

**AEMO Directions to Participants  
in South Australia  
on 2 and 4 February 2020**

22 June 2020

IES Ref 6512

**Draft Determination**

## Disclaimer

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## Executive Summary

IES has been appointed by AEMO as independent expert to determine the fair payment price in accordance with 3.15.7A and assess claims for additional compensation related to directed services provided by three directed participants referred to herein as Claimants 1, 2 and 3.

During a prolonged period of separation between Victoria and South Australia between 31 January and 17 February 2020 a number of *directions* were issued for system strength and frequency control ancillary services (FCAS) including to Claimants 1, 2 and 3 in South Australia. The *directions* were:

for the battery to maintain between 45% and 55% of maximum charge,  
to bid Contingency FCAS to full availability, and  
regulation FCAS is to be bid to zero.

IES has assessed the claims for additional compensation and found most amounts to have been in accordance with 3.15.7B and made adjustments where required.

IES has also made a draft determination of the fair payment price in accordance with 3.15.7A.

The NER requires an independent expert to be appointed to determine compensation under NER clauses 3.15.7A and 3.15.7B sequentially. However, AEMO has obtained permission from the Australian Energy Regulator (AER) to conduct these two processes in parallel for the BESS *directions* in this case.

The draft determination of the claim for additional compensation is summarised in Table 2 and for the fair payment price in Table 3.

The Directed Participants have been informed of this draft determination and invited to make a submission on matters contained in this report in accordance with the intervention settlement timetable, should they wish to do so.

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## Notes to this report

Units and dollars

Unless otherwise specified:

- Dollars refer to Australian dollars.
- The claim amounts do not include interest payable to the participant.



## 1 Introduction

IES has been appointed by AEMO as Independent Expert to

- (1) determine the fair payment price for the “other” service provided by three *Directed Participants* as per NER 3.15.7A(b1).
- (2) assess additional compensation claims submitted by three *Directed Participants* as per NER 3.15.7B(c).

To maintain anonymity the three *Directed Participants* are referred to herein as Claimant 1, Claimant 2 and Claimant 3.

### 1.1 Background and direction to participants

At 1324 hrs 31 January 2020 the Moorabool - Mortlake 500 kV Line and the Moorabool - Haunted Gully 500 kV transmission line tripped resulting in South Australia (SA) separating from Victoria (VIC) at Heywood Terminal Station. At 1500 hrs AEMO was advised that the 2 transmission lines had suffered tower damage and would be on an extended outage. The VIC/SA separation event occurred between 31 January and 17 February 2020.

During the separation event, a number of *directions* were issued for system strength and frequency control ancillary services (FCAS) to restore and maintain the system in a secure operating state. Between 02 and 04 February, three operators of battery energy storage systems (BESS) in SA were directed for:

- (1) the provision of contingency FCAS, and
- (2) to maintain charge levels within a specified range and to bid regulation FCAS to zero for the purpose of maximising frequency response capability.

The five *directions* for battery energy storage systems are summarised in Table 1.

**Table 1 Summary of the South Australia *directions* between 02 and 04 February 2020**

Unit	<i>Directed Participant</i>	Issue time	Cancellation time	Explanation
G1 and L1	Claimant 1	1100 hrs, 02 February 2020	1610 hrs, 02 February 2020	- For the battery to maintain between 45% and 55% of maximum charge. - To bid: G1: Contingency FCAS R5, R60 and R6 to full availability, Regulation FCAS is to be bid to zero L1: Contingency FCAS L5, L60 and L6 to full availability, Regulation FCAS is to be bid to zero
G2 and L2	Claimant 2	1220 hrs, 02 February 2020	1615 hrs, 02 February 2020	- For the battery to maintain between 45% and 55% of maximum charge. - To bid



