

# Settlements guide to ancillary services payment and recovery

**Prepared by:** AEMO Operations/NEM Settlements

---

**Document ref:** XX-XXXX

---

**Version:** 5.0

---

**Effective date:** 04 October 2023

---

**Status:** FINAL

---

**Approved for distribution and use by:**

**Approved by:** David Tagg

---

**Title:** Acting Group Manager Market Management

---

**Date:** 04 / 10 / 2023

---

[aemo.com.au](https://aemo.com.au)

New South Wales | Queensland | South Australia | Victoria | Australian Capital Territory | Tasmania | Western Australia

Australian Energy Market Operator Ltd ABN 94 072 010 327

<b>Contents</b>	<b>Current version release details</b>	<b>3</b>
<b>1.</b>	<b>Introduction</b>	<b>4</b>
<b>2.</b>	<b>Market ancillary services</b>	<b>7</b>
2.1.	Contingency FCAS	7
2.2.	Regulation FCAS	7
2.3.	FCAS Payments	7
2.4.	FCAS Recovery	7
2.5.	Co-optimisation	11
<b>3.</b>	<b>Non-market ancillary services</b>	<b>11</b>
3.1.	NSCAS and SRAS	11
3.2.	NSCAS Payments	11
3.3.	NSCAS Cost Recovery	11
3.4.	SRAS Payments	12
3.5.	SRAS Cost Recovery	13
3.6.	Testing Payment Recovery	14
<b>4.</b>	<b>Glossary of terms</b>	<b>15</b>
<b>Appendix A.</b>	<b>Worked examples</b>	<b>16</b>
A.1	Contingency FCAS Recovery Calculations	16
A.2	Regulation FCAS Recovery Calculations	17
A.3	NSCAS Recovery Calculations	19
A.4	SRAS Recovery Calculations	22
<b>Appendix B.</b>	<b>Data tables</b>	<b>24</b>
<b>Appendix C.</b>	<b>Ancillary Service Reporting in the Settlement Report</b>	<b>25</b>
C.1	Market Ancillary Service Payments	25
C.2	Market Ancillary Service Recovery	26
C.3	Non-Market Ancillary Service Payment	26
C.4	Non-Market Ancillary Service Recovery	27
<b>Appendix D.</b>	<b>Ancillary Service Reports on AEMO’s Website</b>	<b>28</b>
<b>Version release history</b>		<b>32</b>

## Tables

Table 1	Ancillary service payment summary .....	6
Table 2	Ancillary service recovery summary .....	6
Table 3	Contingency Raise FCAS costs by region .....	16
Table 4	Generator energy by Market Generator/MSGAs.....	16
Table 5	Regulation Raise FCAS costs .....	17
Table 6	Market Customer Energy by Market Customer .....	17
Table 7	Total Market Customer Energy by Requirement Region.....	18
Table 8	MPF and Recovery Calculations .....	18
Table 9	Residual MPF and Recovery Calculations .....	19

Table 10 Input Data for Loadshed Recovery Calculations ..... 20

Table 11 Information for Reactive Power Recovery Calculation ..... 20

Table 12 Input data for Market Customer (A) SRAS Recovery Calculations ..... 22

Table 13 Input data for SRAS Generator Recovery Calculation ..... 22

Table 14 Market Ancillary Service Payment by Service Type ..... 24

Table 15 Market Ancillary Service Payment by Service Type ..... 25

Table 16 Market Ancillary Service Payment by Transmission Connection Point ..... 26

Table 17 Market Ancillary Service Recovery by Service Type ..... 26

Table 18 Non-Market Ancillary Service Payment by Service Type ..... 26

Table 19 Non-Market Ancillary Service Payment by Contract ID ..... 27

Table 20 Non-Market Ancillary Service Recovery by NMAS Type ..... 27

Table 21 Non-Market Ancillary Service Recovery by Service Type ..... 27

Table 22 Ancillary Service Recovery Summary Table Names ..... 29

Table 23 AS Payment Summary Table Names ..... 30

## Figures

Figure 1 Market ancillary services summary ..... 5

Figure 2 Non-market ancillary services summary ..... 5

Figure 3 Current Ancillary Service Payment and Recovery Files ..... 28

Figure 4 Historical AS Payment and Recovery Files ..... 29

Figure 5 Customer Recovery Rates ..... 31

Figure 6 Generator Recovery Rates ..... 31

## Current version release details

Version	Effective date	Summary of changes
#5.0	04/10/2023	<ul style="list-style-type: none"> <li>Update for new Very Fast Contingency FCAS services</li> <li>Update links to reference documents</li> <li>Update document template for new branding</li> </ul>

**Note: There is a full version history at the end of this document.**

# 1. Introduction

Terms shown in *italics* are defined in the National Electricity Rules (Rules or NER) and have the same meaning when used in this guide. A glossary of other terms used in this guide can be found in section 4.

AEMO procures *ancillary services* to fulfil its obligations, under the Rules. *Ancillary services* are used to assist in maintaining or restoring a safe and secure *power system*.

*Ancillary service* costs depend on the service prices offered by the *Registered Participants* who provide them, and the quantity required at any given time. They can vary substantially from period to period. AEMO recovers *ancillary service* costs from *Market Participants*. The costs of different types of service are recovered in different ways, in accordance with criteria set out in the Rules. This is all done as a part of the settlement process.

This document provides a high-level understanding of the methodology used in the settlement process for payment and recovery of *ancillary service* costs.

This introduction provides a brief overview of what *ancillary services* are and a summary of how the costs are paid and recovered by AEMO. The subsequent chapters detail the methodology for payment and recovery of *market* and *non-market ancillary service* costs used in the settlement calculations. Worked examples and a list of useful reference documents are provided in the appendices.

*Ancillary services* in the National Electricity Market (NEM) can be broadly grouped under one of the following three categories:

- Frequency control *ancillary services* (FCAS)
- Network support and control ancillary services (NSCAS)
- System restart ancillary services (SRAS)

There are ten types of FCAS, which are all *market ancillary services*. NSCAS and SRAS are *non-market ancillary services*, (see Figure 1 and Figure 2). For more information please see [Guide to Ancillary Services in the National Electricity Market](#).

AEMO procures these services from *Registered Participants* by:

- *Dispatching* them via the NEM dispatch engine (NEMDE) based on Market Ancillary Service Arrangements (for *market ancillary services*).
- Ancillary Service Contractual Agreements (for *non-market ancillary services*).

Figure 1 Market ancillary services summary

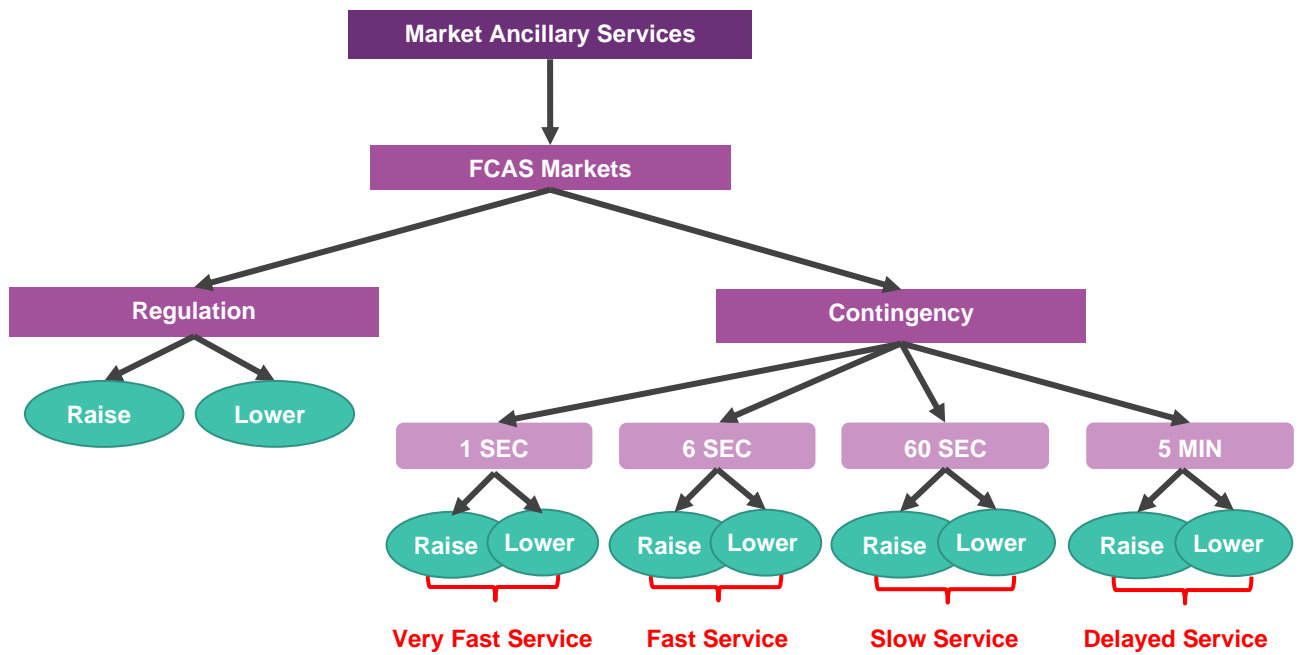
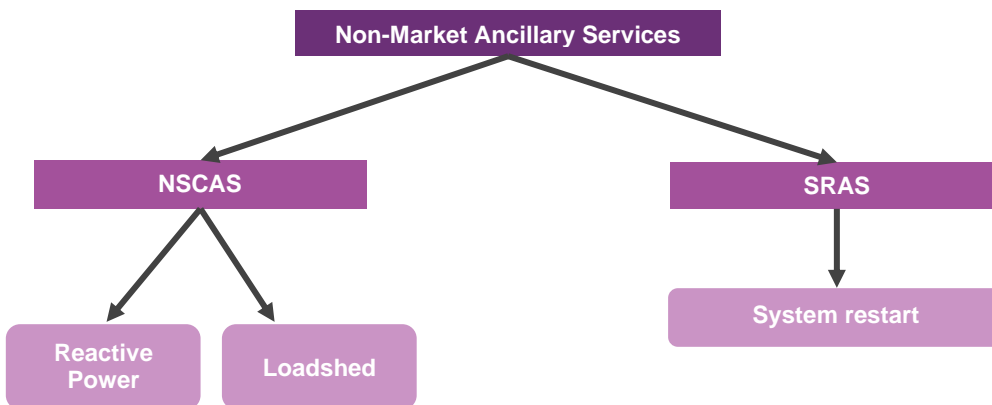


