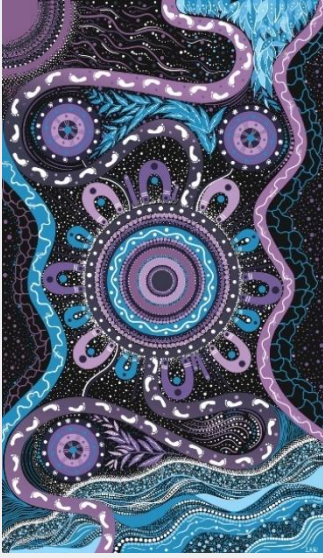


# Guide to Constraint Outcomes for FCAS Cost Recovery

9 December 2024

An interim document for use during the non-financial implementation period of FPP Reform





**We acknowledge the Traditional Custodians of the land, seas and waters across Australia. We honour the wisdom of Aboriginal and Torres Strait Islander Elders past and present and embrace future generations.**

**We acknowledge that, wherever we work, we do so on Aboriginal and Torres Strait Islander lands. We pay respect to the world's oldest continuing culture and First Nations peoples' deep and continuing connection to Country; and hope that our work can benefit both people and Country.**

'Journey of unity: AEMO's Reconciliation Path' by Lani Balzan

AEMO Group is proud to have launched its first [Reconciliation Action Plan](#) in May 2024. 'Journey of unity: AEMO's Reconciliation Path' was created by Wiradjuri artist Lani Balzan to visually narrate our ongoing journey towards reconciliation - a collaborative endeavour that honours First Nations cultures, fosters mutual understanding, and paves the way for a brighter, more inclusive future.

## Important notice

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# 1 Introduction

## 1.1 Background and context

The National Electricity Market (NEM) is experiencing a period of significant change. The progressive replacement of thermal, synchronous generation with variable inverter-connected resources, such as wind, solar and batteries, makes the task of managing the power system securely more complex.

The Australian Energy Market Commission (AEMC) recognised the need for a new framework of incentives for NEM participants regarding primary frequency response (PFR). The AEMC made a final determination in the Primary Frequency Response Incentives rule change<sup>1</sup> on 8 September 2022. The key effects of the rule change are to:

- Extend the requirement for all scheduled and semi-scheduled generators to provide automatic PFR (removing the sunset clause that would have seen that obligation lapse in June 2023).
- Introduce a new system of incentives and penalties that will see eligible units<sup>2</sup> with appropriate metering either receive or be liable for payments, based on whether they have had a helpful or unhelpful impact on system frequency. These are the frequency performance payments (FPP) that give their name to the overall reform.
- Use the performance values determined for FPP, which are calculated for every five-minute trading interval, to allocate the cost of Regulation Frequency Control Ancillary Services (FCAS). The cost of Regulation FCAS is currently allocated via the Causer Pays framework.

## 1.2 Purpose of this document

This interim document has been developed as a stakeholder resource for use during the non-financial implementation of FPP Reform. The document will outline a summary of changes to the way constraint outcomes are used for the purposes of FCAS cost recovery as part of the FPP Reform.

## 1.3 Key terms

The table below lists the different values that are used in the process, to determine and allocate both FPP and regulation FCAS recovery. Please note that, to make this document as helpful as possible, the definitions below are more descriptive than those provided in the Glossary of the National Electricity Rules (NER).

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<sup>1</sup> See <https://www.aemc.gov.au/rule-changes/primary-frequency-response-incentive-arrangements#:~:text=Rule%20Change%3A%20Completed&text=Confirmation%20that%20the%20mandatory%20primary.changes%20in%20power%20system%20frequency>.