**AEMO DIRECTIONS TO PARTICIPANTS IN SOUTH AUSTRALIA ON 2 & 4 FEBRUARY 2020**

<b>Unit</b>	<b><i>Directed Participant</i></b>	<b>Issue time</b>	<b>Cancellation time</b>	<b>Explanation</b>
				G2: Contingency FCAS R5, R60 and R6 to full availability, Regulation FCAS is to be bid to zero L2: Contingency FCAS L5, L60 and L6 to full availability, Regulation FCAS is to be bid to zero
<b>G3 and L3</b>	Claimant 3	1245 hrs, 02 February 2020	1620 hrs, 02 February 2020	- For the battery to maintain between 45% and 55% of maximum charge. - To bid G3: Contingency FCAS R5, R60 and R6 to full availability, Regulation FCAS is to be bid to zero L3: Contingency FCAS L5, L60 and L6 to full availability, Regulation FCAS is to be bid to zero
<b>G1 and L1</b>	Claimant 1	1030 hrs, 04 February 2020	1530 hrs, 04 February 2020	- For the battery to maintain between 45% and 55% of maximum charge. - To bid: G1: Contingency FCAS R5, R60 and R6 to full availability, Regulation FCAS is to be bid to zero L1: Contingency FCAS L5, L60 and L6 to full availability, Regulation FCAS is to be bid to zero
<b>G3 and L3</b>	Claimant 3	1030 hrs, 04 February 2020	1530 hrs, 04 February 2020	- For the battery to maintain between 45% and 55% of maximum charge. - To bid G3: Contingency FCAS R5, R60 and R6 to full availability, Regulation FCAS is to be bid to zero L3: Contingency FCAS L5, L60 and L6 to full availability, Regulation FCAS is to be bid to zero

The remainder of this report is organised as follows:

- Section 2 – Description of services and draft determination
- Section 3 – Claims for additional compensation related to contingency FCAS
- Section 4 – Fair payment price
- Section 5 – Conclusion
- Section 6 – Submissions on matters related to this draft report

Where it is considered important for clarity, terms defined in the National Electricity Rules (NER) have been italicised in the report. Reference to clauses in this report is a reference to the clause in the NER unless stated otherwise.



## 2 Description of services and draft determination

### 2.1 Description of services provided

*Directions* for two types of services were issued. The service to maintain charge levels within a specified range and to bid regulation FCAS to zero for the purpose of maximising frequency response capability were provided pursuant to a *direction* other than *energy* and *market ancillary services*. AEMO must compensate each *Directed Participant* at the fair payment price of the services determined in accordance with clause 3.15.7A.

The service to provide contingency *market ancillary services* to full availability pursuant to a *direction* entitles each *Directed Participant* to compensation calculated in accordance with clause 3.15.7(c). This has already been carried out by AEMO.

In addition, *Directed Participants* are entitled, in respect of both of the above services, to submit a written claim for additional compensation in accordance with clause 3.15.7B. The *Directed Participants* have submitted such claims in relation to the compensation under 3.15.7 calculated and advised by AEMO. The results of assessing these claims are included in this draft determination report.

The NER requires an independent expert to be appointed to determine compensation under NER clauses 3.15.7A and 3.15.7B sequentially. However, AEMO has obtained permission from the Australian Energy Regulator (AER) to conduct these two processes in parallel for the BESS *directions* in this case.

### 2.2 Draft determination of the claim for additional compensation

After assessing the claims for additional compensation made by the three parties, IES has made the following draft determination summarised in Table 2. The amounts in the draft determination agree with the amounts claimed by the parties in nearly all instances. The exception is a downward revision on one component of the claim submitted by Claimant 2. The details are reported and discussed in Section 3.

**Table 2 Claims for additional compensation – draft determination**

Participant	Date	Contingency Raise	Contingency Lower
Claimant 1	02/02/2020	\$106,467.95	\$178,266.47
Claimant 1	04/02/2020	\$168,087.37	\$181,082.31
Claimant 2	02/02/2020	\$ 22,451.98	\$ 85,000.41
Claimant 3	02/02/2020	\$ 17,619.74	\$ 28,495.76
Claimant 3	04/02/2020	\$ 39,609.08	\$ 42,693.63

The amounts in the Table do not include the amount of interest payable to the *directed participant*.



### 2.3 Draft determination of the fair payment price

Clause 3.15.7A(c)(2)(ii) requires the Independent Expert to provide its draft determination of the fair payment price for the services provided. The service in this direction is to maintain a state of charge between 45% and 55% and to bid regulation FCAS to zero.

IES has made a draft determination of the fair payment price in accordance with 3.15.7A that is summarised in Table 3. Although Claimant 2 did not claim under this clause an assessment of whether an amount is payable to Claimant 2 as the fair payment price in accordance with 3.15.7A was made. This amount was determined to be zero.

**Table 3 Fair payment price – draft determination**

Participant	Date	Fair payment price
Claimant 1	02/02/2020	\$ 1,462.83
Claimant 1	04/02/2020	\$ 0
Claimant 2	02/02/2020	\$ 0
Claimant 3	02/02/2020	\$ 31.12
Claimant 3	04/02/2020	\$ 8,986.02

The amounts in the Table do not include the amount of interest payable to the *directed participant*.

