakeholder feedback on the specific questions raised throughout this issues paper, and in particular on the appropriateness of the proposed options.

In accordance with the proposed consultation timetable, AEMO invites stakeholder feedback by 5.00 pm (Melbourne time) on 6 August 2018 to ori.agranat@aemo.com.au.

ABBREVIATIONS

Abbreviation	Expanded name
AEMO	Australian Energy Market Operator
NEM	National Electricity Market
NER	National Electricity Rules
NSW	New South Wales
QLD	Queensland
SA	South Australia
TAS	Tasmania
TI	Trading Interval
VIC	Victoria