Figure 2 Non-market ancillary services summary



The following tables summarise the payment and recovery methods respectively for each of the *ancillary services*.

**Table 1 Ancillary service payment summary**

Ancillary Service Type	Payment Method	Paid To	Reference in this Guide
<b>Contingency FCAS</b>	Paid based on the relevant market clearing price and the quantity of service provided for each relevant dispatch interval	The relevant scheduled <i>Market Generators/ Market Small Generation Aggregators / Market Customers</i>	Section 2.1, 2.3
<b>Regulation FCAS</b>	Paid based on the relevant market clearing price and the quantity of service provided for each relevant dispatch interval	The relevant scheduled <i>Market Generators/ Market Customers</i>	Section 2.2, 2.3
<b>NSCAS</b>	Paid based on terms and conditions in the relevant contractual agreements between AEMO and the contracted <i>Registered Participants</i>	The relevant contracted <i>Registered Participants</i>	Section 3.2
<b>SRAS</b>	Paid based on terms and conditions in the relevant contractual agreements between AEMO and the contracted <i>Registered Participants</i>	The relevant contracted <i>Registered Participants</i>	Section 3.4

**Table 2 Ancillary service recovery summary**

Ancillary Service Type	Recovery Method	Recovered from	Reference
<b>Contingency FCAS</b>	Recovered in proportion to the consumed energy / generation energy of the relevant <i>Market Participants</i>	Raise services are recovered from <i>Market Generators</i> or <i>Market Small Generation Aggregators</i> . Lower services are recovered from <i>Market Customers</i>	Section 2.4.1
<b>Regulation FCAS</b>	Causer pays basis or socialised	<i>Market Participants</i> with individual MPFs or from <i>Market Customers</i> without individual MPFs	Section 2.4.2
<b>NSCAS</b>	Recovered in proportion to the energy consumption of the relevant <i>Market Participants</i> in the relevant benefiting regions	<i>Market Customers</i> only	Section 3.3
<b>SRAS</b>	Recovered in proportion to energy consumption / generation of the relevant <i>Market Participants</i> in the relevant benefiting regions	Recovered in equal proportions (50/50) from <i>Market Customers</i> and <i>Market Generators</i>	Section 3.4

## 2. Market ancillary services

FCAS are used by AEMO to maintain or rebalance the *frequency* on the *power system*, at any point in time, close to fifty cycles per second (50 Hz) as required by the NEM *frequency operating standards* set by the AEMC *Reliability Panel*.

FCAS is divided into Contingency FCAS and Regulation FCAS.

### 2.1. Contingency FCAS

Contingency FCAS correct the supply/demand balance in response to major *frequency* disturbances causing *frequency* to move outside the *normal operating frequency band*, which can occur after *contingency events* such as the loss of a *generating unit* or a major load.

There are eight types of Contingency FCAS:

i)	<b>Very Fast Raise (1 second Raise)</b>	Service provided within 1 second of a <i>contingency event</i>
ii)	<b>Very Fast Lower (1 second Lower)</b>	
iii)	<b>Fast Raise (6 second Raise)</b>	Service provided within 6 seconds of a <i>contingency event</i>
iv)	<b>Fast Lower (6 second Lower)</b>	
v)	<b>Slow Raise (60 second Raise)</b>	Service provided within 60 seconds of a <i>contingency event</i>
vi)	<b>Slow Lower (60 second Lower)</b>	
vii)	<b>Delayed Raise (5 minute Raise)</b>	Service provided within 5 minutes of a <i>contingency event</i>
viii)	<b>Delayed Lower (5 minute Lower)</b>	

### 2.2. Regulation FCAS

Regulation FCAS provide *frequency* correction in response to minor deviations in the demand/supply balance. There are two types of Regulation FCAS:

i)	<b>Regulation Raise</b>	Service provided to add MW to the system in order to raise the frequency closer to 50 Hz
ii)	<b>Regulation Lower</b>	Service provided to take MW out of the system in order to lower the frequency closer to 50 Hz

### 2.3. FCAS Payments

For each Dispatch Interval (DI), AEMO's dispatch engine (NEMDE) determines the FCAS *constraints*, including Global Requirements and Local Requirements, for each type of FCAS, the quantity of each FCAS to be *enabled* from FCAS providers based on their bids or offers, and a market clearing price (called an *ancillary service price*) for each of the above ten FCAS markets for each *region*.

The relevant FCAS providers will receive settlement payments for each Trading Interval (TI) calculated using the relevant *ancillary service price* and the amount of the *ancillary service* provided in each DI.

### 2.4. FCAS Recovery

FCAS payments are recovered from the relevant *Market Participants* (see Table 2). The recovery method for each type of FCAS is detailed in the following subsections.

## 2.4.1. Contingency FCAS Recovery

### Global or Local Requirement

FCAS payments for services *enabled* to meet a Local Requirement are recovered from specified categories of *Market Participants* in the *region(s)* in which the relevant FCAS *constraint* was binding. FCAS payments for Global Requirements are recovered from specified categories of *Market Participants* across the entire NEM.

For more information on FCAS *constraints* please see the documents available on AEMO's [Congestion information resource](#) website.

### Calculating Lower Contingency FCAS Recovery

Lower Contingency FCAS costs are recovered from *Market Customers* only, in the relevant Requirement *region(s)* (including all *regions* for a Global Requirement). The methodology described below is applied for all the relevant *regions'* Lower Contingency Requirements to calculate the service recovery from each relevant *Market Customer* over each TI.

$$(1) \quad \text{Lower Contingency Recovery} = \frac{\text{Total adjusted cost of LC Requirements [X]} \times (\text{Total customer energy by participant in the requirement regions})}{(\text{Total customer energy in the Requirement regions})}$$

Where:

LC Requirements [X]	=	The relevant binding <i>constraints</i> for Lower Contingency to be met in all Requirement <i>regions</i> for each DI in a TI (including Global Requirements and Local Requirements binding for those <i>regions</i> ).
Lower Contingency Recovery	=	The amount recovered from the relevant <i>Market Customer</i> for the cost of meeting the LC Requirements [X] in the relevant Requirement <i>region(s)</i> in respect of the relevant TI.
Total adjusted cost of LC Requirements [X]	=	The total cost for all <i>regions</i> associated with meeting the LC Requirements, being the relevant <i>regions'</i> total amounts to be paid by AEMO to all the FCAS providers who met the LC Requirements in each DI in the TI. This is the aggregate of the relevant <i>global market ancillary service requirement costs</i> and <i>local market ancillary service requirement costs</i> .
Total customer energy by participant in the Requirement <i>regions</i>	=	Total energy consumed by the relevant <i>Market Customer</i> in the relevant TI in the Requirement <i>regions</i>
Total customer energy in the Requirement <i>regions</i>	=	Total energy consumed by all <i>Market Customers</i> in the relevant TI in the Requirement <i>regions</i>

### Calculating Raise Contingency FCAS Recovery

Raise Contingency FCAS costs are recovered from *Market Generators* (MG) and *Market Small Generation Aggregators* (MSGA) in the relevant Requirement *region(s)* (including all *regions* for a Global Requirement). The methodology described below is applied for all the relevant *regions'* Raise Contingency Requirements to calculate the service recovery from each relevant MG and MSGA over each TI.



$$(2) \quad \text{Raise Contingency Recovery} = \frac{\text{Total adjusted cost of RC Requirements [X]} \times (\text{Total generator energy by participant in the Requirement regions})}{(\text{Total generator energy in the Requirement regions})}$$

Where:

RC Requirements [X]	=	The relevant binding <i>constraints</i> for Raise Contingency to be met in all Requirement <i>regions</i> for each DI in a TI (including Global Requirement and Local Requirement binding for those <i>regions</i> ).
Raise contingency recovery	=	The amount recovered from the relevant MG or MSGA for the cost of meeting the RC Requirements [X] in the relevant Requirement <i>region(s)</i> in respect of the relevant TI.
Total adjusted cost of RC requirements [X]	=	The total cost for all <i>regions</i> associated with meeting the RC Requirements, being the relevant <i>regions</i> ' total amounts to be paid by AEMO to all the relevant FCAS providers who met the RC Requirements in each DI in the TI. This is the aggregate of the relevant <i>global market ancillary service requirement costs</i> and <i>local market ancillary service requirement costs</i> .
Total generator energy by participant in the Requirement <i>regions</i>	=	Total generator energy by the relevant MG or MSGA in the relevant TI in the relevant Requirement <i>regions</i> .
Total generator energy in the Requirement <i>regions</i>	=	Total generator energy by all MG and MSGA for the relevant TI in the relevant Requirement <i>regions</i> .