## 3 Claims for additional compensation related to contingency FCAS

In relation to the directed contingency FCAS services, AEMO calculated the settlement compensation in accordance with 3.15.7(c). This resulted in directed participants owing amounts payable to AEMO as a result of following the *directions*. Clause 3.15.7B entitles directed participants to submit a claim for additional compensation.

For the additional compensation claims relating to the amount advised by AEMO that was calculated in accordance with clause 3.15.7(c), IES established the relevant prices and quantities applicable to each claim and calculated the compensation amount claimed by each participant.

The three claimants submitted the following claims for additional compensation which AEMO advised were received within the time frame prescribed in the NER.

AEMO calculated the settlement compensation as

$$\text{Settlement compensation} = \text{DCP} - \text{Retained FCAS payment}$$

DCP is calculated in accordance with 3.15.7(c) as

$$\text{DCP} = \text{AMP} \times \text{DQ} ;$$

where:



DQ is equal to the (5-minute directed enablement in MW)/12;

AMP is the price below which are 90% of the *ancillary service prices* for the relevant service provided in the region to which the direction relates, for the 12 months immediately preceding the *trading day* in which the *direction* was issued;

DQ is the amount of the relevant *market ancillary service* which the *Directed Participant* has been *enabled* to provide in response to the *direction*; and

$$\text{Retained FCAS payment} = \text{FCAS spot price} \times \text{DQ}$$

With, in this case, FCAS spot price being equal to the what-if FCAS price for the service

If the DCP (direction compensation) is greater than the Retained FCAS payment, the Settlement compensation amount is positive and AEMO reflects that in the settlement system as a payment to the participant. Alternatively, if the DCP is smaller than the Retained FCAS payment AEMO recovers that amount from the directed participant through the settlement process.

The NER defines Directed Participant as a Scheduled Generator, Semi-Scheduled Generator, Market Generator, Market Ancillary Service Provider, Scheduled Network Service Provider or Market Customer the subject of a *direction*.

### 3.1 Claims by Claimant 1

Claimant 1 stated that it had rebid the directed contingency FCAS services at maximum capacity shortly before AEMO issued the *direction* on 2 February 2020. A bid covering the period involved in the second *direction* on 4 February 2020 was placed on the day before the *direction* was issued.

**Table 4 Claim for additional compensation – Claimant 1**

Date	Unit	Compensation calculated by AEMO per 3.15.7B(c)	Claim for Additional Compensation
02/02/2020	G1	-\$106,467.95	\$106,467.95
	L1	-\$178,266.47	\$178,266.47
04/02/2020	G1	-\$168,087.37	\$168,087.37
	L1	-\$181,082.31	\$181,082.31

The claim amounts do not include interest payable to the participant.

Claimant 1's claim for additional compensation is equal to its estimate of loss of revenue and is set equal to the negative of the Provisional Compensation calculated by AEMO in accordance with 3.15.7(c). In the view of IES, Claimant 1's claim for additional compensation is in accordance with 3.15.7B.



## 3.2 Claims by Claimant 2

### 3.2.1 Summary of claims by Claimant 2

We summarise the claim submitted by Claimant 2 before proceeding to discuss it. In respect of the generator unit G2 a claim was made for Loss of revenue. The claim amount \$22,451.98 reversed the sign of the settlement compensation amount as follows:

Additional Compensation Amount = (DCP - Retained TA) \* -1 = \$22,451.98

In respect of the load L2 a claim was made in the amount of \$93,120.48 which comprised two components:

- a) Loss of revenue (referenced by Claimant 2 to be) pursuant to 3.15.7B(a1)(1), in the amount of \$56,371.39 which, similar to the case for G2, reversed the sign of the settlement compensation amount: (DCP - Retained TA) \* -1 = \$56,371.39.
- b) The second component, in the amount of \$36,749.09, was characterised by Claimant 2 as Loss of Affected Participant compensation referencing 3.15.7B(a3)(7). Claimant 2's reasoning for this component was that L2 would have received Affected Participant compensation had it not been for the *direction*.

**Table 5 Claim for additional compensation – Claimant 2**

Date	Unit	Compensation calculated by AEMO per 3.15.7B(c)	Claim for Additional Compensation
02/02/2020	G2	-\$22,451.98	\$22,451.98
	L2	-\$56,371.39	\$56,371.39
	L2	N/A	\$36,749.09

The claim amounts do not include interest payable to the participant.