<sup>2</sup> NER 3.15.6AA

Table 1 Key terms and elements of the FPP calculations

Term	Definition
<b>AEMO</b>	Australian Energy Market Operator
<b>AEMC</b>	Australian Energy Market Commission
<b>Adjusted cost</b>	Formerly known as the adjusted Requirement Payment. The adjusted cost calculated for each constraint and service after accounting for regulation and contingency split. If no cost splitting occurs, adjusted cost is equal to base cost.
<b>APC</b>	<i>Administered price cap</i> . A price cap to apply to a regional reference price or <i>ancillary service</i> price as specified in NER clause 3.14.1
<b>Base cost</b>	Formerly known as Requirement Payment. The cost calculated for each constraint by looking at price adjustments
<b>Constraint equation</b>	The mathematical representation that AEMO uses to manage power system limitations and FCAS requirements in NEMDE
<b>Contingency FCAS</b>	<i>Very fast</i> (1 second) <i>raise and lower services</i> , <i>fast</i> (6 seconds) <i>raise and lower services</i> , <i>slow</i> (60 seconds) <i>raise and lower services</i> and <i>delayed</i> (5 Minute) <i>raise and lower services</i>
<b>Contribution Factor</b>	The factor that represents the fraction of regulation FCAS costs for which a particular <i>Market Participant</i> is liable
<b>5 Minute services</b>	Contingency frequency control services required to return the frequency to the normal operating band within five minutes of a contingency. Also referred to as <i>delayed service</i> .
<b>FCAS</b>	Frequency control ancillary service/s
<b>FPP</b>	Frequency Performance Payments
<b>LHS</b>	Left Hand Side of a constraint equation. This consists of the variables that can be optimised by NEMDE. These terms include <i>scheduled or semi-scheduled generators</i> , <i>scheduled loads</i> , <i>ancillary service units</i> , <i>wholesale demand response units</i> , <i>scheduled bidirectional units</i> , <i>regulated interconnectors</i> , <i>Market Network Service Providers</i> or <i>regional FCAS enablement</i> .
<b>Mainland</b>	All regions of the NEM except Tasmania
<b>Marginal value</b>	Marginal cost of the constraint equation calculated by NEMDE. If there was a change in the constraint equation RHS by 1 MW, the marginal value (MV) represents the change in cost to the objective function.
<b>MII</b>	Manifestly Incorrect Input
<b>MPF</b>	Market Participant Factor (contribution factor) for a Market Participant with appropriate metering (NER clause 3.15.6A(i)(1))
<b>MSPS</b>	<i>Market suspension pricing schedule</i> as specified in NER clause 3.14.5(e)(1)
<b>MW</b>	Megawatt
<b>NEM</b>	National Electricity Market
<b>NEMDE</b>	National Electricity Market Dispatch Engine
<b>NER</b>	National Electricity Rules
<b>P_Regulation</b>	The marginal price of meeting the <i>global market ancillary service requirement</i> or <i>local market ancillary service requirement</i> for the <i>regulating raise service</i> or <i>regulating lower service</i> in that <i>trading interval</i> . Calculated in \$ per MW per hour (NER 3.15.6AA(b)(1))
<b>PFR</b>	Primary Frequency Response
<b>Regulation FCAS</b>	<i>Regulating lower service</i> and <i>regulating raise service</i> (the same meaning as regulation services in the NER).
<b>Requirement Payment</b>	Constraint cost of a contingency or regulation constraint. Also known as ReqPayment.
<b>RHS</b>	Right Hand Side of a constraint equation. The RHS is pre-calculated and presented to the solver as a constant; these terms cannot be optimised by NEMDE.
<b>RRP</b>	<i>regional reference price</i>
<b>TI</b>	<i>trading interval</i>



## 2 Business drivers

### 2.1 Objectives

The primary objective of this interim document is to introduce the new business requirements in relation to FPP.

The document outlines the P\_Regulation calculation introduced by the FPP reform to be used in the calculation of FPP trading amounts<sup>3</sup>.

It also covers updates to the data model to support the transition from Causer Pays framework to FPP, with new tables and additional data columns added to enhance transparency. Further enhancements to the calculation methodology were also made during this transition, with updates implemented to improve overall accuracy.

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<sup>3</sup> See Section 2.2 of the Frequency Contribution Factors Procedure: [https://aemo.com.au/-/media/files/stakeholder\\_consultation/consultations/nem-consultations/2022/frequency-contribution-factors-procedure/final-documents/final-frequency-contribution-factors-procedure.pdf?la=en](https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/frequency-contribution-factors-procedure/final-documents/final-frequency-contribution-factors-procedure.pdf?la=en)

## 3 Business requirements

This section summarises the changes and improvements made to the calculation methodology of constraint outcomes for FCAS cost recovery.