## 2.4.2. Regulation FCAS recovery

Regulation FCAS recovery calculations recover the cost of meeting the binding Regulation FCAS constraints on a causer pays basis, i.e. the amount paid by AEMO for the Regulation FCAS service is recovered from *Market Participants* deemed to have 'caused' the need for the service, where this is possible to determine from metering. The residual amount of Regulation FCAS costs that cannot be allocated to metered 'causers' is smeared across all *Market Customers* based on energy consumption.

### Market participant factors

The Regulation FCAS cost recovery methodology incorporates two components:

- (a) Individual causer pays contributions – allocated to the following *Market Participants* with metering sufficient to identify frequency performance based on their calculated contribution factor or MPF.
  - Appropriately metered scheduled, semi-scheduled and non-scheduled *Market Generators*.
  - *Market Customers* with *scheduled loads* or non-scheduled *loads* with appropriate metering.
- (b) Residual – apportioned to *Market Customers* based on their proportion of total consumed energy without appropriate metering.

For more information on Regulation FCAS Contribution Factors, please see the documents available on AEMO's [Ancillary services contribution factors](#) website

### Calculating Regulation FCAS recovery

For *Market Participants* with an individual MPF, the formula for calculating Regulation FCAS recovery can be expressed as:

$$(3) \quad \text{FCAS Regulation Recovery with MPF for Reg Requirement [X]} \\ = \text{Total adjusted cost of Reg Requirement [X]} \times \left( \frac{\text{MPF}}{\text{Total}_{\text{MPF}} + \text{Residual}_{\text{MPF}} \times \text{CR}_{\text{MPF}}} \right)$$

$$(4) \quad \text{CR}_{\text{MPF}} = \frac{\text{Total customer energy in the requirement regions}}{\text{Total customer energy in the NEM}}$$

Where:

Reg Requirement [X]	= The binding <i>constraint</i> for Lower Regulation or Raise Regulation FCAS required to be met in each DI in the relevant TI.
FCAS Regulation recovery with MPF	= The amount recovered from the relevant <i>Market Participant</i> , for a given Regulation FCAS, for the cost of meeting Reg Requirement [X] in the relevant TI and for all the relevant Requirement <i>regions</i>
Total adjusted cost of Reg Requirement [X]	= The total costs associated with meeting Reg Requirement [X], in the relevant dispatch interval, paid by AEMO to all the relevant Regulation FCAS service providers.
MPF	= The normalised Market Participant Factor for the relevant <i>Market Participant</i>
Total MPF	= Sum of all the MPFs
Residual MPF	= The normalised Residual NEM contribution factor (= 100 - Total MPF)
Residual MPF x CRMPF	= Constraint Residual Contribution Factor
Total customer energy in the Requirement <i>regions</i>	= Total energy consumed by all <i>Market Customers</i> in the relevant TI across the relevant Requirement <i>region(s)</i> in which Reg Requirement [X] was a Requirement
Total customer energy in the NEM	= Total energy consumed by all <i>Market Customers</i> over the entire NEM in the relevant TI

Because not all regulation payments can be fully recovered from *Market Participants* with an MPF, the residual amounts are recovered from the remaining *Market Customers* without an individual MPF, as follows:

$$(5) \quad \text{FCAS Regulation Residual Recovery} \\ = \text{Total residual adjusted cost of Reg Requirement [X]} \\ \times \left( \frac{\text{Total customer energy by Market Customer in the Requirement regions}}{\text{Total customer energy by ALL Market Customers in the Requirement regions}} \right)$$

Where:

FCAS Regulation Residual Recovery	= The amount recovered from a <i>Market Customer</i> , for the residual cost of meeting Reg Requirement [X] in the relevant TI
Total residual adjusted cost of Reg Requirement [X]	= This is the remaining adjusted cost of the constraint that is still to be recovered. This is calculated after the recovery from all relevant <i>Market Participants</i> with individual MPFs has been accounted for.
Total customer energy by <i>Market Customer</i> in the Requirement <i>regions</i>	= Total energy consumed in the relevant TI by the relevant <i>Market Customer</i> for <i>loads</i> without appropriate metering across the <i>regions</i> in which Reg Requirement [X] applied

---

Total customer energy by ALL *Market Customers* in the *Requirement regions* = Total energy consumed in the relevant TI by all the *Market Customers* for loads without appropriate metering across all the relevant *regions* in which Reg Requirement [X] applied

---

## 2.5. Co-optimisation

AEMO uses a process of co-optimisation between Delayed Contingency FCAS and Regulation FCAS for the purposes of efficient dispatch. As a result of this, the total amount recovered for Delayed Contingency FCAS and Regulation FCAS will equal the total payments for Delayed Contingency FCAS and Regulation FCAS.

i.e.:

$$\text{Total Payments (Delayed Contingency + Regulation)} = \text{Total Recovery (Delayed Contingency + Regulation)}$$

For more information on co-optimisation of delayed contingency FCAS and regulation FCAS please see the Constraint Implementation Guidelines document on AEMO's [Congestion information resource](#) website.

## 3. Non-market ancillary services

### 3.1. NSCAS and SRAS

NSCAS acquired by AEMO are typically used to control *voltage* at different points along the *network* to within prescribed standards and to keep power flow on the *networks* and *interconnectors* within operational limits. Generally, these services are provided by voluntary *load shedding* or the supply or absorption of *reactive power*.

SRAS enable *generation* to be restarted to energise the *transmission system* following a *major supply disruption*.

For more information on *non-market ancillary services*, please see the guidelines for NSCAS and SRAS on AEMO's website.

### 3.2. NSCAS Payments

AEMO procures NSCAS through contracts with *Registered Participants* on agreed terms and conditions. Some payment parameters in the existing contracts may relate to periods or events longer than one Trading Interval. Where this is the case, for cost recovery purposes they are allocated across all relevant Trading Intervals.

Types of payments made by AEMO to *NSCAS Providers* may include:

- (a) Availability payments for each Trading Interval that the service is available.
- (b) Enabling payments for Trading Intervals when the service is specifically enabled.
- (c) Compensation or usage payments made for the amount of the NSCAS actually provided.
- (d) Testing payments for each successfully conducted test.

### 3.3. NSCAS Cost Recovery

AEMO aggregates the relevant payments (excluding testing payments) for each trading interval and each type of NSCAS, and recovers them fully from *Market Customers* in proportion to their energy consumption in that relevant Requirement *region*.

AEMO recovers NSCAS costs on a regional basis, from the benefiting *region(s)*. This is done by applying Regional Benefit Factors (RBFs). For more information on RBF, please see the document on AEMO's [Regional benefit ancillary services procedure](#) website.

For each Trading Interval, the following regional recovery formulae are applied to the NSCAS costs as follows:

$$(6) \quad \text{NSCAS recovery per participant by region} \\ = \text{Total NSCAS payments for NEM} \times \text{RBF} \\ \times \left( \frac{\text{Total customer energy by customer in the Requirement region}}{\text{Total customer energy in the Requirement region}} \right)$$

For each Trading Interval, the NSCAS recovery is then aggregated for all *regions*, by *Market Participant*, and then summed to give the total NSCAS recovery by *Market Participant*. i.e.,

$$(7) \quad \text{Total NSCAS recovery per participant} \\ = \text{Total loadshed recovery per participant} + \text{Total reactive recovery per participant}$$

Where:

RBF	= Each <i>region</i> is assigned a regional benefit factor (RBF) for the relevant NSCAS type. The RBF for each Requirement <i>region</i> is used to apportion the relevant total NSCAS costs to each relevant Requirement <i>region</i> .
NSCAS recovery per participant by <i>region</i> (\$)	= Recovery amount payable by the relevant <i>Market Participant</i> for the relevant TI for NSCAS in respect of the relevant Requirement <i>region</i>
Total NSCAS payments for NEM (\$)	= Total payments made by AEMO for the relevant NSCAS for the relevant TI for all the relevant NEM <i>regions</i>
Total customer energy by customer in the Requirement <i>region</i> (MWh)	= The total customer energy for the relevant <i>Market Customer</i> in the relevant Requirement <i>region</i> , for the relevant TI
Total customer energy in the Requirement <i>region</i> (MWh)	= The total customer energy for all the relevant <i>Market Customers</i> in that Requirement <i>region</i> for the relevant TI

Note: The total NSCAS payment used in the above recovery calculations is only the total payment made for providing the relevant service. This does not include testing payments. For information on Testing Payment Recovery please see Section 3.6.