Claimant 2 has correctly referenced 3.15.7B as the clause under which it can make a claim for additional compensation. However, the submission contained incorrect references to subclauses or incorrect reference to *Affected Participant*. The reference to 3.15.7B(a1)(1) is incorrect in that it applies to a directed participant submitting a claim to AEMO when AEMO does not involve an independent expert. This may be a typo with reference probably intended to be to 3.15.7B(a)(1).

The reference to 3.15.7B(a3)(7) is also incorrect in that the claim relates to a revenue loss or gap rather than to a direct cost. The gap in revenue resulted from the directed enabled amount being lower than the what-if enabled amount would have been in the absence of the *direction*. The loss of revenue was calculated by Claimant 2 based on the what-if price and the difference between the what-if enabled MW and the enabled MW under the *direction*. The what-if MW quantities and what-if prices are determined by AEMO, as required by the NER, in a separate run (intervention/outturn run). As a revenue loss, this amount is also more correctly referenced to 3.15.7B(a)(1).

We now assess Claimant 2's claim for additional compensation. Claimant 2 identified that they would have been enabled for a higher quantity for some services in some dispatch intervals.



AEMO calculated and published what-if quantities that would have prevailed in the absence of the *direction*. In a 5-minute dispatch interval, the difference between the what-if quantity and the actual quantity enabled under the *direction* multiplied by the what-if price and divided by 12 represents the loss of revenue for Claimant 2 as a result of the *direction*. IES calculated this amount for each 5-minute dispatch interval involved in the *direction* and arrived at a lower total amount than that claimed by Claimant 2. There are two reasons for the difference.

- Firstly, Claimant 2 performed the calculation using MW and prices averaged over a 30-minute interval (instead of the 5-minute MW and prices) and secondly, included all 5-minute dispatch intervals within the first and last 30-minute interval included in the claim. While energy is settled on a 30-minute basis, FCAS is settled on a 5-minute basis. Hence the latter is the correct basis. Using 30-minute averages can result in incorrect amounts unless the values in all the 5-minute intervals within a 30-minute period are constant.
- The second reason is also related to the 5-minute settlement of FCAS. The *direction* started at 12:20 on 02 February 2020 and ended at 16:15 on 02 February 2020. The first 5-minute FCAS settlement period in which the loss occurred is therefore the period ending on 12:25 and the last period is the one ending at 16:15, both on 02 February 2020. These periods were also used by AEMO in arriving at the amount under clause 3.15.7(c). The amount of the claim calculated by Claimant 2 incorrectly included all six 5-minute intervals in each of the first and last 30-minute periods resulting in an unjustifiably higher claim amount. As stated, both reasons seem to be related to overlooking that FCAS is settled on a 5-minute basis, unlike energy which is settled on a 30-minute basis.

The additional compensation amount Claimant 2 is entitled to receive, for this component, was determined by IES to be \$28,629.02.

**Table 6 Claims for additional compensation and draft determination – Claimant 2**

Date	Unit	Claim for Additional Compensation by Claimant 2	IES draft determination
02/02/2020	G2	\$22,451.98	\$22,451.98
	L2	\$56,371.39	\$56,371.39
	L2	\$36,749.09	\$28,629.02

The claim amounts do not include interest payable to the participant.

### **3.3 Claims by Claimant 3**

IES has assessed the claim for additional compensation made by Claimant 3 and has determined that it is in accordance with 3.15.7B.



**Table 7 Claim for additional compensation – Claimant 3**

<b>Date</b>	<b>Unit</b>	<b>Compensation calculated by AEMO per 3.15.7B(c)</b>	<b>Claim for Additional Compensation</b>
<b>02/02/2020</b>	<b>G1</b>	- \$17,619.74	\$17,619.74
	<b>L1</b>	- \$28,495.76	\$28,495.76
<b>04/02/2020</b>	<b>G1</b>	- \$39,609.08	\$39,609.08
	<b>L1</b>	- \$42,693.63	\$42,693.63

The claim amounts do not include interest payable to the participant.



## 4 Fair payment price

Clause 3.15.7A(c)(2)(ii) requires the Independent Expert to provide its draft determination of the fair payment price for the services provided. The service in this direction is to maintain a state of charge between 45% and 55% and to bid regulation FCAS to zero.

