SETTLEMENTS GUIDE TO ANCILLARY SERVICES PAYMENT AND RECOVERY

February 2020

Important notice

VERSION CONTROL

Version	Release date	Changes
#1.0	04/03/2014	
#2.0	01/07/2015	• 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).
#3.0	19/07/2019	• Updated to AEMO new document template • Updated Disclaimer • Updated links to reference documents • Updated worked examples in Appendix A to reflect changes arising from five-minute settlement rule changes • Amended texts, re-arranged order of some sections to improve clarify and flow of the information
#4.0	14/02/2020	• Amended section 2.4.1 (Contingency FCAS recovery) and appendix A1 Contingency FCAS recovery calculations) for clarity • Update links to reference documents

Contents

Tables

Figures

1. Introduction

Five Minute Settlement Rule and future updates

From 1 July 2021, the time interval for financial settlement in the National Electricity Market (NEM) will change from 30 minutes to 5 minutes[1], aligning with existing NEM dispatch intervals. Five-minute settlement (5MS) will impact both *market* and *non-market ancillary service* payments and cost recovery.

The methodology for *market* and *non-market ancillary service* payments and cost recovery will not be affected by this change except as specifically discussed in this guide.

This guide is expected to be updated to include other useful information when it becomes available for 5MS, including relevant data tables and data reports.

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 eight 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*)

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[1] AEMC Five Minute Settlement Rule published at: https://www.aemc.gov.au/rule-changes/five-minute-settlement