### 3.4. SRAS Payments

AEMO procures SRAS through contracts with *Registered Participants* on agreed terms and conditions. Some payment parameters in the existing contracts may relate to periods or events longer than one Trading Interval. Where this is the case, for cost recovery purposes they are allocated across all the relevant Trading Intervals.

Types of payments under SRAS contracts may include:

- (a) Availability payments, usually for every TI that the service is available.
- (b) Usage payments – made on each occasion when the service is successfully delivered in response to instructions from AEMO.
- (c) Testing payments – a payment for each successfully conducted test of the service.

### 3.5. SRAS Cost Recovery

AEMO aggregates the relevant payments for a SRAS event (excluding testing payments) for each trading interval and recovers the relevant costs on a 50/50 split basis from *Market Customers* and collectively from *Market Generators* and *Market Small Generation Aggregators* on a regional basis. The relevant SRAS payments are recovered in proportion to the energy consumption/generation of each relevant *Market Participant* within the respective benefiting *region*.

The formula applied for SRAS cost recovery in a Requirement *region*, for a given trading interval, is as follows:

Market Customer SRAS Recovery:

(8) *SRAS recovery per customer by region*

$$= \text{Total SRAS payments for NEM} \times \left(\frac{1}{2}\right) \times \text{RBF} \times \left(\frac{\text{Total customer energy by Market Customer in the Requirement region}}{\text{Total customer energy in the Requirement region}}\right)$$

Market Generator/ Market Small Generation Aggregator (MSGA) SRAS Recovery:

(9) *Total SRAS recovery per generator by region*

$$= \text{Total SRAS payments for NEM} \times \left(\frac{1}{2}\right) \times \text{RBF} \times \left(\frac{\text{Total generator energy by generator or MSGA in the Requirement region}}{\text{Total generator/SGA energy in the Requirement region}}\right)$$

Where:

SRAS recovery per customer/ generator by <i>region</i>	= SRAS recovery amount for the relevant TI payable from the relevant <i>Market Customer, Market Generator or Market Small Generation Aggregator</i> in the relevant Requirement <i>region</i> .
Total SRAS payment for NEM	= Total SRAS payments made by AEMO for the relevant TI to all the relevant SRAS providers in all the relevant Requirement <i>regions</i>
RBF	= The regional benefit factor. Each <i>region</i> is assigned an RBF. The RBF for each <i>region</i> is used in the recovery calculations for that <i>region</i> .
Total customer energy by <i>Market Customer</i> in the Requirement <i>region</i> (MWh)	= Total <i>Market customer</i> energy for the relevant <i>Market Customer</i> in respect of the relevant TI and the relevant Requirement <i>region</i> .
Total generator energy by generator or MSGA in the Requirement <i>region</i> (MWh)	= Total <i>generator energy</i> for the relevant <i>Market Generator</i> or MSGA in respect of the relevant TI and the relevant Requirement <i>region</i> .
Total customer energy in the Requirement <i>region</i> (MWh)	= The aggregate of <i>Market customer</i> energy of all the relevant <i>Market Customers</i> in respect of the relevant TI and the relevant Requirement <i>region</i> .
Total generator/MSGA energy in the Requirement <i>region</i> (MWh)	= The aggregate of <i>generator energy</i> of all the relevant <i>Market Generator</i> and all the MSGA in respect of the relevant TI and the relevant Requirement <i>region</i> .

Note:

- The factor (1/2 = 0.5) in the above two formulae reflect the equal recovery of SRAS from *Market Customers* and *Market Generators/MSGA*.

- Energy for *Market Generators*/MSGA is floored to 0 MWh. This means these *Market Participants* will be exempted from SRAS recovery if their generator energy is negative.

### 3.6. Testing Payment Recovery

AEMO applies the same formulae to calculate testing payment recovery as for the respective ancillary service non-testing payment recovery, i.e.,

- (a) NSCAS testing payment recovery is calculated as per the formula in Section 3.3
- (b) SRAS testing payment recovery is calculated as per the formula in Section 3.4

However, where those equations refer to *Market Customer*, *Market Generator* or MSGA energy for a given trading interval, the respective testing payment recovery calculations will use the aggregate of the relevant energy of the entire testing period for the respective *Market Participants*.

Testing payments are paid and recovered as a lump sum in the *billing period* in which the successful test is confirmed by AEMO. For billing purposes, non-testing recovery amounts are summed for all relevant trading intervals in a given *billing period* and added to the relevant testing recovery amounts to give rise to the final NSAS or SRAS recovery amounts for the relevant *billing period* for each *Market Participant*.

To find the settlement dates in a given settlement *billing period*, please see the [NEM Settlement Calendar](#).

## 4. Glossary of terms

TERM	DESCRIPTION
<b>5MS</b>	Five-minute settlement, to be implemented in the NEM from 1 July 2021 under the <i>National Electricity Amendment (Five minute settlement) Rule 2017</i> .
<b>AEMC</b>	Australian Energy Market Commission
<b>AEMO</b>	Australian Energy Market Operator Limited
<b>Contingency FCAS</b>	FCAS provided when <i>power system frequency</i> is outside the <i>normal operating frequency band</i> , which can occur on the occurrence of a <i>contingency event</i> . Types of Contingency FCAS are Fast, Slow and Delayed.
<b>Co-optimisation</b>	The process of using Delayed Contingency FCAS and Regulation FCAS interchangeably to increase service efficiency.
<b>Delayed Contingency (comprising Delayed Raise and Delayed Lower Service)</b>	Contingency FCAS provided to either raise or lower <i>frequency</i> within five minutes after the locally-sensed <i>frequency</i> exits the <i>normal operating frequency band</i> .
<b>Dispatch Interval (DI)</b>	A five-minute period for which AEMO runs the <i>dispatch algorithm</i> (via NEMDE). On 5MS implementation, the definition of <i>dispatch interval</i> is deleted from the Rules and effectively replaced by a <i>trading interval</i> .
<b>Fast Contingency (comprising Fast Raise and Fast Lower Service)</b>	Contingency FCAS provided to either raise or lower <i>frequency</i> within six seconds after the locally-sensed <i>frequency</i> exits the <i>normal operating frequency band</i> .
<b>FCAS</b>	Frequency control <i>ancillary services</i>
<b>Global Requirement</b>	FCAS requirement for all <i>regions</i> in the NEM
<b>Local Requirement</b>	FCAS requirement for a single <i>region</i> or group of <i>regions</i> within the NEM.
<b>Lower Contingency</b>	Fast Lower, Slow Lower and Delayed Lower Services
<b>NEM</b>	National Electricity Market
<b>NEMDE</b>	National Electricity Market Dispatch Engine
<b>NER</b>	National Electricity Rules
<b>NSCAS</b>	<i>Network support and control ancillary services</i>
<b>Raise Contingency</b>	Fast Raise, Slow Raise and Delayed Raise Services
<b>Regulation FCAS (comprising Regulation Raise and Regulation Lower Service)</b>	FCAS provided in response to a central control system to maintain <i>power system frequency</i> , usually within the <i>normal operating frequency band</i> .
<b>Regulation FCAS Contribution Factor/MPF</b>	Contribution factors assigned to <i>Market Participants</i> as outlined in NER 3.15.6A. These factors are used to allocate Regulation FCAS costs to be recovered from <i>Market Participants</i> on a 'causer pays' basis.
<b>Requirement</b>	A requirement for a particular type of FCAS established by a binding <i>constraint</i> represented in NEMDE, which may be a Global Requirement or a Local Requirement.
<b>Requirement regions</b>	The <i>regions</i> for which a given FCAS requirement Constraint Equation is binding are known as the Requirement Regions for that constraint.
<b>Rules</b>	National Electricity Rules
<b>Slow Contingency (comprising Slow Raise and Slow Lower Service)</b>	Contingency FCAS provided to either raise or lower <i>frequency</i> within sixty seconds after the locally-sensed <i>frequency</i> exits the <i>normal operating frequency band</i> .
<b>SRAS</b>	<i>System restart ancillary services</i>
<b>Trading Interval (TI)</b>	A period for which AEMO settles <i>trading amounts</i> in the NEM. Until 5MS implementation, a <i>trading interval</i> is defined in the Rules as a 30-minute period. On 5MS implementation, the definition of <i>trading interval</i> changes to a 5 minute period.



## Appendix A. Worked examples.

Note: All data used in these worked examples are for illustrating the calculation steps of the relevant *ancillary service* recovery methodology presented in section 2 and 3. They do not disclose *Market Participants'* confidential information. Unless specified otherwise, these calculations apply to a *Trading Interval* or a *Dispatch Interval*.

### A.1 Contingency FCAS Recovery Calculations

This example illustrates Raise Contingency FCAS recovery for a binding constraint (FC\_1) affecting Dispatch Interval DI1 in Trading Interval T11, from 4 *Market Generators* in three Requirement *regions*. *Generator energy* is used in this example. For Lower Contingency recovery, *Market Customer* energy should be used. See Section 2.1 for the relevant formulae.