### 4.1 Methodology

Clause 3.15.7A, Payment to Directed Participants for services other than energy and market ancillary services, sub clause (c) requires the following of the Independent Expert

3.15.7A “...

- (1) that the independent expert must, in determining the fair payment price of the relevant service for the purposes of clause 3.15.7A, take into account:
  - (i) other relevant pricing methodologies in Australia and overseas, including but not limited to:
    - (A) other electricity markets;
    - (B) other markets in which the relevant service may be utilised; and
    - (C) relevant contractual arrangements which specify a price for the relevant service;
  - (ii) the following principles:
    - (A) the disinclination of Scheduled Generators, Semi-Scheduled Generators, Market Generators, Scheduled Network Service Providers or Market Customers to provide the service the subject of the *direction* must be disregarded;
    - (B) the urgency of the need for the service the subject of the *direction* must be disregarded;
    - (C) the *Directed Participant* is to be treated as willing to supply at the market price that would otherwise prevail for the directed services the subject of the *direction* in similar demand and supply conditions; and
    - (D) the fair payment price is the market price for the directed services the subject of the direction that would otherwise prevail in similar demand and supply conditions;

...”

IES has observed these principles in arriving at its determination contained in this report.

### 4.2 Pricing methodology in Australia

IES has relied on v132 of the NER, the version applicable at the time of the *direction*. The *direction* was for a service to be provided in order to restore and maintain the system in a secure operating state.

#### 4.2.1 AEMO compensation to a Directed Participant under 3.15.7A

AEMO has engaged IES to assess the claims by the three participants in accordance with 3.15.7A. 3.15.7A(a) specifies that "...AEMO must compensate a Directed Participant for the provision of services pursuant to a direction other than energy and market ancillary services, at the fair payment price of the services determined in accordance with this clause 3.15.7A."

### 4.3 Pricing methodologies in overseas markets

The report considers two large established markets in the continental USA. While the market design is not identical to the NEM, the methodologies applied in these markets are relevant to the service subject of the direction of this report. Matching international markets design to the NEM would have been material in other situations such as a service involving dispatch of energy or FCAS.

#### 4.3.1 PJM

PJM is a Regional Transmission Organization (RTO) in the USA. According to their website, PJM Interconnection coordinates the movement of electricity through all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.<sup>1</sup>

PJM publishes rules for compensating generators for the provision of services. Compensation is based on cost and tailored to the type of service and characteristics of the generator. Batteries are treated in Section 11.<sup>2</sup> For example, the energy necessary to charge a battery, referred to as fuel cost for consistency of terminology, is calculated as follows:

$$\text{Fuel Cost} \left( \frac{\$}{MWh} \right) = \left( \text{average charge cost} \left( \frac{\$}{MWh} \right) * \text{efficiency factor} \right)$$

Where the efficiency factor is defined as

$$\text{Efficiency Factor} = \frac{MWh \text{ Discharged}}{MWh \text{ Charged}}$$

Cost-based regulation offers should be supported. A participant can optionally submit a price-based offer for regulation where the price is capped at \$100/MWh.<sup>3</sup>

#### 4.3.2 CAISO

The California Independent System Operator (CAISO) is an established market in the USA. Section 8 of the tariff relates to ancillary services. Ancillary services are purchased competitively in Day-Ahead and Real-Time Markets<sup>4</sup>. The approach by CAISO indicates that a directed

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<sup>1</sup> <https://www.pjm.com/about-pjm/who-we-are/territory-served.aspx>

<sup>2</sup> PJM Manual 15: Cost Development Guidelines, Section 11 Batteries and Flywheels. Revision 35, Effective Date April 24, 2020.

<sup>3</sup> PJM Manual 11: Energy & Ancillary Services Market Operations, Section 3 Overview of the PJM Regulation Market. Revision 108, Effective Date December 3, 2019.

<sup>4</sup> <http://www.caiso.com/Documents/Section8-AncillaryServices-asof-Aug12-2019.pdf>



participant is entitled to compensation only if the generating unit reduces its dispatched quantity.