To support the implementation of the FPP reform, the calculation methodology must produce consistent results when there are multiple dispatch runs. Contribution factors (CFs), a value calculated in FPP to reflect a participant’s performance, are calculated only for the binding constraints in a physical run.

### 3.1 P\_Regulation

P\_Regulation (also referred to as adjusted marginal value) is a calculated value for regulation FCAS services that has been introduced by the FPP reform to be used in the calculation of FPP trading amounts. P\_Regulation is calculated and stored in a new table field (see Section 3.2 for data model changes) and is ingested by both the FPP and Settlements applications.

P\_Regulation is calculated per constraint, for regulation services. This can be for both regulation FCAS constraints and 5 Minute FCAS constraints (that have Regulation terms on the left hand side (LHS)). For all other FCAS services, P\_Regulation will be zero. The respective P\_Regulation formulas are illustrated in Table 2.

**Table 2 P\_Regulation formula**

P_Regulation formula	
<b>Regulation service</b>	$Regulation = \frac{Base\ Cost}{\sum Regulation\ Enabled} \times 12$
<b>5 Minute service</b>	$5\ Minute = \frac{Base\ Cost}{\sum (Regulation\ Enabled + 5\ Minute\ Enabled)} \times 12$

where:

- Base cost is the cost calculated for each constraint.
- 12 represents the number of dispatch intervals in an hour. For Pre-Dispatch, this would be 2.

#### 3.1.1 P\_Regulation example

The examples below illustrate how P\_Regulation is calculated in practice for a case with no ex-post price change (Example 1) and one with an ex-post price change (Example 2).

##### Example 1: P\_Regulation - no ex-post price change

Assume the values in Table 3 for the Tasmanian Regulation and Raise 5 Minute constraints.



**Table 3 No ex-post price change assumed values**

ConstraintID	Region	Bidtype	MV	RRP	Enablement	Regional payment*	Regional base cost	Base cost
F_T_RREG	Tasmania	Raise Regulation	3	5	50	20.83	12.5	12.5
F_T_R5	Tasmania	Raise 5 Minute	2	2	20	3.33	3.33	11.67
		Raise Regulation	2	5	50	20.83	8.33	

\* Regional Payment = FCAS Price × Regional Enablement / nIntervals . Calculated by service.

As shown in Table 4 below, the calculated value of P\_Regulation is equal to the marginal value (MV) of the constraint when there is no ex-post price change.

**Table 4 P\_Regulation calculation: no-ex post price change**

P_Regulation calculation	
<b>Regulation service</b>	$P\_Regulation (Regulation) = \frac{12.5}{50} \times 12 = 3$
<b>5 Minute service</b>	$P\_Regulation (5 Minute) = \frac{11.67}{(50 + 20)} \times 12 = 2$

**Example 2: P\_Regulation – ex-post price change for Regulation constraint**

Consider (as in Table 5) the same constraints as Example 1, with the exception of a change in Regulation service price from \$5/megawatt hour (MWh) to \$9/MWh due to an ex-post price change.

**Table 5 Ex-post price change assumed values**

ConstraintID	Region	Bidtype	MV	RRP	Enablement	Regional payment	Regional base cost	Base cost
F_T_RREG	Tasmania	Raise Regulation	3	9	50	37.50	22.5	22.5
F_T_R5	Tasmania	Raise 5 Minute	2	2	20	3.33	3.33	18.33
		Raise Regulation	2	9	50	37.50	15	

As shown in Table 6 below, the MV of the constraint remains the same from the physical run, however the P\_Regulation (adjusted MV) now differs from the MV. Due to co-optimisation, a change in Regulation price also impacts 5 Minute constraint costs.

**Table 6 P\_Regulation calculation: ex-post price change**

P_Regulation calculation	
<b>Regulation service</b>	$P\_Regulation (Regulation) = \frac{22.5}{50} \times 12 = 5.4$
<b>5 Minute service</b>	$P\_Regulation (5 Minute) = \frac{18.33}{(50 + 20)} \times 12 = 3.142$

## 3.2 Table structure changes

The data model has been updated to support changes for the FPP reform and will be deployed in Quarter 4 2024. Updates include the addition of new tables to support reform requirements, along with modifications to existing tables aimed at enhancing transparency.