Figure 1 Market ancillary services summary
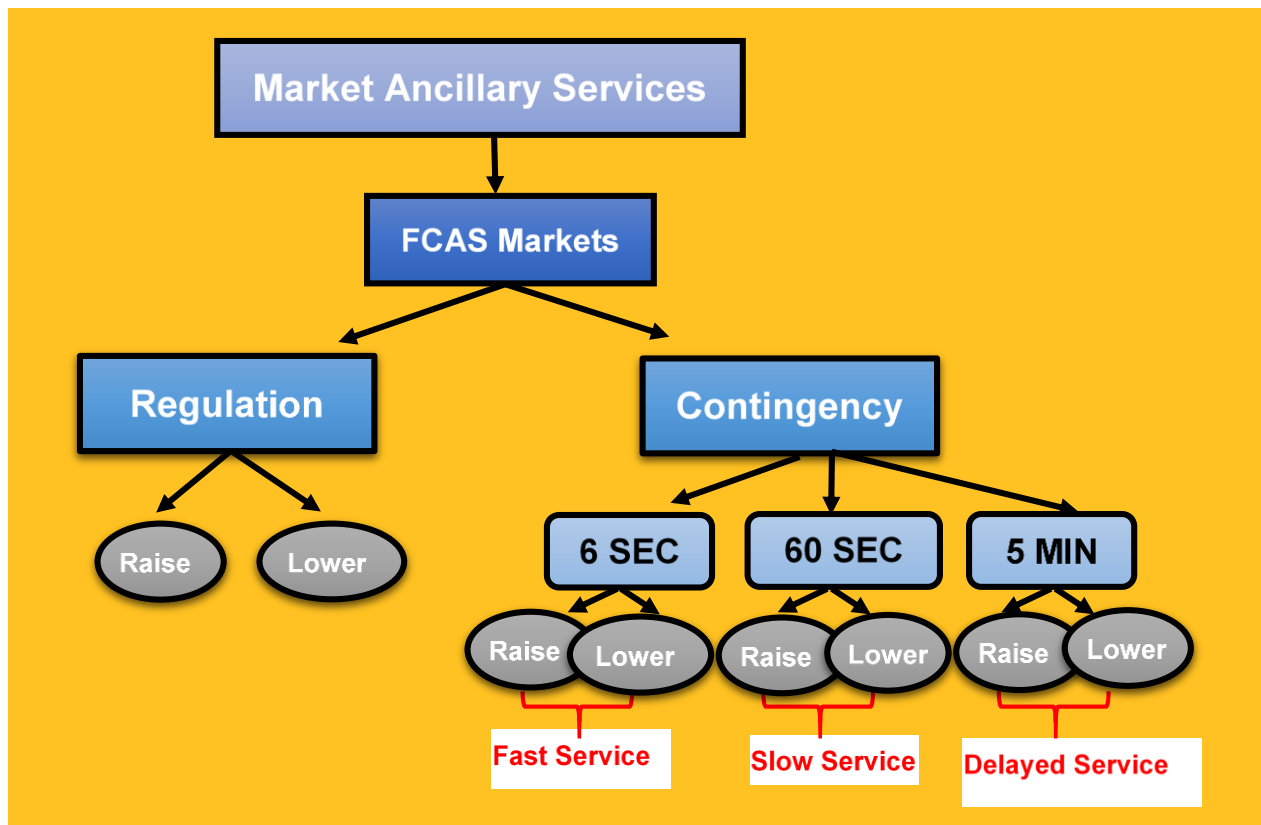
Figure 2 Non-market ancillary services summary
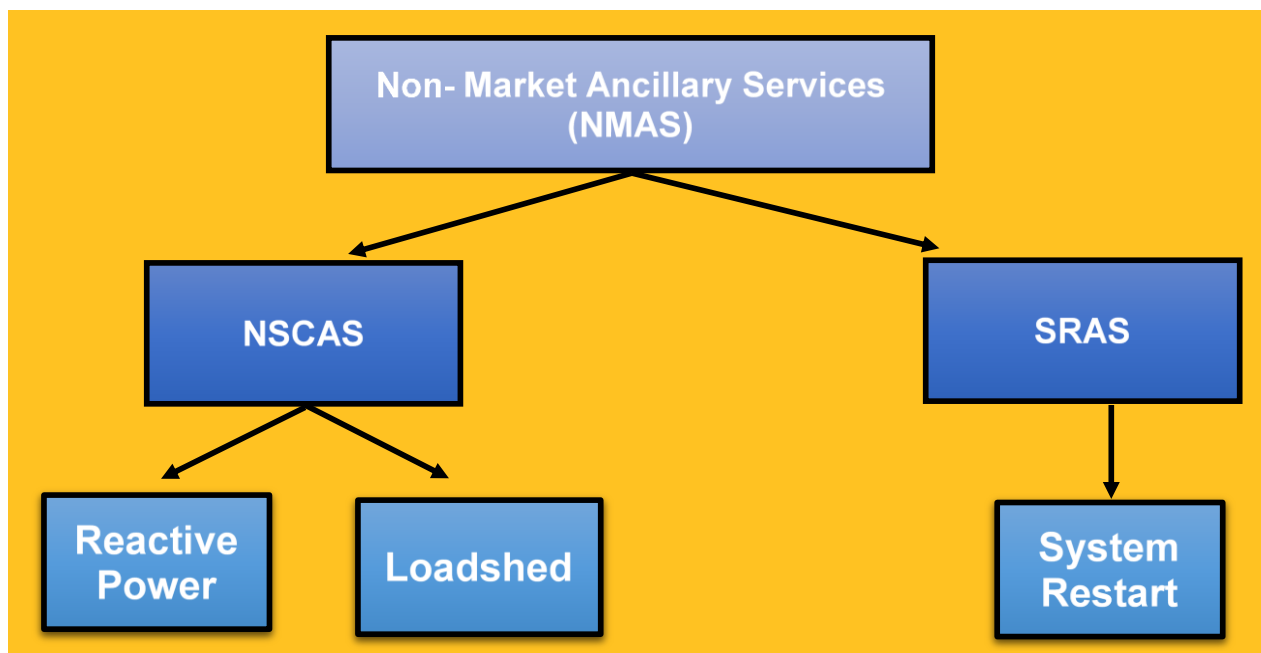
The following tables summarise the payment and recovery methods respectively for each of the *ancillary services*.

