

## Wholesale Electricity Market Rule Change Proposal Submission

**RC\_2019\_05**

### Amending the Minimum STEM Price definition and determination

#### Submitted by

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Submissions on Rule Change Proposals can be sent by:

Email to: [support@rcpwa.com.au](mailto:support@rcpwa.com.au)

Post to: Rule Change Panel  
Attn: Executive Officer  
C/o Economic Regulation Authority  
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**1. Please provide your views on the proposal, including any objections or suggested revisions.**

The Australian Energy Market Operator (**AEMO**) welcomes the opportunity to provide a submission to the Rule Change Panel on the Draft Rule Change Report for Rule Change RC\_2019\_05 Amending the Minimum STEM Price definition and determination.

AEMO has welcomed the opportunity to engage with the Rule Change Panel (**Panel**) team throughout the rule drafting process including engaging expertise from its consultants, Marsden Jacobs Associates, to assist it in providing feedback to the Panel's Secretariat team. This includes the Marsden Jacobs Associates' presentation at Attachment 1 to this submission.

However, AEMO is unable to support the Panel's proposed amendments in their entirety. AEMO has concerns with some of the proposed amendments and its reasons for this are discussed as part of its assessment below.

The Panel is proposing Amending Rules to implement a two-step process for AEMO to review the Minimum STEM Price as part of its annual review of Energy Price Limits under clause 6.20.6 of the Market Rules.

The first of these steps is to assess whether the Minimum STEM Price is appropriate by considering (proposed clause 6.20.6A):

- any incidents where the Balancing Market has settled at the minimum STEM Price
- any changes in the generation fleet
- any requests for Market Participants to revise the Minimum STEM Price or notifications that the price is not appropriate.

AEMO must only move to a full review of the Minimum STEM Price (step two) if, after considering the above factors, AEMO forms the view that the Minimum STEM Price is not appropriate.

AEMO supports the appropriateness test in proposed clause 6.20.6A as the factors that need to be assessed in that clause are clear. AEMO considers that the inclusion of this test will reduce the risk of expending resources on conducting a full review of the Minimum STEM Price every year, where there may be no clear need to do so.

Step two of the process requires AEMO to conduct a full review to determine the Minimum STEM Price, having regard to several factors specified in proposed clauses 6.20.8, 6.20.8B, 6.20.8C, 6.20.8D and 6.20.8E. The Amending Rules detail the factors to be considered when determining the Minimum STEM Price, however the rules do not describe how each of these factors are to be used. This means that a detailed methodology must be developed before undertaking the review.

While AEMO could implement the full review step as currently drafted, AEMO's concern is that this will require significant effort over an alternative approach. This effort includes:

- Addressing potential gaps when gathering inputs (e.g. relies on voluntary provision of generator data, where data is not provided assumptions will need to be formulated)
- Ensuring that the application of complex methodologies are transparent for Market Participants and the regulator
- Addressing alternative interpretations and disagreement when progressing through the regulatory approval process.

AEMO will seek to implement the Amending Rules as efficiently as possible but the effort required to fulfil the obligations under the current drafting will likely lead to high ongoing costs to undertake the annual reviews. AEMO therefore proposes an alternative in the form of a codified approach.

A codified approach will reduce the level of effort and the associated cost for undertaking the review. It also provides consistency from one review to the next. A codified approach means that the prescribing instruments (e.g. rules and procedures) will contain sufficient detail for AEMO to apply a methodology, rather than having to develop a detailed methodology first, and potentially at each review.

A codified approach could be implemented either through the Market Rules, or as combination of the Market Rules and a Market Procedure. A Market Procedure will allow slightly more flexibility if changes to the approach are required at a later time, because the change process is less onerous than that for a rule change.

If the latter approach is taken, AEMO considers that the owner or approver of the Market

Procedure should be the Economic Regulation Authority as it will be the ultimate approver of the Minimum STEM Price.

AEMO considers that the following are some of the matters a codified approach could specify either in the Market Rules and/or Market Procedures:

- **Generator data:** While some technical generator data will be available through Standing Data, others will need to be obtained from Market Participants. The Amending Rules do not provide for a process to obtain this data for the purpose of determining the Minimum STEM Price. This would be a voluntary process for Market Participants. Where this data is not provided, guidelines should prescribe how the required data is to be developed (for example in a Market Procedure). Similar issues arise with cost data (e.g. SRMC).
- **Future Balancing Prices:** Modelling of Balancing Prices is required. Guidelines on how to determine and how to express the distribution of these prices should be prescribed (for example, in a Market Procedure).
- **Minimum STEM Price calculation equation:** The Market Rules or Market Procedure could specify an equation (refer to slide 11 in Attachment 1 for an example) with the guidelines for the assumptions required, explained in a Market Procedure.
- **90th percentile:** Proposed clause 6.20.8A(b) requires the Minimum STEM Price to be lower than 90 percent of the prices determined through the modelling exercise. Guidelines on the approach to obtaining the 90<sup>th</sup> percentile should be prescribed (for example, in a Market Procedure).

