Margin Values for the 2017/18 financial year

Issues paper

28 December 2016

Economic Regulation Authority
WESTERN AUSTRALIA

Economic Regulation Authority

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Introduction

Synergy is currently the default provider of the Spinning Reserve Ancillary Service[1] under the *Wholesale Electricity Market Rules* (**Market Rules**). However, the Market Rules also allow other generators to provide such services through an Ancillary Service Contract, provided it is a less expensive alternative.[2]

The Ancillary Service Margin Peak and Margin Off-Peak parameters (**Margin Values**) are required under the Market Rules to determine the amount Synergy is paid for the provision of Spinning Reserve Ancillary Services.[3] Margin Values are applied to the Balancing Price to calculate the availability cost to be paid to Synergy for this service.

The Market Rules[4] require the Australian Energy Market Operator (**AEMO**) to submit a proposal for the Margin Values to the Economic Regulation Authority (**Authority**) by 30 November of the year prior to the start of the financial year.

The AEMO submitted its proposal on the Margin Values for the period from 1 July 2017 to 30 June 2018 on 30 November 2016.[5] The AEMO engaged Jacobs Group (Australia) Pty Ltd (**Jacobs**) to assist in deriving the Margin Values and provided the Authority with a confidential report prepared by Jacobs on the key modelling assumptions used in deriving the Margin Values.

The AEMO's proposal and Jacobs' public report are available on the Authority's website.[6]

The Market Rules[7] require the Authority to determine the Margin Values by 31 March 2017 to apply from 1 July 2017 to 30 June 2018.

In determining the Margin Values, the Authority must consider the Wholesale Market Objectives[8] and AEMO's proposal. It is also required to undertake a public consultation process, which must include publishing an issues paper and inviting public submissions.[9] This issues paper was prepared to assist interested parties in making submissions on the

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1 The Market Rules define Spinning Reserve as capacity held in reserve from synchronised scheduled generators, dispatchable or interruptible loads to support system frequency in the event of network or generator outages.

2 Clause 3.11.8(b) of the Market Rules.

3 Clause 9.9.2.

4 Clause 3.13.3A(a).

5 Jacobs' 2017/18 Margin Peak and Margin Off-Peak Review public and confidential final reports (dated 29 November 2015) were included as attachments to the AEMO's Margin Values determination proposal.

6 See ERA website, Spinning Reserve (Margin_Peak and Margin_Off-Peak), http://www.erawa.com.au/electricity/wholesale-electricity-market/determinations/ancillary-services-parameters/spinning-reserve-margin_peak-and-margin_off-peak

7 Clause 3.13.3A.

8 The Market Objectives are: (a) to promote the economically efficient, safe and reliable production and supply of electricity and electricity related services in the South West interconnected system; (b) to encourage competition among generators and retailers in the SWIS, including by facilitating efficient entry of new competitors; (c) to avoid discrimination in that market against particular energy options and technologies, including sustainable energy options and technologies such as those that make use of renewable resources or that reduce overall greenhouse gas emissions; (d) to minimise the long-term cost of electricity supplied to customers from the SWIS; and (e) to encourage the taking of measures to manage the amount of electricity used and when it is used.

9 Required by clause 3.13.3A(b) of the Market Rules.

proposed Margin Values for the 2017/18 financial year as submitted by the AEMO. It is intended to be read with AEMO's proposal and supporting documentation.

Invitation to make submissions

Interested parties are invited to make submissions on the Authority's issues paper by **4:00 pm (WST) Monday, 6 February 2017** via:

Email address: publicsubmissions@erawa.com.au

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Office address: Level 4, Albert Facey House, 469 Wellington Street, Perth WA 6000

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Content is available in alternative formats upon request.

CONFIDENTIALITY

In general, all submissions from interested parties will be treated as being in the public domain and placed on the Authority's website. Where an interested party wishes to make a submission in confidence, it should clearly indicate the parts of the submission for which confidentiality is claimed, and specify in reasonable detail the basis for the claim. Any claim of confidentiality will be considered in accordance with the provisions of section 55 of the *Economic Regulation Authority Act 2003*.