Table 1 Ancillary service payment summary

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

Table 2 Ancillary service recovery summary

Ancillary Service Type	Recovery Method	Recovered from	Reference
Contingency FCAS	Recovered in proportion to the consumed energy / generation energy of the relevant *Market Participants*	Raise services are recovered from *Market Generators* or *Market Small Generation Aggregators*. Lower services are recovered from *Market Customers*	Section 2.4.1
Regulation FCAS	Causer pays basis or socialised	*Market Participants* with individual MPFs or from *Market Customers* without individual MPFs	Section 2.4.2
NSCAS	Recovered in proportion to the energy consumption of the relevant *Market Participants* in the relevant benefiting regions	*Market Customers* only	Section 3.3
SRAS	Recovered in proportion to energy consumption / generation of the relevant *Market Participants* in the relevant benefiting *regions*	Recovered in equal proportions (50/50) from *Market Customers* and *Market Generators*	Section 0

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 six types of Contingency FCAS:

i) Fast Raise (6 second Raise)	)	Service provided within 6 seconds of a *contingency event*
ii) Fast Lower (6 second Lower)	)	
iii) Slow Raise (60 second Raise)	)	Service provided within 60 seconds of a *contingency event*
iv) Slow Lower (60 second Lower)	)	
v) Delayed Raise (five-minute Raise)	)	Service provided within 5 minutes of a *contingency event*
vi) Delayed Lower (five-minute Lower)	)	

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) Regulation Raise	Service provided to add MW to the system in order to raise the frequency closer to 50 Hz
ii) Regulation Lower	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 eight 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

2.4.1.1 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 Constraint Implementation Guidelines and the Constraint Formulation Guidelines documents available on AEMO's website.

2.4.1.2 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)
$$Lower\ Contingency\ Recovery$$
$$= Total\ adjusted\ cost\ of\ LC\ Requirements\ [X]$$
$$\times \frac{(Total\ customer\ energy\ by\ participant\ in\ the\ Requirement\ regions)}{(Total\ customer\ energy\ in\ the\ Requirement\ regions)}$$

where

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

2.4.1.3 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)
$$Raise\ Contingency\ Recovery$$
$$= Total\ adjusted\ cost\ of\ RC\ Requirements\ [X]$$
$$\times \frac{(Total\ generator\ energy\ by\ participant\ in\ the\ Requirement\ regions)}{(Total\ generator\ energy\ in\ the\ Requirement\ regions)}$$

Where:

RC Requirements [X]	=	The relevant binding *constraints* for Raise Contingency to be met in all Requirement *regions* for each DI in a TI (including Global Requirement and Local Requirement binding for those *regions*).
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 *region(s)* in respect of the relevant TI.
Total adjusted cost of RC requirements [X]	=	The total cost for all *regions* associated with meeting the RC Requirements, being the relevant *regions'* 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 *global market ancillary service requirement costs* and *local market ancillary service requirement costs*.
Total generator energy by participant in the Requirement *regions*	=	Total generator energy by the relevant MG or MSGA in the relevant TI in the relevant Requirement *regions*.
Total generator energy in the Requirement *regions*	=	Total generator energy by all MG and MSGA for the relevant TI in the relevant Requirement *regions*.

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.

2.4.2.1 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 Regulation FCAS Contribution Factor Procedure and the published MPFs on AEMO's website

2.4.2.2 Calculating Regulation FCAS recovery

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

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

(4)
$$CR_{MPF} = \frac{Total\ customer\ energy\ in\ the\ Requirement\ regions}{Total\ customer\ energy\ in\ the\ NEM}$$

Where:

Reg Requirement [X]	=	The binding *constraint* 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 *Market Participant*, for a given Regulation FCAS, for the cost of meeting Reg Requirement [X] in the relevant TI and for all the relevant Requirement *regions*
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 *Market Participant*
Total MPF	=	Sum of all the MPFs
Residual MPF	=	The normalised Residual NEM contribution factor (= 100 - Total MPF)
Residual MPF x CR$_{MPF}$	=	Constraint Residual Contribution Factor
Total customer energy in the Requirement *regions*	=	Total energy consumed by all *Market Customers* in the relevant TI across the relevant Requirement *region(s)* in which Reg Requirement [X] was a Requirement
Total customer energy in the NEM	=	Total energy consumed by all *Market Customers* 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:

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

Where:

FCAS Regulation Residual Recovery	=	The amount recovered from a *Market Customer*, 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 *Market Participants* with individual MPFs has been accounted for.
Total customer energy by *Market Customer* in the *Requirement regions*	=	Total energy consumed in the relevant TI by the relevant *Market Customer* for *loads* without appropriate metering across the *regions* 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.

