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| Invitation to provide submissions | | |
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| 2017 Energy Price Limits review for the Wholesale Electricity Market draft report | | |
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Important Notice

#### Purpose

The Australian Energy Market Operator (AEMO) has prepared this document to set out proposed inputs and seek feedback on the revised 2017 Energy Price Limits Review draft report. This document has been prepared and published by AEMO as required by clause 6.20.9 of the Wholesale Electricity Market (WEM) Rules.

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# Background

Clause 6.20.6 of the Wholesale Electricity Market (WEM) Rules requires the Australian Energy Market Operator (AEMO) to annually review the appropriateness of the values of the Energy Price Limits. In conducting the review, AEMO may propose revised values for the Maximum Short Term Energy Market (STEM) Price and the Alternative Maximum STEM Price. AEMO must calculate the proposed values using the methodology set out in clause 6.20.7 of the WEM Rules and then submit the proposed values to the Economic Regulation Authority (ERA) for approval.

On 15 June, AEMO provided the ERA with its proposal for the Energy Price Limits for 2017. On 22 June, the ERA identified an issue with the methodology used to discount the operating and maintenance costs. This issue specifically relates to the methodology used to calculate the time value of money with respect to start-up costs. AEMO has undertaken a review of the methodology and confirmed the issue.

Accordingly, AEMO has developed a revised methodology and underlying assumptions in consultation with the ERA. The revised methodology and underlying assumptions have changed the Maximum STEM Price and the Alternative Maximum STEM Price calculated in accordance with the overall methodology set out in clause 6.20.7 of the WEM Rules. The updated proposed values are a Maximum STEM Price of $351/MWh and Alternative Maximum STEM Price of $544/MWh.

Accordingly AEMO has updated its proposal for the Energy Price Limits to apply for 2017 and will submit its updated proposal to the ERA.

Due to the change to the methodology, assumptions and proposed Energy Price Limits, AEMO has elected to conduct an additional, 2 week consultation with Stakeholders. This consultation will focus on the changes to the proposal made in response to the issue.

# Invitation for submissions

AEMO invites all sectors of the Western Australian energy industry, including end-users, to make submissions on the updated draft proposal for the Energy Price Limits to apply for 2017.

Submissions must be delivered to AEMO by **5:00 PM (AWST)** on **Tuesday 29 August 2017**.

Submissions should:

* clearly address any specific issues with the changes to the methodology or assumptions, as outlined in section 3 and Appendix B of the report; and
* provide any supporting evidence or calculations (if appropriate).

Please note that AEMO is required by clause 10.5.1(q) of the WEM Rules to make all submissions public. If confidential information is provided in a submission as supporting evidence, the submitting party must provide a public and a confidential version of the submission. The public submissions will be made available on the Market Web Site at: <https://www.aemo.com.au/Stakeholder-Consultation/Consultations/>

In addition to the updated draft proposal, AEMO has made available a version of the proposal with track changes to assist stakeholders with comparing the changes to the draft proposal published in March 2017.

AEMO prefers to receive submissions by email to [wa.operations@aemo.com.au](mailto:wa.operations@aemo.com.au).

Written submissions may also be sent to AEMO by post, addressed to:

**Australian Energy Market Operator**   
Attn: Group Manager, Operations and Technology (WA)  
PO Box 7096   
Cloisters Square, PERTH, WA 6850

# Changes to the proposal for the Energy Price Limits for 2017

## Summary

Variable Operating and Maintenance (O&M) costs are used as an input for the calculation of the Energy Price Limits as outlined in the equation in clause 6.20.7(b) of the WEM Rules.

On 22 June, the ERA identified an issue with the methodology used to discount the operating and maintenance costs. To better reflect time value of money in calculating variable O&M costs, AEMO has updated the methodology to annualise the average discounted cost in an annuity as opposed to averaging discounted cost of maintenance over future periods. The previous methodology had a tendency to underestimate the present value of future maintenance costs.

In line with the methodology change, the assumptions underlying the O&M costs for industrial turbines were revised and adjusted accordingly. Table 1 summarises the changes in methodology and assumptions.

1. Key changes from the updated 2017 Draft report

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| **Values** | **Previous report** | **Change** | **Reason** |
| Maximum STEM Price | $245 MWh. | $351/MWh (+$106/MWh). | Change in discount methodology applied on O&M costs to better reflect time value of money. |
| Alternative Maximum STEM Price | $424/MWh. | $544/MWh (+$120/MWh). |
| O&M cycle costs | $12.3M (need to add 20%, see below). | Reduced to $10.0M. | Used to have a conservative assumption estimating old parts to be repaired once per year. Assumption revised to 3 repairs per year before being replaced. |
| Escalation to represent the O&M cost impact of peaking duty to cover unscheduled maintenance | 20% escalation factor. | 20% escalation factor applied differently. | Revised to be used as a multiplier on the number of starts as opposed to applying it as a cost uplift to better reflect the factored starts attributable to trips in gas turbines. |

## O&M Cost Escalation Issue

Section 3.4.2 of the initial draft proposal, outlines the methodology used to discount the O&M costs. In order to discount the O&M costs, an integration formula is used to estimate the present value of future maintenance expenditures. It is noted that maintenance expenditures (as shown in Table 4 of the initial draft proposal) are denominated in December 2017 dollar values. Those maintenance expenditures, however, will be accrued in future time periods depending on the number of starts per year (and the point of the maintenance cycle for the machine).