Table 3 shows the incurred adjusted costs for each Requirement *region*. Table 4 shows *Market Generator* energy in each *region* for the relevant *Trading Interval* and the relevant *Market Generators* or MSGA.

**Table 3 Contingency Raise FCAS costs by region**

Dispatch Interval in Trading Interval T11	RC Requirement	Requirement Regions	Adjusted RC Costs (\$)
DI1	FC_1	NSW1; VIC1	\$45.00

**Table 4 Generator energy by Market Generator/MSGA**

Trading Interval	Requirement Region	RC Requirments	Market Generator/MSGA	Generator Energy (MWh)
T11	NSW1	FC_1	A	100
T11	NSW1	FC_1	B	200
T11	NSW1	FC_1	C	20
T11	VIC1	FC_1	C	30

Note: This is the energy data for the relevant TI in which the relevant DI falls.

Calculating recovery for constraint FC\_1

$$\begin{aligned}
 \text{Total Generator Energy (FC_1, NSW1)} &= \text{Gen Energy (A, NSW1)} + \text{Gen Energy (B, NSW1)} + \text{Gen Energy (C, NSW1)} + \text{Gen Energy (C, VIC1)} \\
 &= 100 + 200 + 20 + 30 \\
 &= 350
 \end{aligned}$$

Therefore, the amount to be recovered from the relevant *Market Participant* for the given dispatch interval

$$\begin{aligned}
 \text{Recovery (A, FC_1, NSW1)} &= \$45.00 \times 100 / 350 \\
 &= \$12.86 \\
 \text{Recovery (B, FC_1, NSW1)} &= \$45.00 \times 200 / 350 \\
 &= \$25.71 \\
 \text{Recovery (C, FC_1, NSW1)} &= \$45.00 \times 20 / 350 \\
 &= \$2.57 \\
 \text{Recovery (C, FC_1, VIC1)} &= \$45.00 \times 30 / 350
 \end{aligned}$$



= \$3.86

## A.2 Regulation FCAS Recovery Calculations

This example illustrates the step-by-step calculations for Regulation Raise FCAS recovery for a Global Requirement affecting *Dispatch Interval* D2 in *Trading Interval* TI2. These calculations apply equally to Regulation Lower FCAS recovery using the relevant data and follow the equations in section 2.4.2. These are outlined below.

Step 1: Obtain Regional Requirement Information

Table 5 shows the Regulation Raise FCAS constraint information for binding constraint FC\_Reg\_1, the constraint costs and the *regions* the constraint applies to.

Table 6 shows customer energy for each *Market Customer* in each Requirement *region*. The aggregated values by *region* have been populated in Table 7.

Market Participant Factors (MPF) for *Market Participants* with appropriate metering are shown in Table 8.

**Table 5 Regulation Raise FCAS costs**

Dispatch Interval in Trading Interval TI2	Regulation Raise Requirement	Requirement Region	Adjusted Regulation Raise Costs (\$)
D12	FC_Reg_1	NSW1	\$150
D12	FC_Reg_1	QLD1	\$150
D12	FC_Reg_1	VIC1	\$150
D12	FC_Reg_1	TAS1	\$150
D12	FC_Reg_1	SA1	\$150

**Table 6 Market Customer Energy by Market Customer**

Trading Interval	Market Customer	Requirement Region	Market Customer Energy (MWh)	Trading Interval	Market Customer	Requirement Region	Market Customer Energy (MWh)
TI2	A	NSW1	100	TI2	I	TAS1	108
TI2	A	QLD1	200	TI2	I	SA1	68
TI2	A	VIC1	150	TI2	J	NSW1	201
TI2	B	NSW1	145	TI2	J	QLD1	252
TI2	B	TAS1	400	TI2	J	SA1	101
TI2	C	QLD1	650	TI2	K	TAS1	93
TI2	D	QLD1	225	TI2	L	QLD1	72
TI2	D	TAS1	230	TI2	L	VIC1	351
TI2	D	SA1	355	TI2	M	NSW1	637
TI2	E	NSW1	470	TI2	N	VIC1	45

Trading Interval	Market Customer	Requirement Region	Market Customer Energy (MWh)	Trading Interval	Market Customer	Requirement Region	Market Customer Energy (MWh)
T12	F	NSW1	120	T12	O	QLD1	8
T12	F	TAS1	115	T12	P	NSW1	155
T12	G	VIC1	234	T12	P	QLD1	217
T12	H	SA1	56			Total	6,286
T12	I	NSW1	98				

Note: This is the energy data for the relevant TI in which the relevant DI falls.

**Table 7 Total Market Customer Energy by Requirement Region**

Trading Interval	Requirement Region	NSW1	QLD1	VIC1	SA1	TAS1	TOTAL
T12	Total Market Customer Energy in Requirement Region (MWh)	1,926	2,005	1,059	580	946	6,286

**Step 2: Calculate CR<sub>MPF</sub>**

The information from Table 7 can then be used to calculate the CR<sub>MPF</sub>, as shown below:

$$\begin{aligned}
 CR_{MPF} &= \frac{\text{Total energy consumed in Requirement regions (NSW1, QLD1, VIC1, TAS1, SA1)}}{\text{Total energy consumed in the NEM}} \\
 &= \frac{(1,926 + 2,005 + 1,059 + 580 + 716)}{6,286} \\
 &= \frac{6,286}{6,286} = 1
 \end{aligned}$$

The CR<sub>MPF</sub> equals 1 for a *Global Requirement* affecting all *regions* in NEM. It will be less than 1 for a *local requirement*.

**Step 3: Calculate Regulation FCAS Recovery for Market Participants with individual MPFs.**

After calculating the CR<sub>MPF</sub> and obtaining the MPF data, we can calculate the Regulation FCAS recovery for *Market Participants* with MPFs (see Section 2.4.2 for formula). The data and calculations are shown in Table 8.

**Table 8 MPF and Recovery Calculations**

Trading Interval	Market Participant	MPF (%)	CRMPF	ADJ COST (\$)	MPF Recovery (\$)
T12	A	5.6	1	150	\$8.4
T12	B	8.9	1	150	\$13.35
T12	D	1.5	1	150	\$2.25
T12	E	11.2	1	150	\$16.80
T12	G	6.4	1	150	\$9.60
T12	I	5.25	1	150	\$7.88
T12	J	7.35	1	150	\$11.03

$$\begin{aligned}
 &\text{MPF recovery (A)} \\
 &= \frac{\$150.00 \times 5.6}{65 + (1 \times 35)} = \$8.4
 \end{aligned}$$

Trading Interval	Market Participant	MPF (%)	CRMPF	ADJ COST (\$)	MPF Recovery (\$)
T12	K	9.8	1	150	\$14.70
T12	L	9	1	150	\$13.50
	Total MPF	65			
	Total Residual MPF	35			
	Total	100			\$97.5
				Residual Adjusted Costs	\$52.5

Residual Adjusted Costs  
 = \$150.00 – \$97.50  
 = \$52.50

#### Step 4: Calculate Regulation FCAS Residual Recovery

Table 9 shows the residual FCAS cost recovered from each *Market Customer* with no MPF in proportion to their share the total loads without MPFs from all *Market Participants* in the relevant Requirement regions.

**Table 9 Residual MPF and Recovery Calculations**

Trading Interval	Market Participant with no MPF	Total Customer Energy in Requirement Regions	RMPF Recovery
T12	C	650	\$17.04
T12	F	235	\$6.16
T12	H	56	\$1.47
T12	M	637	\$16.70
T12	N	45	\$1.18
T12	O	8	\$0.21
T12	P	372	\$9.75
	Total	2,003	\$52.5

$$R_{MPF} = \$52.5 \times \left( \frac{650}{2,003} \right) = \$17.04$$

## A.3 NSCAS Recovery Calculations

This section provides step-by-step instructions for calculating *Loadshed*, *Reactive Power* and total NSCAS recovery for a *Market Customer* for a Trading Interval.

### A.3.1 Calculate total loadshed recovery

Table 10 shows the required input data for *Loadshed* recovery calculations for *Market Customer A* for the relevant *Trading Interval* in the relevant Requirement regions. The step-by-step calculations follow the equations in section 3.3.

**Table 10 Input Data for Loadshed Recovery Calculations**

	VIC1	NSW1	QLD1	TOTAL
Market Customer A Energy (MWh)	200	150	350	700
Total Market Customer energy (MWh)	500	600	800	1,900
RBF	0.1	0.75	0.15	1
Loadshed Payment (\$)				\$54,500

RBF allocated across all regions will sum to 1

**Step 1: Calculate Loadshed recovery from Market Customer A in each Requirement region**

$$\begin{aligned}
 \text{Loadshed recovery for Market Customer A (VIC1)} &= \$54,500.00 \times 0.1 \times 200 / 500 \\
 &= \$2,180.00 \\
 \text{Loadshed recovery for Market Customer A (NSW1)} &= \$54,500.00 \times 0.75 \times 150 / 600 \\
 &= \$10,219.00 \\
 \text{Loadshed recovery for Market Customer A (QLD1)} &= \$54,500.00 \times 0.15 \times 350 / 800 \\
 &= \$3,577.00
 \end{aligned}$$

**Step 2: Sum all Loadshed recovery from Market Customer A by Requirement region**

$$\begin{aligned}
 \text{Total Loadshed recovery for Market Customer A} &= \$2,180.00 + \$10,219.00 + \$3,577.00 \\
 &= \$15,976.00
 \end{aligned}$$

**A.3.2 Calculate Total Reactive Power Recovery**

Table 11 shows the input data required for *Reactive Power ancillary service (RPAS)* recovery calculations for *Market Customer A* for the relevant *Trading Interval* in each Requirement region. The step-by-step calculations follow the equations in section 3.3.