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**2. Please provide an assessment whether the change will better facilitate the achievement of the Wholesale Market Objectives.**

AEMO considers that under the current drafting, the Minimum STEM Price determination process could be a costly one and therefore not consistent with Market Objective (a):

*to promote the economically efficient, safe and reliable production and supply of electricity and electricity related services in the South West interconnected system.*

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**3. Please indicate if the proposed change will have any implications for your organisation (for example changes to your IT or business systems) and any costs involved in implementing these changes.**

AEMO stated in its first-round submission that if this Rule Change Proposal proceeds as drafted, then AEMO will be able to modify the Minimum STEM Price in its market systems at no system cost. This advice remains current should there be a change in the Minimum STEM Price following future reviews.

Under the current drafting, AEMO's estimate of the ongoing cost to determine the Minimum STEM Price has not changed from that stated in the Draft Rule Change Report.

**4. Please indicate the time required for your organisation to implement the change, should it be accepted as proposed.**

The timeframe for implementation will be dependent on the final Amending Rules. If for example, the Amending Rules require the development of a Market Procedure then sufficient time will be needed for this, ahead of AEMO incorporating the proposed changes in subsequent Energy Price Limit reviews.

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Attachment 1: Marsden Jacobs Associates presentation

MARSDEN JACOB ASSOCIATES

economics  
public policy  
markets  
strategy

WEM rule change RC\_2019\_05  
Approach and Issues

Presentation to the Rule Change Panel 17 April 2020

A Marsden Jacob Presentation

## Presentation Outline

- Review of proposed rules – what they require to be considered and undertaken.
- Economic model of decommitment decision:
  - based on requirements of the rules.
- Calculation of the Minimum STEM Price:
  - calculation
  - what is known and not known.
- Proposed Rules:
  - range of approaches
  - assessed range of consulting resources required.
- Codified approach.
- Conclusions.

*Note: These slides present various equations. These are presented for illustration only.*

## STEM Minimum Price - Objectives

### Rule 6.20.8

Objectives of the Minimum STEM Price are to:

- (a) facilitate clearance of the Balancing Market without the Balancing Price being equal to the Minimum STEM Price in most circumstances; and
- (b) limit Market Participants' exposure to Balancing Prices that could threaten the financial viability of a prudent Market Participant.

### ***Marden Jacob Comment on Rule 6.20.8***

*The objectives are a balance between clearing above the Minimum STEM Price and financial risk.*

## Summary Assessment of Rule Change

- The draft rules detail the factors to be considered when determining the Minimum STEM Price, however they do not describe how each of these factors are to be used.
- This means that a detailed methodology must be developed before undertaking a review.
- A lack of clear and prescribed methodology comes with a number of risks including:
  - difficulties associated with gathering inputs
  - complex and non transparent methodologies
  - potential disagreement and uncertainty with the regulator
  - time and costs to undertake the review.
- A codified approach is preferred as it reduces these risks and provides consistency from one review to the next.
- A codified approach could also include a process for participants to provide required information and guidance on the assumptions that need to be formulated (such as SRMC).



## Appropriate Test (6.20.6A)

*NOTE: The rules presented below are summaries of the actual rules.*

### **Annual review** (6.20.6)

- (b) must determine whether the Minimum STEM Price is appropriate; and
- (c) if not appropriate recommend a revised value.

### **Appropriate test** (6.20.6A) – since the last review

- (a) any incidents where the Balancing Market has settled at the Minimum STEM Price
- (b) change in the generation fleet that is likely to result in the current Minimum STEM Price being materially lower or materially higher than necessary to achieve the objectives
- (c) Market Participant has notified AEMO - current Minimum STEM Price is not appropriate or requests it be revised.