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

For more information on co-optimisation of delayed contingency FCAS and regulation FCAS please see the Constraint Implementation Guidelines document on AEMO's 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:

i)   Availability payments for each Trading Interval that the service is available.

ii)   Enabling payments for Trading Intervals when the service is specifically enabled.

iii)   Compensation or usage payments made for the amount of the NSCAS actually provided.

iv)   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 Regional Benefit Ancillary Service Procedure on AEMO's website.

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

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

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)
$$Total \ NSCAS \ recovery \ per \ participant \\ = Total \ loadshed \ recovery \ per \ participant \ + Total \ reactive \ recovery \ per \ participant$$

Where:

RBF	=	Each *region* is assigned a regional benefit factor (RBF) for the relevant NSCAS type. The RBF for each Requirement *region* is used to apportion the relevant total NSCAS costs to each relevant Requirement *region*.
NSCAS recovery per participant by *region* ($)	=	Recovery amount payable by the relevant *Market Participant* for the relevant TI for NSCAS in respect of the relevant Requirement *region*
Total *NSCAS* payments for NEM ($)	=	Total payments made by AEMO for the relevant NSCAS for the relevant TI for all the relevant NEM *regions*
Total customer energy by customer in the Requirement *region* (MWh)	=	The total customer energy for the relevant *Market Customer* in the relevant Requirement *region*, for the relevant TI
Total customer energy in the Requirement *region* (MWh)	=	The total customer energy for all the relevant *Market Customers* in that Requirement *region* 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 3.5.

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:

i)   Availability payments, usually for every TI that the service is available.

ii)   Usage payments – made on each occasion when the service is successfully delivered in response to instructions from AEMO.

iii)   Testing payments – a payment for each successfully conducted test of the service.

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

$$
\begin{aligned}
(8) \quad &SRAS\ recovery\ per\ customer\ by\ region \\
&= Total\ SRAS\ payments\ for\ NEM \times \left(\frac{1}{2}\right) \times RBF \\
&\quad \times \left(\frac{Total\ customer\ energy\ by\ Market\ Customer\ in\ the\ Requirement\ region}{Total\ customer\ energy\ in\ the\ Requirement\ region}\right)
\end{aligned}
$$

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

$$
\begin{aligned}
(9) \quad &Total\ SRAS\ recovery\ per\ generator\ by\ region \\
&= Total\ SRAS\ payments\ for\ NEM \times \left(\frac{1}{2}\right) \times RBF \\
&\quad \times \left(\frac{Total\ generator\ energy\ by\ generator\ or\ MSGA\ in\ the\ Requirement\ region}{Total\ generator/SGA\ energy\ in\ the\ Requirement\ region}\right)
\end{aligned}
$$

Where:

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

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.

3.5   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.,

i)   NSCAS testing payment recovery is calculated as per the formula in Section 3.3

ii)   SRAS testing payment recovery is calculated as per the formula in Section 0

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
5MS	Five-minute settlement, to be implemented in the NEM from 1 July 2021 under the *National Electricity Amendment (Five minute settlement) Rule 2017*.
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator Limited
Contingency FCAS	FCAS provided when *power system frequency* is outside the *normal operating frequency band*, which can occur on the occurrence of a *contingency event*. Types of Contingency FCAS are Fast, Slow and Delayed.
Co-optimisation	The process of using Delayed Contingency FCAS and Regulation FCAS interchangeably to increase service efficiency.
Delayed Contingency (comprising Delayed Raise and Delayed Lower Service)	Contingency FCAS provided to either raise or lower *frequency* within five minutes after the locally-sensed *frequency* exits the *normal operating frequency band*.
Dispatch Interval (DI)	A five-minute period for which AEMO runs the *dispatch algorithm* (via NEMDE). On 5MS implementation, the definition of *dispatch interval* is deleted from the Rules and effectively replaced by a *trading interval*.
Fast Contingency (comprising Fast Raise and Fast Lower Service)	Contingency FCAS provided to either raise or lower *frequency* within six seconds after the locally-sensed *frequency* exits the *normal operating frequency band*.
FCAS	Frequency control *ancillary services*
Global Requirement	FCAS requirement for all *regions* in the NEM
Local Requirement	FCAS requirement for a single *region* or group of *regions* within the NEM.