### 3.2.1 Run Table

A new table will be added to the data model to store the run date and time of the dispatch case that triggers the run and published at the completion of a dispatch run to the data model.

### 3.2.2 Constraint Requirement Table

A new table will be added to replace and enhance the existing FCAS\_Requirement table. The new table will see the removal of the four Causer Pays Market Participant Factor (MPF) columns<sup>4</sup>, while adding the following new columns:

- LHS and right hand side (RHS) values of the constraint.
- Enablement per region and constraint.
- Regional Base cost before aggregating to a constraint level.
- P\_Regulation, the adjusted MV of the constraint for FPP recovery (blank for constraints without regulation terms).

The full details of the data model changes will be in Data Model 5.4<sup>5</sup>.

## 3.3 Changes to methodology inputs

### 3.3.1 Marginal value

Constraints are imposed in dispatch to determine the quantity of *market ancillary service* requirements (NER 3.8.11(a1)). These FCAS requirements then set dispatch targets in the central dispatch run, which is known as the 'physical run'. To reflect the intention of FCAS requirements in accordance with the NER, the methodology has been updated to use a constraint's MVs from the physical run instead of the pricing run<sup>6</sup>.

### 3.3.2 Negative marginal value

In the rare occurrence where the MV of a constraint is negative (typically derived from  $\leq$  constraints<sup>7</sup>), it will be floored to zero instead of being converted to absolute values for calculation purposes. This is consistent with the capping applied when MVs are greater than *market price cap* (MPC). While the floored values are used for calculation, negative MVs will continue to be stored as raw values within the data model.

<sup>4</sup> See [https://visualisations.aemo.com.au/aemo/di-help/Content/Data\\_Model/MMS\\_Data\\_Model\\_Report\\_53.pdf#page=320](https://visualisations.aemo.com.au/aemo/di-help/Content/Data_Model/MMS_Data_Model_Report_53.pdf#page=320).

<sup>5</sup> See [https://visualisations.aemo.com.au/aemo/web-techspecportal/Content/TSP\\_EMMSDM54\\_Oct2024/Data\\_Model\\_v5.4\\_November\\_2024.htm?TocPath=Electricity%20Data%20-%20A0Model%7CDM%205.4%20-%20November%202024%7C\\_\\_\\_\\_\\_0](https://visualisations.aemo.com.au/aemo/web-techspecportal/Content/TSP_EMMSDM54_Oct2024/Data_Model_v5.4_November_2024.htm?TocPath=Electricity%20Data%20-%20A0Model%7CDM%205.4%20-%20November%202024%7C_____0).

<sup>6</sup> Refers to the central dispatch run used to set prices during an *AEMO intervention event*. Also known as the "what-if" run.

<sup>7</sup> LHS less than or equal to RHS.

### 3.3.3 LHS terms

LHS terms in FCAS constraints can include other non-regional terms such as interconnectors or specific units (hereafter referred to as 'other terms').

For interconnectors, this occurs most commonly with Basslink interconnector when its flows are co-optimised with mainland local requirements. In such instance, Basslink would be included in the LHS term of the constraint when used to transfer FCAS.

To calculate the FCAS requirement, the RHS value will be corrected by first removing the impact of other LHS terms, such as interconnectors, unit energy dispatch or unit FCAS enablement.

Where the actual calculated LHS and RHS terms remain negative, values will be floored to zero for the calculation.

In the context of the data model, the original LHS and RHS (which may include negative values) will continue to be stored as their raw values.

## 3.4 Constraint grouping

Before calculating the Adjusted cost (discussed in Section 3.5), any binding 5 Minute constraint needs to be grouped with the respective regulation constraint to carry out the cost split. The regulation constraint must:

- a) be non-binding (LHS>RHS) which indicates excess regulation is used;
- b) have the same region(s) in the LHS as the 5 Minute constraint; and
- c) have the largest (most restrictive) RHS out of other constraints that satisfy a) and b).