The publication of a submission on the Authority's website shall not be taken as indicating that the Authority has knowledge either actual or constructive of the contents of a particular submission and, in particular, whether the submission in whole or part contains information of a confidential nature and no duty of confidence will arise for the Authority.

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Proposed margin values

Under the Market Rules, Synergy is the default provider of Spinning Reserve Ancillary Services. The Margin Values[10] determined by the Authority are used to calculate the total payment to Market Participants for providing Spinning Reserve Service in a Trading Interval.[11]

Table 1 below shows the AEMO's proposed Margin Values for 2016/17 compared with the approved Margin Values for 2015/16. The table also shows other parameters used in deriving the Margin Values.

The Margin Values and other parameters used in deriving the Margin Values are estimates from Jacobs' modelling which is discussed further below.

Table 1 Margin Values and other parameters used in deriving the Margin Values

Margin Values	Proposed 2017/18	Current 2016/17
Margin Off-Peak (%)[12]	64%	35%
Margin Peak (%)[12]	36%	24%
Average Annual Spinning Reserve Capacity_Off-Peak (MW)[13]	163.2	191.9
Average Annual Spinning Reserve Capacity_Peak (MW)[14]	208.6	218.1
System Marginal Price_Off-Peak ($/MWh)	39.56	36.17
System Marginal Price_Peak ($/MWh)	56.27	52.97
Off-peak estimated availability cost ($m)	4.72	3.85
Peak estimated availability cost ($m)	8.57	6.7
Estimated Annual Availability Cost ($m)	13.29	10.55

The proposed margin values for 2017/18 are higher than those approved for 2016/17.[15] Margin Peak has increased from 24 per cent to 36 per cent, and margin off-peak has increased from 35 per cent to 64 per cent.

[10] Expressed as a percentage.

[11] Clause 9.9.2(f) provides the total payment to all Market Participants for Spinning Reserve Service in Trading Interval(t) is calculated as: SR_Availability_Payment(t) = 0.5 x Margin(t) x Balancing_Price(t) x max(0, SR_Capacity(t) – LF_Up_Capacity(t) – Sum(c ϵ CAS_SR,ASP_SRQ(c,t))) + Sum(c ϵ CAS_SR,ASP_SRPayment(c,m) / TITM))

[12] Margin Peak and Off-Peak in percentages.

[13] The Average Annual Spinning Reserve Capacity refers to the Spinning Reserve Capacity requirement, which is dynamic in each Trading Interval and is set by the dispatch profile in Jacobs' model.

[14] The Average Annual Spinning Reserve Capacity refers to the Spinning Reserve Capacity requirement, which is dynamic in each Trading Interval and is set by the dispatch profile in Jacobs' model.

[15] See ERA website, https://www.erawa.com.au/electricity/wholesale-electricity-market/determinations/ancillary-services-parameters/spinning-reserve-margin_peak-and-margin_off-peak

The following sections outline factors contributing to the proposed Margin Values identified in Jacobs' report.[16]

What are margin values?

Generation reserves cover unforeseen events such as equipment failure and load changes. Spinning reserve is the ancillary service that covers loss of a major generator and/or transmission equipment and generation shortfall to avoid load shedding (cutting customers off).[17] The provision of spinning reserve changes the revenue, cost and therefore margin received by generators providing spinning reserve. Margin values enable generators and interruptible loads to recoup the cost of providing spinning reserve ancillary service.

Some lower cost generation may be held in reserve instead of generating, with more expensive generation dispatched in its place. Generators' efficiency and operating costs change with output. Not all generators are able to provide spinning reserve, as it depends on their operational flexibility and the commercial objectives of their owners.

In order to determine the costs of providing spinning reserve, the model derives costs comparing modelled dispatch simulating the market as it exists with reserves against a counterfactual market with and without different ancillary service reserves.

Consider an example where there are four generators.[18] The default provider owns Generators 1, 2 and 4 and generator 3 is owned separately (**Error! Reference source not found.**). Each generator has an increasingly higher short run marginal cost and the highest short run marginal cost sets the balancing price. The product of generation (the output of generators 1, 2 and 4) and the balancing price determines default provider's revenue.