TERM	DESCRIPTION
Lower Contingency	Fast Lower, Slow Lower and Delayed Lower Services
NEM	National Electricity Market
NEMDE	National Electricity Market Dispatch Engine
NER	National Electricity Rules
NSCAS	*Network support and control ancillary services*
Raise Contingency	Fast Raise, Slow Raise and Delayed Raise Services
Regulation FCAS (comprising Regulation Raise and Regulation Lower Service)	FCAS provided in response to a central control system to maintain *power system frequency*, usually within the *normal operating frequency band*.
Regulation FCAS Contribution Factor/ MPF	Contribution factors assigned to *Market Participants* as outlined in NER 3.15.6A. These factors are used to allocate Regulation FCAS costs to be recovered from *Market Participants* on a 'causer pays' basis.
Requirement	A requirement for a particular type of FCAS established by a binding *constraint* represented in NEMDE, which may be a Global Requirement or a Local Requirement.
Requirement regions	The *regions* for which a given FCAS requirement Constraint Equation is binding are known as the Requirement Regions for that constraint.
Rules	National Electricity Rules
Slow Contingency (comprising Slow Raise and Slow Lower Service	Contingency FCAS provided to either raise or lower *frequency* within sixty seconds after the locally-sensed *frequency* exits the *normal operating frequency band*.
SRAS	*System restart ancillary services*
Trading Interval (TI)	A period for which AEMO settles *trading amounts* in the NEM. Until 5MS implementation, a *trading interval* is defined in the Rules as a 30-minute period. On 5MS implementation, the definition of *trading interval* 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 TI1, 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 TI1	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)
TI1	NSW1	FC_1	A	100
TI1	NSW1	FC_1	B	200
TI1	NSW1	FC_1	C	20
TI1	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

Total Generator Energy (FC_1, NSW1)	=	Gen Energy (A, NSW1) + Gen Energy (B, NSW1) + Gen Energy (C, NSW1) + Gen Energy (C, VIC1)
	=	100 + 200 + 20 + 30
	=	350

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

Recovery (A, FC_1, NSW1)	=	$45.00	x	100	/	350
	=	$12.86				
Recovery (B, FC_1, NSW1)	=	$45.00	x	200	/	350
	=	$25.71				
Recovery (C, FC_1, NSW1)	=	$45.00	x	20	/	350
	=	$2.57				
Recovery (C, FC_1, VIC1)	=	$45.00	x	30	/	350
	=	$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 ($)
DI2	FC_Reg_1	NSW1	$150
DI2	FC_Reg_1	QLD1	$150
DI2	FC_Reg_1	VIC1	$150
DI2	FC_Reg_1	TAS1	$150
DI2	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
TI2	F	NSW1	120	TI2	O	QLD1	8
TI2	F	TAS1	115	TI2	P	NSW1	155
TI2	G	VIC1	234	TI2	P	QLD1	217

Trading Interval	Market Customer	Requirement Region	Market Customer Energy (MWh)	Trading Interval	Market Customer	Requirement Region	Market Customer Energy (MWh)
TI2	H	SA1	56			Total	6,286
TI2	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
TI2	Total Market Customer Energy in Requirement Region (MWh)	1,926	2,005	1,059	580	946	6,286

Step 2: Calculate CR$_{MPF}$

The information from Error! Reference source not found. can then be used to calculate the CR$_{MPF}$, as shown below:

$$CR_{MPF} = \frac{Total\ energy\ consumed\ in\ Requirement\ regions\ (NSW1,\ QLD1,\ VIC1,\ TAS1,\ SA1)}{Total\ energy\ consumed\ in\ NEM}$$

$$= (\ 1,926\ +\ 2,005\ +\ 1,059\ +\ 580\ +\ 716\ )\ /\ 6,286$$

$$=\ 6,286\ /\ 6,286$$

$$=\ 1$$

The CR$_{MPF}$ equals 1 for a *Global Requirement* affecting all *region*s 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$_{MPF}$ 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 (%)	CR_{MPF}	ADJ COST ($)	MPF Recovery ($)
TI2	A	5.6	1	150	$8.4
TI2	B	8.9	1	150	$13.35
TI2	D	1.5	1	150	$2.25
TI2	E	11.2	1	150	$16.80
TI2	G	6.4	1	150	$9.60
TI2	I	5.25	1	150	$7.88
TI2	J	7.35	1	150	$11.03
TI2	K	9.8	1	150	$14.70
TI2	L	9	1	150	$13.50
	Total MPF	65			
	Total Residual MPF	35			
	Total	100			$97.5
				Residual Adjusted Costs	$52.5