#### **4.3.3 Alberta - AESO**

The Alberta deregulated market started in 1996 with the creation of the Power Pool of Alberta and became fully deregulated in 2001. Section 11 of the ISO tariff relates to ancillary services. If a participant who is directed to provide an ancillary service, other than transmission must-run service, does not have an existing contract it will be compensated at the greater of (a) the highest price paid in the interval to market participants, and (b) the verifiable net opportunity cost related to electricity sales foregone by the participant in order to supply the directed ancillary service. Compensation for unforeseeable transmission must-run services where the directed participant does not have a contract is equal to the net variable and fixed costs.<sup>5</sup>

#### **4.4 Other markets in which the relevant service may be utilised**

In determining the fair payment price relating to the direction, 3.15.7A(1)(i)(B) requires the Independent Expert to take into account other markets in which the relevant service may be utilised. IES is not aware of other markets in which maintaining a charge level and bidding FCAS to zero can be utilised.

#### **4.5 Discussion of international markets**

There is a spread of approaches to compensate ancillary services. PJM compensates ancillary service providers based on cost, although a market based bid is optionally additionally allowable. CAISO procures ancillary services on a competitive basis. Alberta compensates a directed participant at the greater of the highest price paid in an interval and the verifiable opportunity cost related to foregone electricity sales incurred by the participant in order to provide the directed service. Alberta, however, compensates a directed participant of net variable and fixed costs in the case of unforeseeable transmission must-run services. An approach that is based on compensation for cost seems to be a reasonable method consistent with the international markets reviewed in this report.

#### **4.6 Relevant contractual arrangements**

In determining the fair payment price relating to the direction, 3.15.7A(1)(i)(C) requires the Independent Expert to take into account “relevant contractual arrangements which specify a price for the relevant service”. IES is aware of only one such agreement that may be applicable but the terms are confidential.

#### **4.7 Fair payment price**

AEMO issued directions to maintain charge levels within a specified range of 45% to 55% and to bid regulation FCAS to zero for the purpose of maximising frequency response capability.

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<sup>5</sup> <https://www.aeso.ca/rules-standards-and-tariff/tariff/section-11-ancillary-services/> ISO Tariff – Section 11 Ancillary Services current as at April, 1 2016 (note that this is the current version at the time of writing this report).



Maintaining charge levels and bidding regulation FCAS to zero is a service that is not energy nor FCAS. Regulation FCAS is clearly an FCAS service but it has been directed at zero.

In order to maintain charge levels as directed, participants had to charge and discharge their battery. Energy prices were negative in the majority of periods during the *direction* and directed participants ought to be compensated if they incurred a net cost over the entire period of the *direction* as a result of providing the directed service. Figure 1 and Figure 2 provide an example of energy what-if prices at 5-minute and the corresponding 30-minute intervals during the period. Taking the directions as a whole, and taking into account that maintaining the state of charge was issued for the purpose of maximising the FCAS response capability as part of ensuring system security, and that the directed participants have been compensated for enablement of contingency FCAS on the basis set out in Section 3; the directed participants are entitled to an amount equal to the cost of energy incurred to maintain the state of charge in accordance with the *direction*. The final amount should be set at the final settlement amount that will be calculated by AEMO and represents the amount payable to the directed participants. The final amount will probably be different from the provisional settlement amount that has been already calculated by AEMO. To determine the fair payment price for the purposes of the draft determination an estimate was made using 5-minute data. The estimate was calculated as

30-minute what-if energy price x estimate of actual energy x MLF (for generators and /MLF for loads).

where; the 30-minute what-if energy price corresponds to intervention=0. The 30-minute energy price was calculated as the average of the prices of the six 5-minute prices that make up the 30-minute trading interval.

The MLF were obtained from AEMO tables for 2019/2020.<sup>6</sup>

And the estimate of the actual energy was based on a straight line trajectory between the actual (intervention=1) initial MW values at the start and at the end of each 5-minute period published by AEMO.

The energy was estimated as follows:

For a 5-minute interval “k” the average of the initial MW between period “k” and the immediately succeeding interval “k+1” was divided by 12.

[ actual (Initial MW<sub>k</sub> + Initial MW<sub>k+1</sub>) / 2 ] / 12

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<sup>6</sup> MLF values for the 2019/20 financial year were obtained from the information published by AEMO on <https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/market-operations/loss-factors-and-regional-boundaries>



Figure 1 An example of 5-minute what-if energy prices during the direction period