Additionally, criteria c) will be achieved by calculating the FCAS requirement as per Section 3.3.3.

Below is an example of a constraint grouping for a Mainland Raise 5 Minute constraint (F\_MAIN++R5). Consider the following two non-binding raise regulation constraints in the constraint group, and their respective LHS and RHS values.

**Table 7** Calculated actual RHS becomes the most restrictive constraint

Regulation constraint	LHS (Original)	RHS (Original)	LHS (Actual)	RHS (Actual)	Most restrictive actual RHS
F_MAIN++RREG	-335	-270	170*	235*	✓
F_TASCAP_RREG	170	170	170	170	

MW flow on Basslink interconnector is 505 MW.

\* To calculate actual LHS and RHS, add Basslink MW flow to original LHS and RHS values

In Table 7, Raise 5 Minute constraint will group with F\_MAIN++REG constraint instead of F\_TASCAP\_RREG as it has the most restrictive RHS value (255 MW) once Basslink transfers are accounted for.

In contrast, Table 8 shows that the Raise 5 Minute constraint will group with F\_TASCAP\_RREG constraint instead of F\_MAIN++RREG as it has the most restrictive RHS value (170 MW) once Basslink transfers are accounted for in F\_MAIN++RREG constraint.

**Table 8** Calculated actual RHS becomes the least restrictive constraint

Regulation constraint	LHS (Original)	RHS (Original)	LHS (Actual)	RHS (Actual)	Most restrictive actual RHS
F_MAIN++RREG	335	270	170	105	
F_TASCAP_RREG	170	170	170*	170*	✓

MW flow on Basslink interconnector is -165 MW.

\* To calculate actual LHS and RHS, add Basslink MW flow to original LHS and RHS values

### 3.5 Adjusted cost

When additional regulation service is enabled to meet 5 Minute service requirements, the Base cost of each 5 Minute service constraint is split into the cost to be recovered through regulation and 5 Minute service recovery mechanisms. This recovery cost split is also known as the Adjusted cost.

The Adjusted cost formula has been enhanced to account for rare events such as *administered price cap* (APC) or *market suspension pricing schedule* (MSPS) causing an ex-post price change. The updated formula, as shown in Table 9, eliminates the dependency on MV while maintaining the same cost split ratio between regulation and 5 Minute services (see Section 3.5.1 for a worked example). For standard cases without ex-post price changes, the updated formula will yield the same results as previously.

**Table 9** Adjusted cost formula

Previous Adjusted cost formula	Updated Adjusted cost formula
$\text{Min}(\text{ReqPayment}_c, \text{Max}\left(\frac{\text{RHS}_r}{n\text{Intervals}} \times \text{MV}_c, 0\right))$ <p>where:</p> <ul style="list-style-type: none"> <li>• <math>c</math> = A contingency constraint in the group</li> <li>• <math>r</math> = Regulation constraint with the most restrictive RHS value in the group</li> <li>• <math>\text{ReqPayment}_c</math> = Constraint cost of contingency constraint <math>c</math></li> <li>• <math>\text{RHS}_r</math> = Right Hand Side (requirement) value of Regulation constraint <math>r</math></li> <li>• <math>\text{MV}_c</math> = Constraint MV of contingency constraint <math>c</math></li> <li>• <math>n\text{Intervals}</math> = number of intervals (12 for dispatch, 2 for 30 minutes pre dispatch)</li> </ul>	$\text{BaseCost}_c \times \left[ \frac{\text{REG\_Calculated\_MW}}{(\text{REG\_Calculated\_MW} + 5\text{Min\_Calculated\_MW})} \right]$ <p>where:</p> <ul style="list-style-type: none"> <li>• <math>\text{BaseCost}_c</math> = Formerly known as <math>\text{ReqPayment}_c</math>, the constraint cost of a contingency constraint <math>c</math>.</li> <li>• <math>\text{REG\_Calculated\_MW}</math> = <math>\text{Constraint\_Enablement (REG)} - \text{Extra\_Regulation\_MW}^8</math></li> <li>• <math>5\text{Min\_Calculated\_MW}</math> = <math>\text{Constraint\_Enablement (5Min)} + \text{Extra\_Regulation\_MW}</math></li> </ul>

#### 3.5.1 Adjusted cost example

Below is an example of how the updated Adjusted cost formula is applied to a case with no ex-post price change (Example 3) and one with an ex-post price change (Example 4).