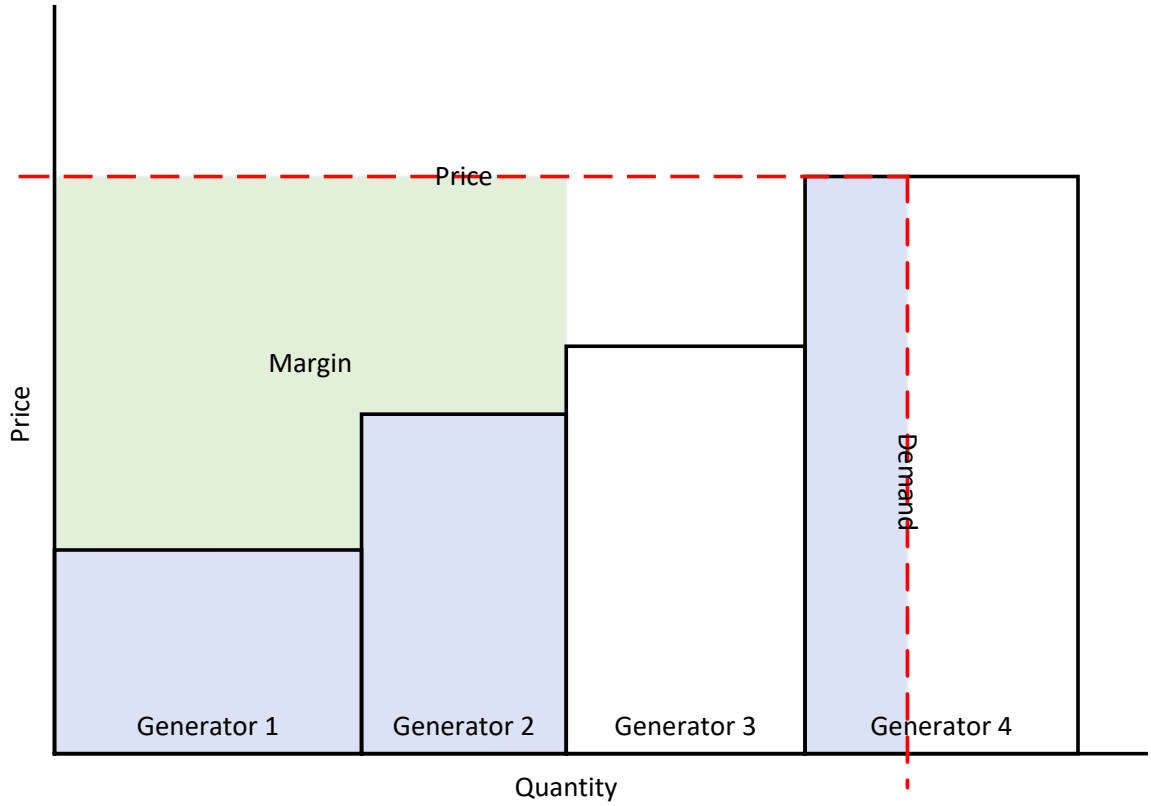
The default generator's margin (shown in green in the figure) is the total revenue less the total costs (shown in pale blue). For the marginal generator, (generator 4) costs equal revenue. Revenue is the total quantity of generation multiplied by the price

[16] Jacobs' 2017/18 Margin Peak and Margin Off-Peak Review public final report (29 November 2016) p. 30

[17] Market Rule 3.9.2

[18] The example was adopted from Jacobs' 2017/18 Margin Peak and Margin Off-Peak Review public final report (29 November 2016).

Figure 1 Costs and margins without reserve provision



In **Error! Reference source not found.**, the same generators must provide spinning reserve. Not all generators are capable of providing spinning reserve. In this example, only Generator 2 is capable of providing spinning reserve. The output of Generator 2 is reduced to provide the reserve. This results in a series of cost changes that lead to margin changes.