**Table 11 Information for Reactive Power Recovery Calculation**

2013, Wk18	VIC1	NSW1	QLD1	TOTAL
Market Customer A Energy (MWh)	300	425	250	975
Total Customer Energy (MWh)	900	1,100	700	2,700
RBF	0.7	0.1	0.2	1
RPAS Payment (\$)				\$61,500

RBF allocated across all regions will sum to 1

**Step 1: Calculate the reactive power recovery from Market Customer A in each Requirement region**

$$\begin{aligned}
 \text{Total RPAS recovery for Market Customer A (VIC1)} &= \$61,500.00 \times 0.7 \times 300 / 900 \\
 &= \$14,350.00 \\
 \text{Total RPAS recovery for Market Customer A (NSW1)} &= \$61,500.00 \times 0.1 \times 425 / 1100 \\
 &= \$2,376.00
 \end{aligned}$$

$$\begin{aligned}
 \text{Total RPAS recovery for Market Customer A (QLD1)} &= \$61,500.00 \times 0.2 \times 250 / 700 \\
 &= \$4,393.00
 \end{aligned}$$

Step 2: Sum the Reactive Power recovery from Market Customer A for all Requirement regions

$$\begin{aligned}
 \text{Total RPAS recovery for Market Customer A} &= \$14,350.00 + \$2,376.00 + \$4,393.00 \\
 &= \$21,119.00
 \end{aligned}$$

### A.3.3 Calculate Total NSCAS Recovery

This step aggregates total Loadshed and RPAS recovery amounts for *Market Customer A* in respect of the relevant *Trading Interval*.

$$\begin{aligned}
 \text{Total NSCAS recovery for Market Customer A} &= \text{Total Loadshed recovery} + \text{Total RPAS recovery} \\
 &= \$15,976.00 + \$21,119.00 \\
 &= \$37,095.00
 \end{aligned}$$

## A.4 SRAS Recovery Calculations

This section provides calculation steps for SRAS recovery for a *Trading Interval* with respect to a *Market Customer* and a *Market Generator* in each *Requirement region*. The step-by-step calculations follow the equations in section 3.4.

### A.4.1 Calculate SRAS recovery from a Market Customer

Table 12 shows the required input data for SRAS recovery calculations for a *Market Customer* (A) for the relevant *Trading Interval* in each *Requirement region*.

**Table 12 Input data for Market Customer (A) SRAS Recovery Calculations**

	VIC1	NSW1	QLD1	TOTAL
<b>Market Customer A Energy (MWh)</b>	100	200	300	600
<b>Total Customer Energy (MWh)</b>	400	600	800	1,800
<b>RBF</b>	0.7	0.1	0.2	1.0
<b>SRAS Payment (\$)</b>				\$50,000
<b>Market Customer Recovery Proportion</b>				(1/2)

RBF allocated across all regions will sum to 1

SRAS is recovered equally from customers and generators

$$\begin{aligned}
 \text{Total SRAS recovery for Market Customer A (VIC1)} &= \$50,000.00 \times 0.5 \times 0.7 \times 100 / 400 \\
 &= \$4,375.00 \\
 \text{Total SRAS recovery for Market Customer A (NSW1)} &= \$50,000.00 \times 0.5 \times 0.1 \times 200 / 600 \\
 &= \$833.00 \\
 \text{Total SRAS recovery for Market Customer A (QLD1)} &= \$50,000.00 \times 0.5 \times 0.2 \times 300 / 800 \\
 &= \$1,875.00
 \end{aligned}$$

### A.4.2 Calculate SRAS Recovery from a Market Generator

Table 13 shows the required input data for SRAS recovery calculations for a *Market Generator* (B) for the relevant *Trading Interval* in each *Requirement region*.

**Table 13 Input data for SRAS Generator Recovery Calculation**

	VIC1	NSW1	QLD1	TOTAL
<b>Market Generator B Energy (MWh)</b>	200	500	400	1,100
<b>Total Generator Energy (MWh)</b>	500	900	900	2,300
<b>RBF</b>	0.7	0.1	0.2	1.0
<b>SRAS Payment (\$)</b>				\$75,000
<b>Generator Recovery Proportion</b>				(1/2)

RBF allocated across all regions will sum to 1

SRAS is recovered equally from customers and generators

Total SRAS recovery for <i>Market Generator B VIC1</i> ) =	\$75,000.00	x	0.5	x	0.7	x	200	/	500	
=	\$10,500.00									
Total SRAS recovery for <i>Market Generator B (NSW1)</i>	=	\$75,000.00	x	0.5	x	0.1	x	500	/	900
=	\$2,083.00									
Total SRAS recovery for <i>Market Generator B (QLD1)</i>	=	\$75,000.00	x	0.5	x	0.2	x	400	/	900
=	\$3,333.00									

## Appendix B. Data tables

This section lists confidential and public data tables currently available for use for settlement reconciliation purposes. These tables can be found in the EMMS data model available to *registered Market Participants*. Description of the contents of these tables can be found in the [MMS Data Model Report](#) published on AEMO website.

**Table 14 Market Ancillary Service Payment by Service Type**

Table Name	Description	Type
<b>billingasrecovery</b>	Shows participant charges for ancillary services for the billing period	Confidential
<b>billing_nmas_tst_payments</b>	Shows testing payment details for system restart services by period	Confidential
<b>billing_nmas_tst_recovery</b>	Shows testing recovery amounts for system restart services to be recovered from participants	Confidential
<b>setcfg_participant_mpf</b>	Shows the Market Participant Factors (MPF) for each connection point	Public
<b>dispatch_fcas_req</b>	Shows dispatch constraint tracking for regional Frequency Control Ancillary Services (FCAS) recovery	Public
<b>setgendata</b>	Shows settlement data (including generator energy) for each generating unit	Confidential
<b>setcpdata</b>	Shows settlement data for each customer connection point	Confidential
<b>setpowerrecovery</b>	Shows recovery amounts for reactive power ancillary services to be recovered from participants	Confidential
<b>setshedrecovery</b>	Shows recovery amounts for loadshed ancillary services to be recovered from participants	Confidential
<b>setrestartrecovery</b>	Shows recovery amounts for system restart ancillary services to be recovered from participants	Confidential
<b>setshedpayment</b>	Shows specific payment details for loadshed services by period	Confidential
<b>setpowerpayment</b>	Shows specific payment details for reactive power services by period	Confidential
<b>setrestartpayment</b>	Shows specific payment details for system restart services by period	Confidential
<b>set_fcas_payment</b>	Sets out enabling payment details for FCAS	Confidential
<b>set_fcas_recovery</b>	Shows recovery amounts for FCAS to be recovered from participants.	Confidential
<b>set_nmas_recovery</b>	Shows recovery amounts for system restart services to be recovered from participants	Confidential



## Appendix C. Ancillary Service Reporting in the Settlement Report

Along with the weekly settlement statements, *Market Participants* receive a text document called the Settlement Report (SR). The SR contains a summary of the energy sold and purchased for the *billing period* and also contains a detailed summary of the *ancillary services* payments and recovery for the *billing period*. This section gives an example of what the *ancillary services* payment and recovery summary looks like in a typical settlement report received by a *Market Participant*.

Note that each *Market Participant* will not receive all of the *ancillary service* payment and recovery summaries shown below. For instance, *Market Participants* who are not providers of *ancillary services* will not see the *ancillary service* payment summaries while *Market Participants* who are *Market Generators* will not receive a breakdown of the NSCAS recovery as this *ancillary service* is not recovered from *Market Generators*.

The data presented in the tables in this section are for illustration purposes and do not reflect any *Market Participants'* confidential information.

Note: The below SR examples are from a period prior to the implementation of the Very Fast services in October 2023.

### C.1 Market Ancillary Service Payments

Table 15 shows the total amount paid by AEMO to all *Market Participants* broken down by service type. Table 16 presents the same information broken down further by *transmission node*. Note that the total payments by *transmission node* in Table 16 need to reconcile with the total amounts by service type in Table 15, as highlighted below.