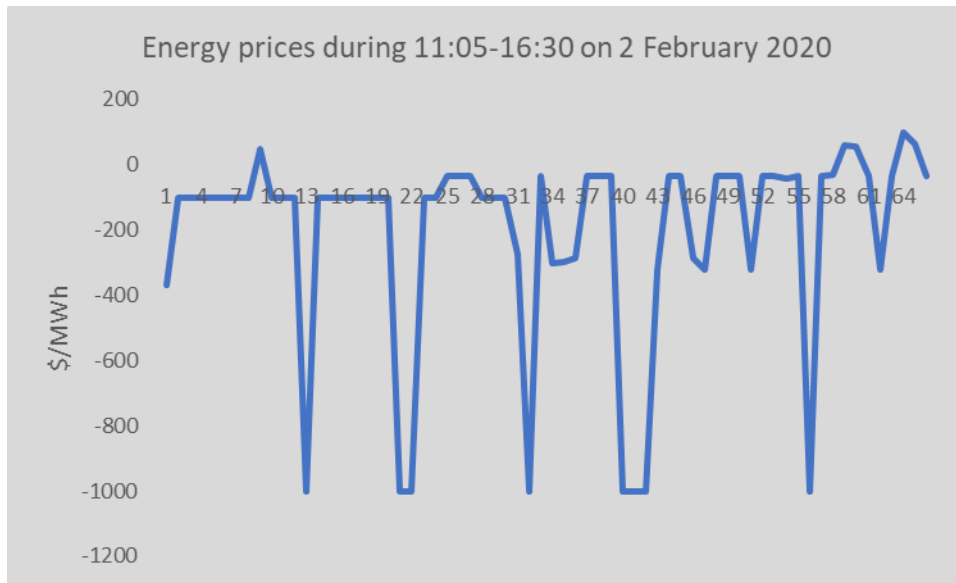
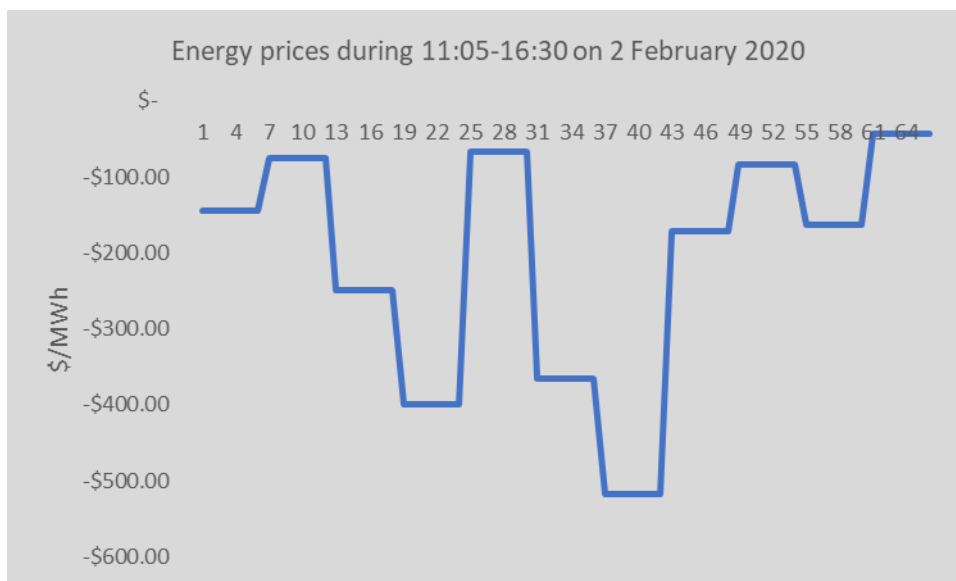


Figure 2 An example of 30-minute what-if energy prices during the direction period



#### 4.8 Claim by Claimant 1

Claimant 1's claim includes an amount to compensate for the loss of revenue. The loss of revenue claimed was incurred due to reduced dispatch of regulation FCAS resulting from the *direction* to bid regulation FCAS to zero. The claim assumes that the dispatch of its G1 and L1 units would not have impacted the price level. Claimant 1 considers that in view of prices during the period of *direction* it would have bid the maximum available capacity of regulation FCAS at

zero dollars. The claim estimates the quantity (MW) dispatched of both services to be equal to the maximum available capacity which it would have bid. This estimate is based on what Claimant 1 reasoned would have resulted in the absence of the *direction*.

Claimant 1 also claimed for energy revenue that would have resulted from providing regulation FCAS at the maximum available level. In that calculation Claimant 1 used a typical development of energy stored in the battery, an increase in energy stored by the battery per 30-minute interval, when providing the regulation services at the maximum available levels. This net consumed energy was multiplied by the corresponding 30-minute price and the negative of the resulting amount claimed as revenue.