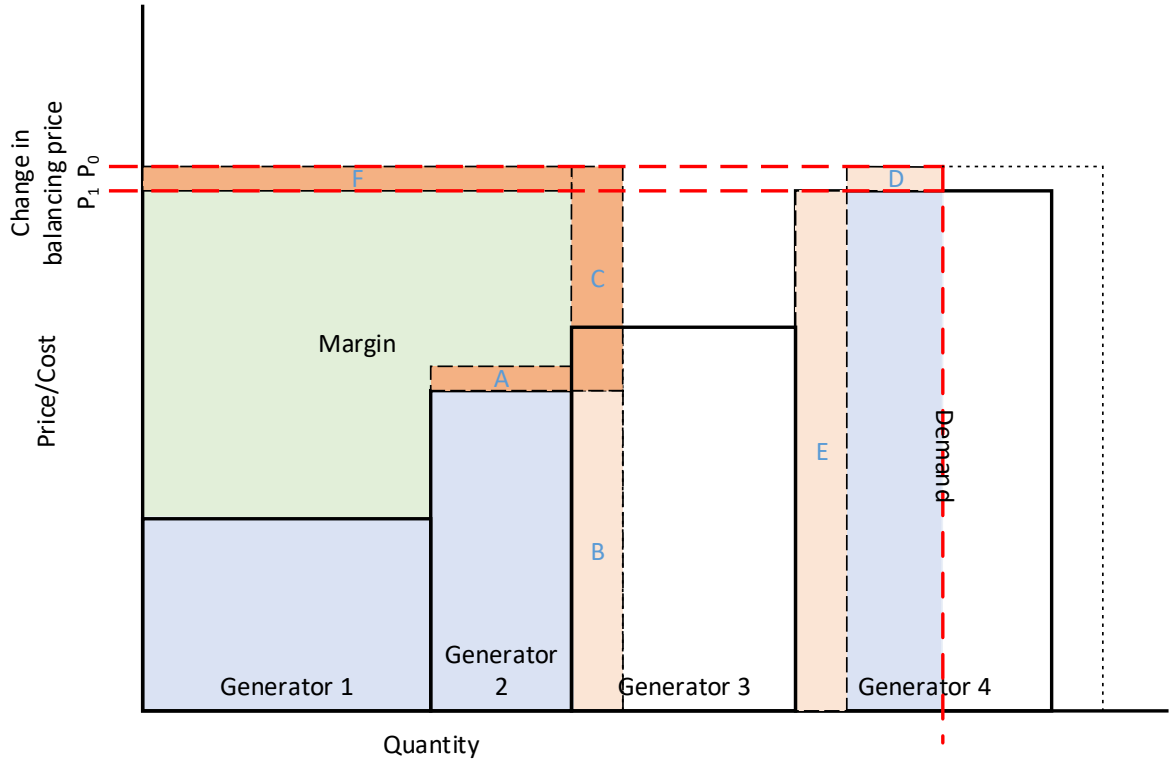
As Generator 2 reduces output to provide spinning reserve, its efficiency reduces, increasing its unit costs (shown in the diagram by the box A). Generator 2's total costs reduce with its output (shown in the diagram by the box B). The margin associated with Generator 2's output also reduces as the output falls (shown in the diagram by box C).

Generator 4's efficiency improves as its output increases. This reduces its unit running cost (shown in the diagram by box D). Generator 4 increases its costs as it must generate more (shown in the diagram by box E). Because Generator 4 is the marginal generator its reduction in short run marginal cost reduces the balancing price to P_1 leading to less revenue (shown in the diagram by box F).

The change in position for the marginal generator is net zero as revenue changes offset cost changes (boxes D and E). Box B is both a gain and a loss as the lower costs offset lower revenue. The margin is ultimately reduced by the area represented by boxes A, C and F. Other generators' revenue changes are not part of the margin values calculation.

The 'availability cost' is the cost of providing the reserve and is the sum of the losses and gains in revenue in response to changes in output and efficiency. The availability cost in the context of Figure 2 is the sum of the areas of boxes A, C and F.

Figure 2 Costs and margins with reserve provision



The margin value is then derived from the availability cost expressed as a percentage of the balancing price.

2017-18 margin values modelling

The AEMO commissioned Jacobs to inform its proposal. Jacobs first calculated Synergy's availability cost for providing Spinning Reserve.[19] In order to estimate the availability cost, Jacobs undertook market simulations. These compare the revenue and generation cost outcomes with and without the provision of spinning reserve and interactions with other ancillary services like load rejection reserve.