## Proposed Rules - Basis of Decommitment Decision that determines the Minimum STEM Price

### **6.20.7 (a) ii.** (underlining added by Marden Jacob)

subject to clause 6.20.6B, the Minimum STEM Price, which is to be based on AEMO's estimate of the decommitment costs of the Facility with the highest decommitment costs in the SWIS and is to be determined with reference to clause 6.20.8 and in accordance with clauses 6.20.8A and 6.20.8B;

### **6.20.8B (a)** (underlining added by Marden Jacob)

Decommitment decision:

- Facility with the highest decommitment cost
- fully exposed to the Balancing Price

### **6.20.8A** (underlining added by Marden Jacob)

When determining the Minimum STEM Price AEMO must

- (a) determine for credible scenarios of low demand, the price at which the operator of the Facility with the highest decommitment costs per MW of its minimum stable level of operation in the scenario would, acting reasonably, decommit the Facility should the Balancing Price equal or fall below that price for a single Trading Interval; and
- (b) determine the Minimum STEM Price to be the price that is lower than 90 percent of the prices determined under clause 6.20.8B(a).

## Proposed Rules - AEMO Specified Factors

*NOTE: The rules presented below are summaries of the actual rules.*

When determining the decommitment costs of a Facility under clause 6.20.8A, AEMO must consider:

6.20.8B (a) i. to iv. (underlining added by Marden Jacob)

Factors include but not limited to:

- the cost to decommit and recommit – include start-related fuel and variable operating and maintenance costs
- timeframe is the minimum time the Facility must remain out of service once decommitted before recommitment is possible
- the minimum stable level of operation
- any expected losses or gains, opportunity costs and cost savings that the Market Generator would incur as a result of decommitment for the duration of the minimum time the Facility must remain out of service.

Other Matters AEMO deems relevant.

## Economic Model of Decommitment Decision

*A decision is made to decommit if the cost of remaining in service is higher than the cost of decommitting.*

The equation for this is:  $\text{Avoided Cost (\$)} > \text{Decommitment Cost (\$)}$

Can divide this equation by the Minimum Stable Load to get  $\$/\text{MW}$

**The proposed rules require this that the Minimum STEM Price be calculated based on:**

- Highest Decommitment Cost unit expressed as  $\$/\text{MW}$  (MW is Minimum Stable Load)
- Min Stable Load (MW) (6.20.8B (a) ii.)
- The decommit period being the Minimum Decommit Period (hrs) (6.20.8B (a) i and iii.)
- Opportunity cost limited to that during the Minimum Decommit Period (6.20.8B (a) iv.)
- The Minimum STEM Price occurs for one 30 minute period only.

For a set of assumed values, the highest value of the Minimum STEM Price occurs when  
 $\text{Avoided Cost} = \text{Decommitment Cost}$

Question: would a Facility “acting reasonably” decommit based on the above equation.

# Decommitment Cost

Expressed as \$ per MW of the Minimum Stable Load

### Decommitment and recommitment assumptions

- For a period equal to the Minimum Decommit Period
- From and to the Minimum Stable Load  
(The above is based on the normal generator operation)  
**(these are known)**

### Input costs

- Fuel and Heat rate (normal)
- Auxiliary fuel (to start and maybe stop)
- Maintenance (additional due to wear and tear)
- Operations (manning etc.)  
**(these are not known)**

### Notes:

- The unit with the highest decommit cost (\$) may not have the highest \$/MW decommit costs.
- The Decommitment Period is not relevant.

### Example Calculation:

#### Unit 1:

Total cost to commit and decommit: \$80,000  
Min Stable Load: 200 MW  
Decommit cost: \$400/MW

#### Unit 2:

Total cost to commit and decommit: \$50,000  
Min Stable Load: 100 MW  
Decommit cost: \$500/MW

## Avoided Cost

Expressed as \$ per MW of the Minimum Stable Load

### Assumptions

- Period equal to the Minimum Decommitment Period
- One period is at the Minimum STEM Price. Question – is this necessarily the first 30 minutes?  
(these are known subject to the question noted)

### Input costs

- The operating cost of the unit when operating as Minimum Stable Load (assume this is SRMC)
- The balancing prices during the Minimum Decommit Period (excluding the period of Minimum STEM Price).
- This can be expressed as the Average Balancing Price during this period which equals

$$\frac{\text{Minimum STEM Price}_{\$/MWh} \times 0.5 + \text{Balancing Price}_{\$/MWh} \times (\text{Min Decommit Time} - 0.5)}{\text{Min Decommit Time}}$$

(Balancing Prices excluding Min STEM Price period are not known)

### Avoided cost (\$/MW) is:

$$(\text{Average Balancing Price}_{\$/MWh} - \text{Short Run Cost}_{\$/MWh}) \times \text{Min Decommit Time}_h$$

(On the assumption the Balancing Price elasticity (to the decommitment) is not considered, the level of Minimum Stable Load is not relevant.)