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

$$\text{Residual Adjusted Costs} = \$150.00 - \$97.50 = \$52.50$$

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	R_{MPF} Recovery
TI2	C	650	$17.04
TI2	F	235	$6.16
TI2	H	56	$1.47
TI2	M	637	$16.70
TI2	N	45	$1.18
TI2	O	8	$0.21
TI2	P	372	$9.75
	Total	2,003	$52.5

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

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	RBF allocated across all regions will sum to 1
Total *Market Customer* energy (MWh)	500	600	800	1,900	
RBF	0.1	0.75	0.15	1	
Loadshed Payment ($)				$54,500	

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

Loadshed recovery for *Market Customer* A (VIC1)	=	$54,500.00	x	0.1	x	200	/	500
	=	$2,180.00						
Loadshed recovery for *Market Customer* A (NSW1)	=	$54,500.00	x	0.75	x	150	/	600
	=	$10,219.00						
Loadshed recovery for *Market Customer* A (QLD1)	=	$54,500.00	x	0.15	x	350	/	800
	=	$3,577.00						

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

Total Loadshed recovery for *Market Customer* A	=	$2,180.00	+	$10,219.00	+	$3,577.00
	=	$15,976.00				

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

Total RPAS recovery for *Market Customer* A (VIC1)	=	$61,500.00	x	0.7	x	300	/	900
	=	$14,350.00						
Total RPAS recovery for *Market Customer* A (NSW1)	=	$61,500.00	x	0.1	x	425	/	1100
	=	$2,376.00						
Total RPAS recovery for *Market Customer* A (QLD1)	=	$61,500.00	x	0.2	x	250	/	700
	=	$4,393.00						

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

Total RPAS recovery for *Market Customer* A	=	$14,350.00	+	$2,376.00	+	$4,393.00
	=	$21,119.00				

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*.

Total NSCAS recovery for *Market Customer* A	=	Total Loadshed recovery		Total RPAS recovery
	=	$15,976.00	+	$21,119.00
	=	$37,095.00		

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 0.

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	
Market Customer A Energy (MWh)	100	200	300	600	RBF allocated across all regions will sum to 1
Total *Customer Energy* (MWh)	400	600	800	1,800	
RBF	0.7	0.1	0.2	1.0	
SRAS Payment ($)				$50,000	SRAS is recovered equally from customers and generators
Market Customer Recovery Proportion				(1/2)	

Total SRAS recovery for *Market Customer* A (VIC1)	=	$50,000.00		x	0.5	x	0.7	x	100	/	400
	=	$4,375.00									
Total SRAS recovery for *Market Customer* A (NSW1)	=	$50,000.00		x	0.5	x	0.1	x	200	/	600
	=	$833.00									
Total SRAS recovery for *Market Customer* A (QLD1)	=	$50,000.00		x	0.5	x	0.2	x	300	/	800
	=	$1,875.00									

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	
Market Generator B Energy (MWh)	200	500	400	1,100	RBF allocated across all regions will sum to 1
Total *Generator Energy* (MWh)	500	900	900	2,300	
RBF	0.7	0.1	0.2	1.0	
SRAS Payment ($)				$75,000	SRAS is recovered equally from customers and generators
Generator Recovery Proportion				(1/2)	

Total SRAS recovery for *Market Generator* B VIC1)	=	$75,000.00	x	0.5	x	0.7	x	200	/	500
	=	$10,500.00								
Total SRAS recovery for *Market Generator* B (NSW1)	=	$75,000.00	x	0.5	x	0.1	x	500	/	900
	=	$2,083.00								
Total SRAS recovery for *Market Generator* B (QLD1)	=	$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 [MMS Data Model Report](#) published on AEMO website.

Note: the list below may change from 1 July 2021 on 5ms implementation. Data table names and data table structure may change, and new tables may be added.