##### Example 3: Adjusted cost – no ex-post price change

Consider a trading interval where the Base cost of a global 5 Minute lower constraint (for example, F\_I\_L5) is split into the cost to be recovered through regulation and 5 Minute recovery mechanism. Assume the following values for the constraint:

- $\text{MV} = 0.38$ .

<sup>8</sup> Extra Regulation = total Regulation enablement – max(RHS Regulation requirement), where RHS Regulation requirement refers to the RHS value of the grouped non-binding Regulation constraint.

- Base cost = \$14.83.
- Total lower regulation enablement = 210 megawatts (MW).
- Total lower 5 Minute enablement = 258.25 MW.

**Table 10 Adjusted cost calculation: no ex-post price change**

	Previous formula calculation	Updated formula calculation
<b>Regulation Adjusted cost</b>	$= \text{Min}(14.83, \text{Max}\left(\frac{210}{12} \times 0.38, 0\right))$ $= \text{Min}(14.83, 6.65)$ $= \$6.65$	$= 14.83 \times \left[\frac{210}{(210)+(258.3)}\right]$ $= 14.83 \times 0.449$ $= \$6.65$
	Ratio = Regulation Adjusted cost/Base cost $= \$6.65/\$14.83$ $= 0.45$	Ratio = Regulation Adjusted cost/Base cost $= \$6.65/\$14.83$ $= 0.45$
<b>5 Minute Adjusted cost</b>	$= \$14.83 - \$6.65$ $= \$8.18$	$= \$14.83 - \$6.65$ $= \$8.18$
	Ratio = 5 Minute Adjusted cost/Base cost $= \$8.18/\$14.83$ $= 0.55$	Ratio = 5 Minute Adjusted cost/Base cost $= \$8.18/\$14.83$ $= 0.55$

As illustrated in Table 10 above, the updated formula will yield the same result as previously.

**Example 4: Adjusted cost – ex-post price change (APC event, prices capped at \$600/MWh)**

Consider the same binding global 5 Minute lower constraint as Example 3, however the Base cost in this scenario is now \$13.13 instead of \$14.83, due to an APC event where lower regulation prices are capped to \$600/MWh in mainland NEM regions. Assume the following values for the constraint:

- MV = 0.38.
- Base cost = \$13.13.
- Total lower regulation enablement = 210 MW.
- Total lower 5 Minute enablement = 258.25 MW.

**Table 11 Adjusted cost calculation: ex-post price change**

	Previous formula calculation	Updated formula calculation
<b>Regulation Adjusted cost</b>	$= \text{Min}(13.13, \text{Max}\left(\frac{210}{12} \times 0.38, 0\right))$ $= \text{Min}(13.13, 6.65)$ $= \$6.65$	$= 13.13 \times \left[\frac{210}{(210)+(258.25)}\right]$ $= 13.13 \times 0.449$ $= \$5.89$
	Ratio = Regulation Adjusted cost/Base cost $= \$6.65/\$13.13$ $= 0.51$	Ratio = Regulation Adjusted cost/Base cost $= \$5.89/\$13.13$ $= 0.45$
<b>5 Minute Adjusted cost</b>	$= \$13.13 - \$6.65$ $= \$6.48$	$= \$13.13 - \$5.89$ $= \$7.24$
	Ratio = 5 Minute Adjusted cost/Base cost $= \$6.48/\$13.13$	Ratio = 5 Minute Adjusted cost/Base cost $= \$7.24/\$13.13$

Previous formula calculation	Updated formula calculation
= 0.49	= 0.55

With the updated formula as shown in Table 11, cost allocation will now be accurately adjusted to reflect Base cost changes resulting from an ex-post price change. In this example, \$5.89 (or 45% of Base cost) will be allocated to the regulation service while \$7.24 (or 55% of Base cost) will be allocated to 5 Minute service. As per Example 3, the regulation and 5 Minute Adjusted cost to Base cost ratio of 45% and 55% remains the same.