Jacobs accounted for the effects of load rejection reserve to ensure that only the cost of spinning reserve was included in calculating the margin values.[20] Jacobs believes there is an interaction between spinning and load rejection reserves. The cost of providing both forms of reserve may be higher or lower than providing them separately. The difference between these two quantities is the "Interaction Cost".

AEMO and Jacobs agreed the Spinning Reserve availability cost to be the sum of the base availability cost and the interaction cost.[21] The spinning reserve availability cost should be

[19] Compared to the 2015/16 review of the Margin Values, inputs assumptions related to demand have been updated to reflect the expected values for the 2016/17 financial year.

[20] Load Rejection Reserve is the service of holding capacity of a Scheduled Generator or Dispatchable Load in reserve so that the Scheduled Generator can reduce output rapidly or the Dispatchable Load can increase consumption rapidly in response to a sudden decrease in SWIS load. The cost for Load Rejection for the review period 2016/17 to 2018/19 was determined by the Authority to be $1.4 million.

[21] Base availability cost is the availability cost of providing Spinning Reserve only, with no provision of Load Rejection Reserve.

allocated based on the average spinning reserve requirement relative to the sum of the spinning reserve and load rejection reserve requirements.[22] Jacobs used **Error! Reference source not found.** to assess the spinning reserve availability cost.

Equation 1 Availability cost for providing spinning reserve

Availability cost for providing SR = Base availability cost for providing SR[23] + (Interaction Cost[24] * SR Proportion[25])

Or as expressed in the assumptions report

Availability cost = GenCost_Res – GenCost_NRP + (GenQ_NRP – GenQ_Res)*SMP

where: GenCost_Res = Synergy's total generation costs, including start-up costs, with reserve provision

GenCost_NRP = Synergy's total generation costs, including start-up costs, without any reserve provision apart from LFAS

GenQ_Res = Synergy's total generation volume, with reserve provision

GenQ_NRP = Synergy's total generation volume, without any reserve provision apart from LFAS

SMP = system marginal price with reserve provision

Jacobs estimates Synergy's availability cost by comparing a market simulation with spinning reserve to simulations without spinning and/or load rejection reserves. The difference in Synergy's generation short run marginal costs between the two cases reveals the efficiency loss. Synergy's revenue loss is the generation difference multiplied by the price from the simulation including reserve provision. The price is the market price with Spinning Reserve requirements met and energy demand satisfied.

In order to assess the availability cost that Synergy could reasonably be expected to incur, Jacobs compared revenue and generation cost outputs from 10 iterations of four market scenarios with and without provision of Spinning Reserve and also with and without provision of Load Rejection Reserve.

Having defined the input parameters and their relationships, Jacobs re-arranged the equation in clause 9.9.2(f) of the Market Rules.[26] Jacobs describe this method in its public final report attached to AEMO's proposal.[27]

As part of the Margin Values determination for the 2017/18 financial year, the Authority intends to examine Jacobs' modelling approach in deriving the Margin Values. This is to

[22] Jacobs' model determines a Spinning Reserve requirement for every interval. As Jacobs is apportioning a 'total cost' it is apportioned using the average of the Spinning Reserve requirement over all relevant intervals.

[23] Base availability cost is the availability cost of providing Spinning Reserve only, with no provision of Load Rejection Reserve.

[24] Interaction Cost = Availability cost (Spinning Reserve given Load Rejection Reserve) – Availability cost (Spinning Reserve only) - Availability cost (Load Rejection Reserve only)

[25] SR Proportion = Average Spinning Reserve provision / (Average Spinning Reserve provision + Average Load Rejection Reserve provision)

[26] Clause 9.9.2(f) provides the settlement equation to be used in calculating spinning reserve payment to be paid to Synergy.

[27] See ERA website, Nidras P., (2016) *2017/18 Margin Peak and Margin Off-peak Review,* public final report, Jacobs, Melbourne, pp13-14 http://www.erawa.com.au/electricity/wholesale-electricity-market/determinations/ancillary-services-parameters/spinning-reserve-margin_peak-and-margin_off-peak

ensure Jacobs' approach is appropriate and the modelled Margin Values reflect the Market Rules' requirements.