Table 14   Market Ancillary Service Payment by Service Type

Table Name	Description	Type
billingasrecovery	Shows participant charges for ancillary services for the billing period	Confidential
billing_nmas_tst_payments	Shows testing payment details for system restart services by period	Confidential
billing_nmas_tst_recovery	Shows testing recovery amounts for system restart services to be recovered from participants	Confidential
setcfg_participant_mpf	Shows the Market Participant Factors (MPF) for each connection point	Public
dispatch_fcas_req	Shows dispatch constraint tracking for regional Frequency Control Ancillary Services (FCAS) recovery	Public
setgendata	Shows settlement data (including generator energy) for each generating unit	Confidential
setcpdata	Shows settlement data for each customer connection point	Confidential
setrpowerrecovery	Shows recovery amounts for reactive power ancillary services to be recovered from participants	Confidential
setlshedrecovery	Shows recovery amounts for loadshed ancillary services to be recovered from participants	Confidential
setrestartrecovery	Shows recovery amounts for system restart ancillary services to be recovered from participants	Confidential
setlshedpayment	Shows specific payment details for loadshed services by period	Confidential
setrpowerpayment	Shows specific payment details for reactive power services by period	Confidential
setrestartpayment	Shows specific payment details for system restart services by period	Confidential
set_fcas_payment	Sets out enabling payment details for FCAS	Confidential
set_fcas_recovery	Shows recovery amounts for FCAS to be recovered from participants.	Confidential
set_nmas_recovery	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 format and the contents of these Settlement Ancillary Service Reports may change on 5MS implementation.

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

Table 16   Market Ancillary Service Payment by Transmission Node

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**


```
Market Ancillary Service Transactions - Recovery
---------------------------------------------------------------------------------------------
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
---------------------------------------------------------------------------------------------
Total Recovery(Payment to AEMO)        -$1,185.15              -$136.84          -$1,321.99
=============================================================================================
```

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
-----------------------------------------------------------------
Total Payment From AEMO                     $133,570.32
=================================================================
```

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.

```
Non Market Ancillary Service by Contract ID (Payments By AEMO)
-------------------------------------------------------------------------------------------------------
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
-------------------------------------------------------------------------------------------------------
Total Payments By AEMO                                                                             $133,570.32
=======================================================================================================
```

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.

```
Non Market Ancillary Service Transactions - Recovery
-----------------------------------------------------------------------------------------------
NMAS Type                   Customer Amount($)      Generator Amount($)      Total Amount($)
-----------------------------------------------------------------------------------------------
NSCAS                           -$353.42                  $0.00                 -$353.42
SRAS                            -$234.48               -$3,944.05              -$4,178.53
-----------------------------------------------------------------------------------------------
Total Recovery (Payment To AEMO) -$587.91              -$3,944.05              -$4,531.96
===============================================================================================
```

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