**Table 15 Market Ancillary Service Payment by Service Type**

Ancillary Service Transactions	
-----	
Market Ancillary Service Transactions - Payments	
-----	
Service Provided	Amount (\$)
-----	
Very fast raise	\$0.00
Very fast lower	\$0.00
Fast raise	\$1,770.60
Fast lower	\$10,036.81
Slow raise	\$1,211.71
Slow lower	\$11,341.06
Delayed raise	\$961.54
Delayed lower	\$2,351.81
Regulation raise	\$15,054.66
Regulation lower	\$11,835.11
-----	
Total Payments By AEMO	\$54,563.30
=====	

**Table 16 Market Ancillary Service Payment by Transmission Connection Point**

Market Frequency Control Ancillary Services by Transmission Connection Point (Payments By AEMO)

Connection Point	Very fast raise	Very fast lower	Fast raise	Fast lower	Slow raise	Slow lower	Delayed raise	Delayed lower	Reg raise	Reg lower	Total
XXXX1	\$100.00	\$0.00	\$5,213.70	\$463.75	\$2,681.75	\$2,562.39	\$232.29	\$796.89	\$29,712.04	\$2,490.91	\$44,153.72
XXXX2	\$0.00	\$15.00	\$4,026.04	\$471.89	\$2,512.38	\$2,428.77	\$230.70	\$858.84	\$33,730.53	\$2,486.47	\$46,745.62
XXXX3	\$0.00	\$0.00	\$4,148.69	\$270.76	\$2,374.78	\$1,669.03	\$206.55	\$704.17	\$28,184.83	\$1,987.15	\$39,545.95
XXXX4	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
YYYY1	\$0.00	\$145.09	\$1,143.91	\$3,962.00	\$740.77	\$8,668.42	\$0.00	\$0.00	\$754.16	\$964.68	\$16,233.94
YYYY2	\$535.00	\$0.00	\$1,359.83	\$540.92	\$945.82	\$2,342.30	\$0.00	\$0.00	\$634.35	\$685.45	\$6,508.67
YYYY4	\$0.00	\$5.90	\$878.44	\$4,327.48	\$961.26	\$13,670.15	\$0.00	\$0.00	\$2,538.76	\$2,221.30	\$24,597.39
<b>Total</b>	<b>\$635.00</b>	<b>\$165.99</b>	<b>\$16,770.60</b>	<b>\$10,036.81</b>	<b>\$10,216.77</b>	<b>\$31,341.06</b>	<b>\$669.54</b>	<b>\$2,359.89</b>	<b>\$95,554.66</b>	<b>\$10,835.97</b>	<b>\$177,785.29</b>

## C.2 Market Ancillary Service Recovery

Table 17 shows the amounts recovered by AEMO from a *Market Participant* by *market ancillary service* type and broken down by *Market Customer* and *Market Generator* categories.

**Table 17 Market Ancillary Service Recovery by Service Type**

Service Provided	Customer Amount (\$)	Generator Amount (\$)	Total Amount (\$)
Fast raise	\$0.00	-\$54.28	-\$54.28
Fast lower	-\$20.53	\$0.00	-\$20.53
Slow raise	\$0.00	-\$34.98	-\$34.98
Slow lower	-\$96.88	\$0.00	-\$96.88
Delayed raise	\$0.00	-\$47.58	-\$47.58
Delayed lower	-\$54.23	\$0.00	-\$54.23
Regulation raise	-\$480.62	\$0.00	-\$480.62
Regulation lower	-\$532.89	\$0.00	-\$532.89
<b>Total Recovery(Payment to AEMO)</b>	<b>-\$1,185.15</b>	<b>-\$136.84</b>	<b>-\$1,321.99</b>

Contingency raise services are not recovered from customers

Contingency lower services are not recovered from generators

Contingency FCAS

Regulation FCAS

## C.3 Non-Market Ancillary Service Payment

Table 18 shows *non-market ancillary service* payments by service type. While Table 19 captures the same information as Table 18, it is further broken down by contract id and payment component (i.e availability, enablement/ usage, compensation and testing).

**Table 18 Non-Market Ancillary Service Payment by Service Type**

Non Market Ancillary Service Transactions - Payments		
NMAS Type	Service Provided	Amount (\$)
SRAS	System Restart	\$53,432.00
NSCAS	Reactive	\$49,934.34
NSCAS	Loadshed	\$30,203.98
<b>Total Payment From AEMO</b>		<b>\$133,570.32</b>

**Table 19 Non-Market Ancillary Service Payment by Contract ID**

Compensation may be paid to market participant if AEMO makes a direction.

Test Payments are made to participants for testing their systems are capable of providing the non-market ancillary service. This payment is made when a successful test is confirmed.

NMAS Type	Service	Contract ID	Availability	Enablement/Usage	Compensation	Testing	Total
SRAS	System Restart	AAAA12345	\$28,893.43	\$0.00	\$0.00	\$0.00	\$28,893.43
SRAS	System Restart	BBBB54321	\$24,538.57	\$0.00	\$0.00	\$0.00	\$24,538.57
NSCAS	Reactive Power	CCCC67890	\$49,934.34	\$0.00	\$0.00	\$0.00	\$49,934.34
NSCAS	Loadshed NSCAS	DDDD09876	\$30,203.98	\$0.00	\$0.00	\$0.00	\$30,203.98
<b>Total Payments By AEMO</b>							<b>\$133,570.32</b>

## C.4 Non-Market Ancillary Service Recovery

Table 20 shows non-market ancillary service (NMAS) recovery by category (i.e., NSCAS, SRAS). Table 21 further breaks down the NMAS recovery by service type, *region* and payment type.

**Table 20 Non-Market Ancillary Service Recovery by NMAS Type**

NSCAS is not recovered from generators.

NMAS Type	Customer Amount (\$)	Generator Amount (\$)	Total Amount (\$)
NSCAS	-\$353.42	\$0.00	-\$353.42
SRAS	-\$234.48	-\$3,944.05	-\$4,178.53
<b>Total Recovery (Payment To AEMO)</b>			<b>-\$4,531.96</b>

**Table 21 Non-Market Ancillary Service Recovery by Service Type**

NMAS Type	Service	RegionId	Availability	Enablement/Usage	Compensation	Testing	Total
NSCAS	Reactive Power	NSW1	-\$67.34	\$0.00	\$0.00	\$0.00	-\$67.34
NSCAS	Reactive Power	QLD1	-\$56.78	\$0.00	\$0.00	\$0.00	-\$56.78
NSCAS	Reactive Power	SA1	-\$82.67	\$0.00	\$0.00	\$0.00	-\$82.67
NSCAS	Loadshed NSCAS	NSW1	-\$146.63	\$0.00	\$0.00	\$0.00	-\$146.63
SRAS	System Restart	QLD1	-\$2,750.83	\$0.00	\$0.00	\$0.00	-\$2,750.83
SRAS	System Restart	TAS1	-\$1,427.70	\$0.00	\$0.00	\$0.00	-\$1,427.70
<b>Total Recovery (Payment To AEMO)</b>							<b>-\$4,531.96</b>

## Appendix D. Ancillary Service Reports on AEMO's Website

AEMO publishes *Ancillary Service* payment and recovery reports on AEMO's website. These reports contain publicly available for *billing period* total payment and recovery amounts for each *ancillary service* category, broken down by *region*.

The data in the current year summary files (shown in Figure 3) are updated to capture information in the most recent posted settlement statements (*preliminary, final, or revised*). *Market participants* are also able to access and subscribe to receive these files by email, through Settlement Direct.

Note: the information below can be accessed on AEMO's [Ancillary services payments and recovery](#) website.

**Figure 3 Current Ancillary Service Payment and Recovery Files**

The overview document below describes how the Ancillary Services Payments and Recovery amounts are calculated.

[Overview Document v2 \(effective 1 July 2015\)](#)

[Overview Document](#)

The summary files below contain the weekly summarised regional Ancillary Services Payments and Recovery data. The payments and recovery amounts are exclusive of GST. Additional data (for previous years) is available from links at the bottom of the page.

The payments and recovery amounts are exclusive of GST.

[AS Payments Summary File 2019](#)

[AS Recovery Summary File 2019](#)

Historical *ancillary service* recovery and payment summary files are also available (see Figure 4). These are archived reports that are only updated at the start of the year if revised data is available. These historical files are available for the last two calendar years.

**Figure 4 Historical AS Payment and Recovery Files**

**Historical files:**

The payments and recovery amounts are exclusive of GST.

- [AS Payments Summary File 2019](#)
- [AS Recovery Summary File 2019](#)
- [AS Payments Summary File 2018](#)

Table 22 lists the contents of the published ancillary service recovery summary data table.