## Determining the Minimum STEM Price

The Minimum STEM Price is determined by the following equation:

$$\text{Avoid Cost}_{\$/MW} = \text{Decommitment Cost}_{\$/MW}$$

Combining the two equations (see previous slides) and solving for the Minimum STEM Price:

$$\text{Minimum STEM Price}_{\$/MWh} =$$

$$-2 \times \left( \sum_{0.5}^h \left( \text{Balancing Price}_{\$/MWh} - \text{SRMC}_{\$/MWh} \right) + \text{Decommitment Costs}_{\$/MW} \right) \quad -- (1)$$

The solution of the Minimum STEM Price will vary based on the assumptions for the unknown factors identified in the previous slides.

### To obtain the 90<sup>th</sup> Percentile

- Develop probability distributions for each of the unknown factors where precise data is not possible
- Monte-Carlo Equation 1 using known values and value distributions
- Order results from lowest to highest and select the 90<sup>th</sup> percentile value of the Minimum STEM Price (i.e. 10% from the top).

## Proposed Rules – Possible Approaches

### **Decommitment equation**

- Avoidable Costs to be greater than Decommit Costs by an error margin (this may be what is reasonable).

### **Obtain or determine the factors in the equation**

- Generator decommit / commit costs and SRMC:
  - obtain actual values and verify. There maybe a spread in these values.
  - not provided – independently develop – uncertainty expressed through a distribution.
- Avoided costs:
  - how SRMC varies with generation level
  - assumptions of period when decommitment occurs – low demand, or other
  - assumption of 30 minute period in the Min Decommit Period that the Minimum STEM price occurs
  - provide for more than one Minimum STEM Price in the Min Decommit Period
  - account for price elasticity
  - generator operation (level of output) if not decommitted
  - not only energy by other services

### **Development and application of Monte-Carlo model**

- Nature of distributions developed.



## Application of Proposed Rules: Issues

### Issues

- It is likely that the Minimum STEM Price determined will be sensitive to the assumptions and approaches:
  - Balancing Prices
  - generator unit marginal heat rate etc.
- There could be a tendency to introduce great analysis and modelling detail, requiring time, costs and review time and cost
- The need to develop an approach and make judgements on approach also introduces a sizable amount of work.

## Application of the Proposed Rules: Codification

### Proposed Rules - Non-Codified Approach

- The proposed rules do not present a “step by step” and specified equation(s) approach to the determination of the Minimum STEM Price.
- Lends to different approaches and disputes on what should be done.

### Codified Approach

- Provides for a uniform approach to the issues (and other issues) of the previous slide.
- Allows for:
  - ready assessment of conformance with the rules
  - a process for participants to provide required information for the review
  - guidance on assumptions that need to be formulated (such as SRMC)
  - market Procedures for assumptions that need to be formulated
  - lower cost on implementation.
- If properly done minimal loss of the accuracy level required.

## Outline of a Codified Approach

### Generator data - unit with highest Decommitment Cost

- Generator Data:
  - Standing data of generators
  - data to be obtained from generators
  - if not obtained, guidelines on how to develop
  - uncertainties.
- Assumptions of generator decommitment and commitment processes:
  - generation profile (of decommit and commit)
  - costs to be included.
- Calculation of Decommitment costs \$/MW as a function of the variables.
- SRMC \$/MWh as a function of variables.

### Determine Avoidable Cost

- Balancing prices:
  - guidelines on how to determine and how to express the distribution.

### Min STEM Price calculation equation

- Specify – address issues such as error margin.

### Obtaining the 90<sup>th</sup> Percentile

- Guidelines on approach.

## Application of Proposed Rules: Resources

### Assessment of resources

- The estimate and range is difficult to assess with this not having been previously done.
  - the components that have the greatest impact on the Minimum STEM Price are not known.
- Expressed in terms of “multiples” of resources required for the STEM Price Limits review.
- Based on this, an initial estimate of the range of costs is as follows:
  - Low estimate: About 1.5 x resources required for the STEM Price Limits review
  - High estimate: At least 3 x resources required for the STEM Price Limits review.

# Conclusions

## Determination of the Minimum STEM Price

- The current rules:
  - have unaddressed questions
  - provide a wide range of possible approaches to the assessment of the Minimum STEM Price
  - Provide for the potential costs to be many times that required for the Energy Price Limits review.
- A codified approach would:
  - narrow the range of possible approaches
  - limit of time and costs involved
  - not sacrifice the level of required accuracy.
- Provides no limit to the Minimum STEM Price should this be calculated as a negative number much less than -\$1,000/MWh.

## The Appropriateness test (6.20.6A)

- Addresses the requirements well.
- Fails to give guidance on how the objectives should be applied when considering the number of periods at the Minimum STEM Price and the level of the Minimum STEM Price.