In the initial draft proposal it is assumed that maintenance expenditures denominated in 2017 dollar values can be spread over future periods based on an arithmetic average calculation. Those average amounts are then discounted to a present value to calculate the average discounted cost of maintenance.

Three shortcomings arise with this methodology:

1. The spread of maintenance expenditures based on an arithmetic average does not account for the time value of money. By averaging those costs over future periods and discounting back based the time value of money adjusted discount rate, the method underestimates the present value of future maintenance costs.
2. The method does not account for potential variations in future maintenance expenditures in comparison with their estimates in 2017.
3. The average discounted cost of maintenance is divided by the total number of starts in a full maintenance cycle. The discounted cost of maintenance per starts has been estimated using an annual compounding method to estimate present values and annuities.[[1]](#footnote-1) The number of starts in a future period has to be discounted in a similar manner to the future maintenance expenditures.[[2]](#footnote-2)

Therefore, the applied method in the initial draft proposal did not appropriately account for the time value of money and risk when estimating the average discounted cost of maintenance.

In the initial draft proposal the discounted maintenance cost was divided by the total of 2,400 starts in a maintenance cycle, corresponding to the maintenance cycle C. The numerator was being discounted but the denominator was not, which was not properly accounting for the time value of money.

In response to this issue, AEMO has annualised the average discounted cost for variable O&M costs in an annuity as opposed to averaging discounted cost of maintenance over future periods. In the updated draft proposal, the number of starts in the denominator has been discounted and is set at 838 (based on the average number of factored starts per year, 82.2).

Accordingly, the start cost is 2.9 times larger (= 2400 / 838) in AEMO’s updated draft and is the key driver for the change in this year’s Energy Price.

## Revised assumptions

In reviewing the O&M cost methodology, AEMO’s consultant Jacobs identified two changes to the assumptions used for the calculation of the Energy Price Limits in accordance with clause 6.20.7 of the WEM Rules.

1. **Operating and Maintenance Costs**

The cost methodology underlying the O&M cost estimate was reassessed against industry practice which identified that some of the components of the O&M cost were overly conservative. In particular, it was identified that the assumptions regarding the cost of repairing parts and the re-use and repair of existing parts rather than replacement had been conservative.

Accordingly, the base O&M costs were adjusted to better reflect industry practice. This led to a 19% reduction of the base O&M cost relative to the cost derived using last year’s assumptions.

1. **Frequency of Start**

In the initial draft proposal a 20% uplift was applied on the start cost to account for a gas turbine operating in peaking mode. It was identified that the 20% factor was intended to account for relationship between the “factored starts” anticipated by the equipment manufacturer and the actual starts that the gas turbine might experience. To better reflect this relationship, the 20% was applied as a multiplier to the number of starts rather than the applying it as an overall cost uplift.

The changes to these assumptions mitigated some of the increase from the O&M cost escalation issue.

# Results

The proposed revised values for the Energy Price Limits are as follows:

* **Maximum STEM Price**: The proposed revised value for the Maximum STEM Price is $351/MWh. This is based on the estimated costs (with gas firing) for industrial type gas turbines. These units have shorter run times and higher start-up costs, which make them the higher cost resources; and
* **Alternative Maximum STEM Price**: The proposed revised value for the Alternative Maximum STEM Price is $544/MWh using the estimated costs (with distillate firing) for industrial type gas turbines at the distillate price of $16.43/GJ. The Alternative Maximum STEM Price is calculated, applying this distillate price as the fuel cost, as the total of:

$227.88/MWh + 19.256 multiplied by the Net Ex Terminal[[3]](#footnote-3) distillate fuel cost in $/GJ.

1. A continuous compounding model can also be developed to estimate discounted costs in a closed form solution. [↑](#footnote-ref-1)
2. This may seem counterintuitive as number of starts are not monetary values. However, note that there is a cost associated with each start of the machine. Those costs are spread over future periods and have to be discounted to their present value. A more intuitive alternative to calculate cost per start is to annualize the average discounted cost (in an annuity) and then divide the annual amount by the average number of starts per year. [↑](#footnote-ref-2)
3. Wholesale price for distillate in Perth, Western Australia, after deduction of excise rebate and excluding GST. This price does not include road freight costs. [↑](#footnote-ref-3)