The modelling seeks to reflect the structure of Synergy and other market participants. With the exception of two small spinning reserve contracts, Synergy is the default spinning reserve provider.

The Authority invites public submissions from interested parties on AEMO's proposal, including the supporting calculation method and modelling used to derive the Margin Values for the 2017/18 financial year.

Modelling process and outputs

In determining the margin values, the Market Rules require the Authority to consider:

- the margin Synergy could reasonably have been expected to earn on energy sales forgone due to the supply of spinning reserve service; and
- the efficiency loss of Synergy's scheduled generators that System Management has scheduled to provide spinning reserve service that could reasonably be expected due to the scheduling of those reserves.

Synergy's unit cost of providing spinning reserve have increased when compared to the 2016-17 determination. Jacobs reports that this cost increase is mainly driven by the projected increase in Synergy's average gas price and the number of start-ups. Interaction with the load rejection reserve appears to have had a moderating influence on the modelled results.

Operation cost changes and generation outputs

Some plant operation cost assumptions were higher than last year's and some generators changed their position in the modelled merit order.[28] The effects of this are most pronounced with the Cockburn CCGT and Newgen Kwinana where the former became more expensive than the latter.

Cockburn CCGT's relatively more expensive position in the merit order makes it more sensitive to reserve provision. Higher start-up costs, coupled with more frequent starts from Cockburn CCGT and gas turbines at Kemerton and Kwinana increased Synergy's availability cost.

The market simulations co-optimise the operation of facilities for energy provision and for reserve provision. In this year's modelling, Collie's output has reduced during peak and off-peak periods which was enabled by a greater supply of base load energy from other generators. This has led to a reduction in the spinning reserve requirement as Collie sets the spinning reserve requirement for the system being the largest unit connected to the network.[29] The model offsets lower spinning reserve quantities with higher costs arising

[28] Merit order refers to the sequence system managers use to dispatch generators ranked from least to most expensive.

[29] Clause 3.10.2 of the Market Rules specify the standard for spinning reserve service must be at a level sufficient to cover the greater of 70% of the total output, including parasitic load, of the generation unit synchronised to the South West Interconnected System with the highest total output at that time; and the maximum load ramp expected over a period of 15 minutes.

from lower dispatch from Collie (Collie is a low cost base load generator). Decreasing Collie's output to offset incurring spinning reserve costs increases Synergy's availability cost.[30]

The cost difference between the more expensive peaking units that can provide other load reserves increased Synergy's availability cost although some of the difference is compensated by a lower 'interaction cost' with the load rejection reserve.

Contribution to spinning reserve through other ancillary service reserves

The market rules recognise that load following ancillary services reduce the requirement for spinning reserve. Load following usually requires faster response times than spinning reserve. While this is broadly the case, on advice from System Management, Jacobs assumed load following ancillary service capacity from Cockburn CCGT and NewGen Kwinana to be incapable of offsetting the spinning reserve requirement. While the market rules require this to be accounted for, the modelling assumes the units do not contribute to spinning reserve.[31]

The market rules require load following ancillary services to be netted off the calculation of the margin values. Consistent with the method Jacobs used in previous years, the margin values calculation compensates for Cockburn CCGT and Newgen Kwinana's limitations in contributing to spinning reserve.

Some generators that provide spinning reserve can also provide load rejection reserve at the same time. The cost of providing both forms of reserve may be higher or lower than providing them separately. The difference between these two quantities is the "interaction cost".

The interaction cost is mostly negative in this year's modelling results, which has mitigated the increase in availability cost. In the modelled scenarios which include the provision of load rejection reserve, more expensive peaking generators are already committed. This reduces the incremental additional cost of the spinning reserve availability cost from the same units.

The Authority invites public submissions from interested parties on the proposed Margin Values for the 2017/18 financial year.

[30] Jacobs' 2017/18 Margin Peak and Margin Off-Peak Review public final report (29 November 2016) p. 30

[31] Jacobs' 2017/18 Margin Peak and Margin Off-Peak Review public final report (29 November 2016) pp.26, 27, 31