**Table 22 Ancillary Service Recovery Summary Table Names**

COLUMN NAME	DEFINITION
<b>AS_RECOVERY_SUMMARY</b>	This specifies the report type - Ancillary Services Recovery Summary Report
<b>BILLING_WEEK</b>	Specifies the year and billing week the ancillary services are recovered. The settlement dates within the billing week can be found from the settlement calendar
<b>STATUS</b>	This refers to the latest statement type for the billing week. The corresponding data is used in the recovery calculations
<b>REGIONID</b>	The <i>region</i> the ancillary services costs are recovered from
<b>LOWER1SEC</b>	Very Fast Contingency Lower FCAS Recovery (\$)
<b>LOWER6SEC</b>	Fast Contingency Lower FCAS Recovery (\$)
<b>LOWER60SEC</b>	Slow Contingency Lower FCAS Recovery (\$)
<b>LOWER5MIN</b>	Delayed Contingency Lower FCAS Recovery (\$)
<b>LOWERREG</b>	Lower Regulation FCAS Recovery (\$)
<b>RAISE1SEC</b>	Very Fast Contingency Raise FCAS Recovery (\$)
<b>RAISE6SEC</b>	Fast Contingency Raise FCAS Recovery (\$)
<b>RAISE60SEC</b>	Slow Contingency Raise FCAS Recovery (\$)
<b>RAISE5MIN</b>	Delayed Contingency Raise FCAS Recovery (\$)
<b>RAISEREG</b>	Raise Regulation FCAS Recovery (\$)
<b>RESTART</b>	Restart (SRAS) Recovery (\$)
<b>REACTIVE</b>	Reactive (NSCAS) Recovery (\$)
<b>LOADSHED</b>	Loadshed (NSCAS) Recovery (\$)
<b>TOTAL_CUSTOMER_RECOVERY</b>	Total ancillary service costs recovered from market customers (\$)
<b>TOTAL_GENERATOR_RECOVERY</b>	Total ancillary service costs recovered from market generators (\$) where generators include SGA
<b>ENERGY_CUSTOMER</b>	Total customer energy (MWh)
<b>ENERGY_GENERATOR</b>	Total generator energy (MWh) where generators includes SGA
<b>RECOVERY_RATE_CUSTOMER</b>	The customer recovery rate is given in \$/MWh and is the TOTAL_CUSTOMER_RECOVERY divided by ENERGY_CUSTOMER
<b>RECOVERY_RATE_GENERATOR</b>	The generator recovery rate is given in \$/MWh and is the TOTAL_GENERATOR_RECOVERY divided by ENERGY_GENERATOR

Table 23 lists the contents of the published ancillary service payment summary data table.

**Table 23 AS Payment Summary Table Names**

ASPAYMENT_SUMMARY		This specifies the report type - Ancillary Services Payment Summary Report
<b>BILLING_WEEK</b>		Specifies the year and billing week the ancillary services are recovered. The settlement dates within the billing week can be found from the settlement calendar
<b>STATUS</b>		This refers to the latest statement type for the billing week. The corresponding data is used in the payment calculations
<b>REGIONID</b>		The <i>region</i> in which ancillary services payments are made
<b>LOWER1SEC</b>		Very Fast Contingency Lower FCAS Payment (\$)
<b>LOWER6SEC</b>		Fast Contingency Lower FCAS Payment (\$)
<b>LOWER60SEC</b>		Slow Contingency Lower FCAS Payment (\$)
<b>LOWER5MIN</b>		Delayed Contingency Lower FCAS Payment (\$)
<b>LOWERREG</b>		Lower Regulation FCAS Payment (\$)
<b>RAISE1SEC</b>		Very Fast Contingency Raise FCAS Payment (\$)
<b>RAISE6SEC</b>		Fast Contingency Raise FCAS Payment (\$)
<b>RAISE60SEC</b>		Slow Contingency Raise FCAS Payment (\$)
<b>RAISE5MIN</b>		Delayed Contingency Raise FCAS Payment (\$)
<b>RAISEREG</b>		Raise Regulation FCAS Payment (\$)
<b>RESTART</b>		Restart (SRAS) Payment (\$)
<b>REACTIVE</b>		Reactive (NSCAS) Payment (\$)
<b>LOADSHED</b>		Loadshed (NSCAS) Payment (\$)
<b>TOTAL_AS_PAYMENT</b>		Sum of all ancillary service payments (\$)

AEMO also publishes graphs showing rolling 12-month *Market Customer* and *Market Generator* recovery rates for each *region* (see Figure 5 and Figure 6). These charts are updated to reflect settlement outcomes in the latest *Preliminary, Final and Revised statements*.



Figure 5 Customer Recovery Rates

Customer Recovery Rates from 17/06/2018 to 15/06/2019

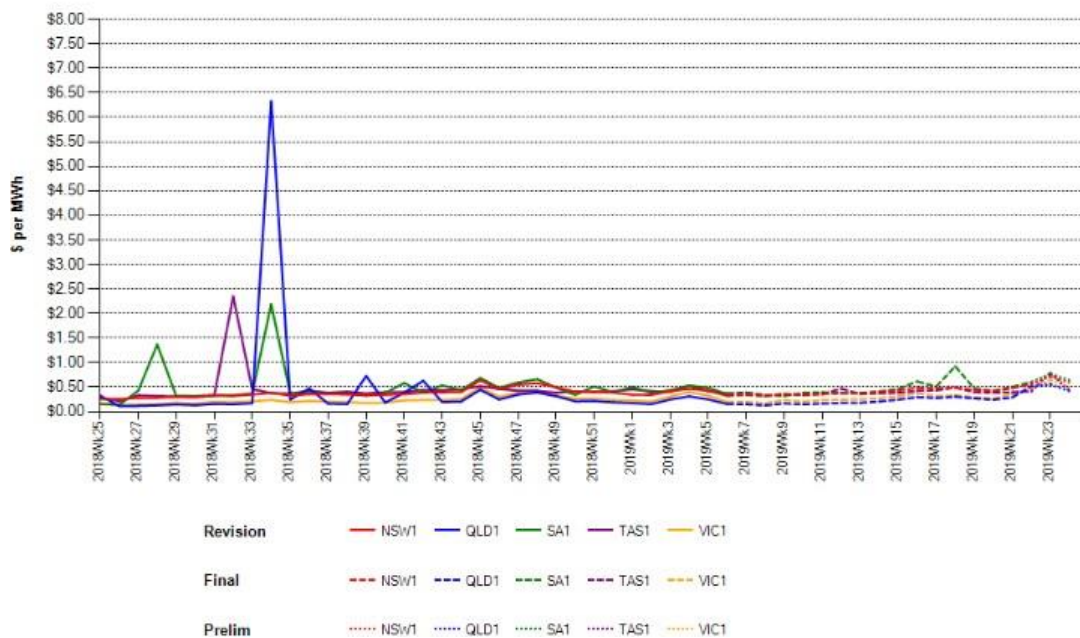
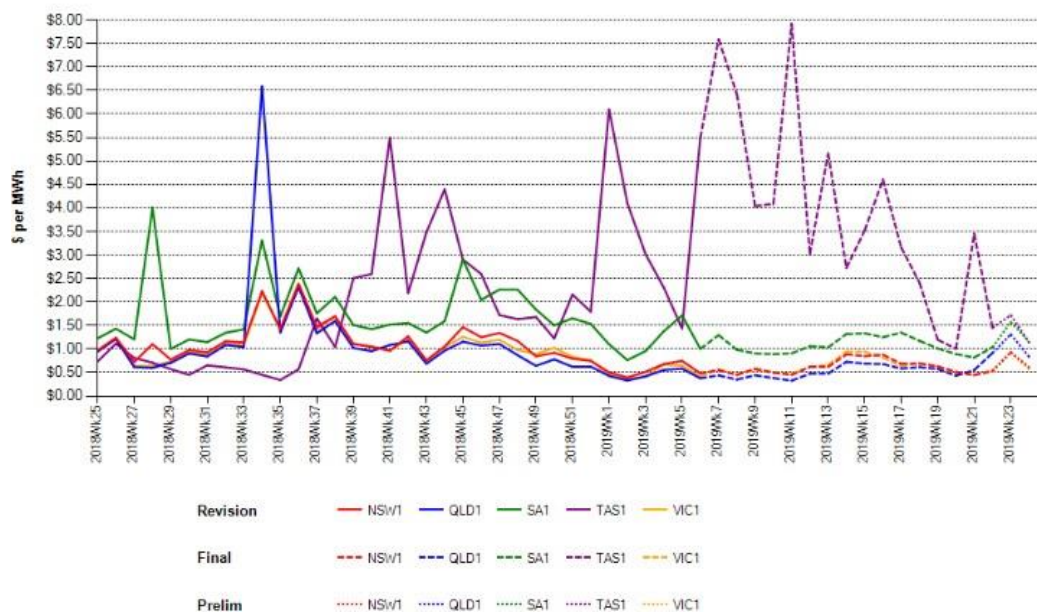


Figure 6 Generator Recovery Rates

Generator Recovery Rates from 17/06/2018 to 15/06/2019



## Version release history

Version	Effective Date	Summary of Changes
#1.0	04/03/2014	
#2.0	01/07/2015	<ul style="list-style-type: none"> <li>Updated 3.5, Appendix A.4 and Appendix B based on changes to the SRAS cost recovery calculations commencing on 1 July 2015 – recovering SRAS costs on the basis of the regional benefits (rule change reference ERC0168).</li> </ul>
#3.0	19/07/2019	<ul style="list-style-type: none"> <li>Updated to AEMO new document template</li> <li>Updated Disclaimer</li> <li>Updated links to reference documents</li> <li>Updated worked examples in Appendix A to reflect changes arising from five- minute settlement rule changes</li> <li>Amended texts, re-arranged order of some sections to improve clarity and flow of the information</li> </ul>
#4.0	14/02/2020	<ul style="list-style-type: none"> <li>Amended section 2.4.1 (Contingency FCAS recovery) and appendix A1 Contingency FCAS recovery calculations) for clarity</li> <li>Update links to reference documents</li> </ul>
#5.0	04/10/2023	<ul style="list-style-type: none"> <li>Update for new Very Fast Contingency FCAS services</li> <li>Update links to reference documents</li> <li>Update document template for new branding</li> </ul>