The fair payment price is a price for the directed services. The direction was to bid regulation FCAS at zero. The common application of the NER in these cases has been that when a *direction* constrains a participant for reasons of system security the participant is not entitled to compensation for the value related to the quantity constrained by the *direction*. Compensation as an *Affected Participant* does not apply in this case either because the definition of *Affected Participant* excludes a participant who was ‘...the subject of a *direction*, that had its dispatched quantity affected by that *direction*;’

Claimant 1 did not claim an amount for maintaining the charge level. However, it is IES’s view that this amount constitutes, in the case of the *direction* considered, the fair payment price. IES calculated the amount as described in Section 4.7. These amounts are related to the energy actually dispatched and consumed (intervention=1) by the battery in maintaining charge level. The price used is the what-if 30-minute energy price. Claimant 1 did not bid regulation FCAS to zero during the following 5-minute intervals:

- On 2 February 2020, Lower regulation during the periods ending 1105 to 1200 hrs inclusive
- On 4 February 2020, Raise and Lower regulation during the periods ending 1035 to 1530.

Consequently, these periods have not been included in the calculation of the fair payment price. The result of the calculation was negative. In IES’s view the fair payment price is the reimbursement of this negative amount. As discussed earlier, this is an estimate for the purposes of the draft determination and the amount should be updated to reflect the final settlement amounts calculated by AEMO.

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**Table 8 Amount for maintaining a charge level – draft fair payment price**

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Date	Discharge (1)	Charge (2)	Total = (1) - (2)
02/02/2020	\$ 1,462.83	\$ 0.00	\$ 1,462.83
04/02/2020	\$ 0.00	\$ 0.00	\$ 0.00

The amounts shown do not include interest.



#### **4.9 Claim by Claimant 2**

Although Claimant 2 did not claim under 3.15.7A consideration was given to a potential entitlement of Claimant 2 under 3.15.7A as required in that clause.

Claimant 2 operated its battery to maintain the directed charge level. The same methodology was applied and resulted in a positive amount settled as a result of maintaining the state of charge. This indicates that Claimant 2 should not be paid any additional amounts.

**Table 9 Amount for maintaining a charge level – fair payment price**

Date	Discharge (1)	Charge (2)	Total = (1) - (2)	Final value
02/02/2020	\$ 120.07	\$ 704.76	-\$ 584.69	\$ 0

The amounts shown do not include interest.

#### **4.10 Claim by Claimant 3**

Claimant 3 claimed for the cost of maintaining the directed charge levels. The method outlined in this report was applied. The estimate is based on actual MW and the what-if price for energy. Claimant 3 did not bid regulation to zero during the following 5-minute interval:

- On 2 February 2020, Lower regulation during the periods ending 1250 to 1435 hrs inclusive
- On 4 February 2020, Raise regulation during the period ending 1035 hrs.

Consequently, these periods have not been included in the calculation of the fair payment price. The difference between the determined draft fair payment price and the amount claimed by Claimant 3 is likely due to the exclusion of the periods indicated and to the linear trajectory assumption made in the estimation method compared to the actual trajectory followed by the battery. When the final settlement amount is calculated by AEMO it should replace this estimate as the final fair payment price.

**Table 10 Amount for maintaining a charge level – draft fair payment price**

Date	Discharge (1)	Charge (2)	Total = (1) - (2)
02/02/2020	\$ 120.73	\$ 89.61	\$ 31.12
04/02/2020	\$ 8,829.25	-\$ 156.76	\$ 8,986.02

The amounts shown do not include interest.

#### **4.11 Other remarks**

During the period of the directions the constraints imposed for regulation FCAS were effectively zero (0.0001) and there were no constraints for state of charge. Complying with the direction to maintain the state of charge was left to the participants to manage. There was a constraint on regulation during the period of the *direction*. At a later period, the regulation FCAS constraint was increased to 5 MW and a constraint of 2 MW was introduced for state of charge.

## 5 Conclusion

This draft determination has assessed claims for additional compensation by directed participants in relation to compensation calculated by AEMO pursuant to 3.15.7(c). A fair payment price was also determined for services other than energy or FCAS and applied to the *directions*. Since the participants had submitted claims in relation to the fair payment price, these were also assessed.

## 6 Submissions on matters in this draft report

Interested parties are invited to make submissions on the matters contained in this draft report in accordance with the intervention settlement timetable. Details of the closing time to receive submissions are set out in said timetable.

This invitation is in fulfilment of the requirements of clause 3.15.7A(c)(2)(iv).