### 3.6 Cost splitting amendments

To address the interaction between local and global FCAS requirement constraints (where regulation constraints may inadvertently appear as non-binding when assessed independently), the methodology has been updated to define a regulation constraint as binding when LHS=RHS. This supports the logic that no additional regulation is enabled to satisfy the respective 5 Minute constraint when LHS is equal to RHS.

## 4 Further information and engagement opportunities

### 4.1 List of relevant documents

Table 12 below lists relevant documents that provide further information about how the FPP system will run and how data will be communicated.

**Table 12 Relevant documents**

Title	Location
<b>Frequency Contribution Factors Procedure</b>	<a href="https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/frequency-contribution-factors-procedure/final-documents/final-frequency-contribution-factors-procedure.pdf?la=en">https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/frequency-contribution-factors-procedure/final-documents/final-frequency-contribution-factors-procedure.pdf?la=en</a>
<b>Efficient Dispatch and Localised Recovery of Regulation Services Business Specification</b>	<a href="https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/ancillary_services/0160-0049-pdf.pdf">https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/ancillary_services/0160-0049-pdf.pdf</a>
<b>Power System Data Communication Standard</b>	<a href="https://aemo.com.au/-/media/files/electricity/nem/network_connections/transmission-and-distribution/aemo-standard-for-power-system-data-communications.pdf">https://aemo.com.au/-/media/files/electricity/nem/network_connections/transmission-and-distribution/aemo-standard-for-power-system-data-communications.pdf</a>
<b>Frequency Contribution Factor Tuning Parameters and Input Sources</b>	<a href="https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/ancillary-services/frequency-contribution-factors">https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/ancillary-services/frequency-contribution-factors</a>
<b>Guide to Ancillary Services in the National Electricity Market</b>	<a href="https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/ancillary_services/guide-to-ancillary-services-in-the-national-electricity-market.pdf">https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/ancillary_services/guide-to-ancillary-services-in-the-national-electricity-market.pdf</a>
<b>MMS Data Model Reports</b>	<a href="https://visualisations.aemo.com.au/aemo/di-help/Content/Data_Model/MMS_Data_Model.htm">https://visualisations.aemo.com.au/aemo/di-help/Content/Data_Model/MMS_Data_Model.htm</a>

### 4.2 How to stay engaged with the implementation of the FPP reform

#### 4.2.1 Online resources

AEMO is implementing FPP as part of the NEM Reform Program. Information about the NEM Reform Program can be found at: <https://aemo.com.au/initiatives/major-programs/nem-reform-program>

The FPP Project page can be found at <https://aemo.com.au/initiatives/major-programs/frequency-performance-payments-project>. This page includes links to all consultation materials and other resources developed as part of the FPP implementation process.

The NEM Reform Program also publishes a bi-monthly newsletter. Stakeholders can register to receive that newsletter at <https://aemo.us10.list-manage.com/subscribe?u=eae433173c2b1acb87c5b07d1&id=9c87409bb5>.

#### 4.2.2 Regular forums

As part of the NEM Reform Program, AEMO operates a number of stakeholder forums. The implementation of FPP is regularly discussed at the following public monthly forums:

- **NEM Reform Program Consultative Forum** (see <https://aemo.com.au/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/program-consultative-forum>)
- **NEM Reform Implementation Forum** (see <https://aemo.com.au/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/implementation-forum>)
- **NEM Reform Electricity Wholesale Consultative Forum** (see <https://aemo.com.au/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/electricity-wholesale-consultative-forum>).

To join the invite list for any of the above forums, email [NEMReform@aemo.com.au](mailto:NEMReform@aemo.com.au).

### 4.3 Comments on this FPP external data model

AEMO is not calling for written submissions on this document by a specified deadline. However, if market participants or other stakeholders believe there are elements of the FPP external reporting data model that require amendment, AEMO would welcome receiving such comments (including why changes are required).

The AEMO FPP team can be contacted at any time via [FPPconsultation@aemo.com.au](mailto:FPPconsultation@aemo.com.au).

The NEM Reform Program can be contacted via [NEMReform@aemo.com.au](mailto:NEMReform@aemo.com.au).