```
Non Market Ancillary Service Transactions by Region and Type - Recovery
-----------------------------------------------------------------------------------------------------
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
-----------------------------------------------------------------------------------------------------
Total Recovery (Payment To AEMO)              -$4,531.96          $0.00            $0.00        $0.00    -$4,531.96
=====================================================================================================
```

Appendix D Ancillary Service Reports on AEMO 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 website via this link (Ancillary services payments and recovery), and may change on 5MS implementation.

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
AS_RECOVERY_SUMMARY	This specifies the report type - Ancillary Services Recovery Summary Report
BILLING_WEEK	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
STATUS	This refers to the latest statement type for the billing week. The corresponding data is used in the recovery calculations
REGIONID	The *region* the ancillary services costs are recovered from
LOWER6SEC	Fast Contingency Lower FCAS Recovery ($)
LOWER60SEC	Slow Contingency Lower FCAS Recovery ($)
LOWER5MIN	Delayed Contingency Lower FCAS Recovery ($)
LOWERREG	Lower Regulation FCAS Recovery ($)
RAISE6SEC	Fast Contingency Raise FCAS Recovery ($)
RAISE60SEC	Slow Contingency Raise FCAS Recovery ($)
RAISE5MIN	Delayed Contingency Raise FCAS Recovery ($)
RAISEREG	Raise Regulation FCAS Recovery ($)
RESTART	Restart (SRAS) Recovery ($)
REACTIVE	Reactive (NSCAS) Recovery ($)
LOADSHED	Loadshed (NSCAS) Recovery ($)
TOTAL_CUSTOMER_RECOVERY	Total ancillary service costs recovered from market customers ($)
TOTAL_GENERATOR_RECOVERY	Total ancillary service costs recovered from market generators ($) where generators include SGA
ENERGY_CUSTOMER	Total customer energy (MWh)
ENERGY_GENERATOR	Total generator energy (MWh) where generators includes SGA
RECOVERY_RATE_CUSTOMER	The customer recovery rate is given in $/MWh and is the TOTAL_CUSTOMER_RECOVERY divided by ENERGY_CUSTOMER
RECOVERY_RATE_GENERATOR	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
BILLING_WEEK	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
STATUS	This refers to the latest statement type for the billing week. The corresponding data is used in the payment calculations
REGIONID	The *region* in which ancillary services payments are made
LOWER6SEC	Fast Contingency Lower FCAS Payment ($)
LOWER60SEC	Slow Contingency Lower FCAS Payment ($)
LOWER5MIN	Delayed Contingency Lower FCAS Payment ($)
LOWERREG	Lower Regulation FCAS Payment ($)
RAISE6SEC	Fast Contingency Raise FCAS Payment ($)
RAISE60SEC	Slow Contingency Raise FCAS Payment ($)
RAISE5MIN	Delayed Contingency Raise FCAS Payment ($)
RAISEREG	Raise Regulation FCAS Payment ($)
RESTART	Restart (SRAS) Payment ($)
REACTIVE	Reactive (NSCAS) Payment ($)
LOADSHED	Loadshed (NSCAS) Payment ($)
TOTAL_AS_PAYMENT	Sum of all ancillary service payments ($)

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*.
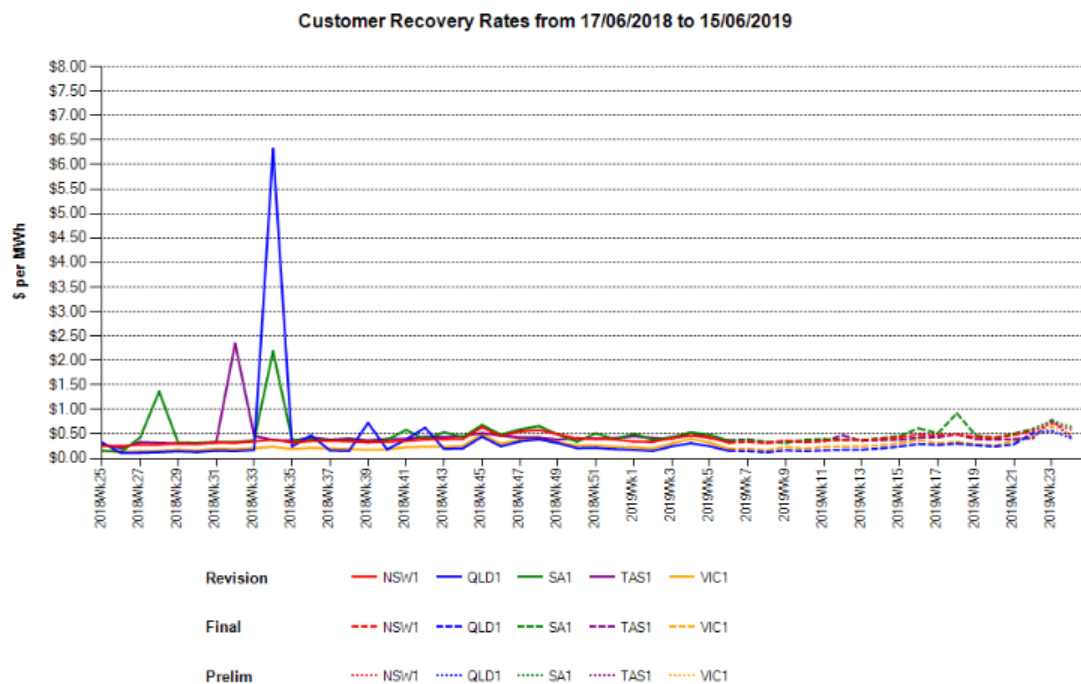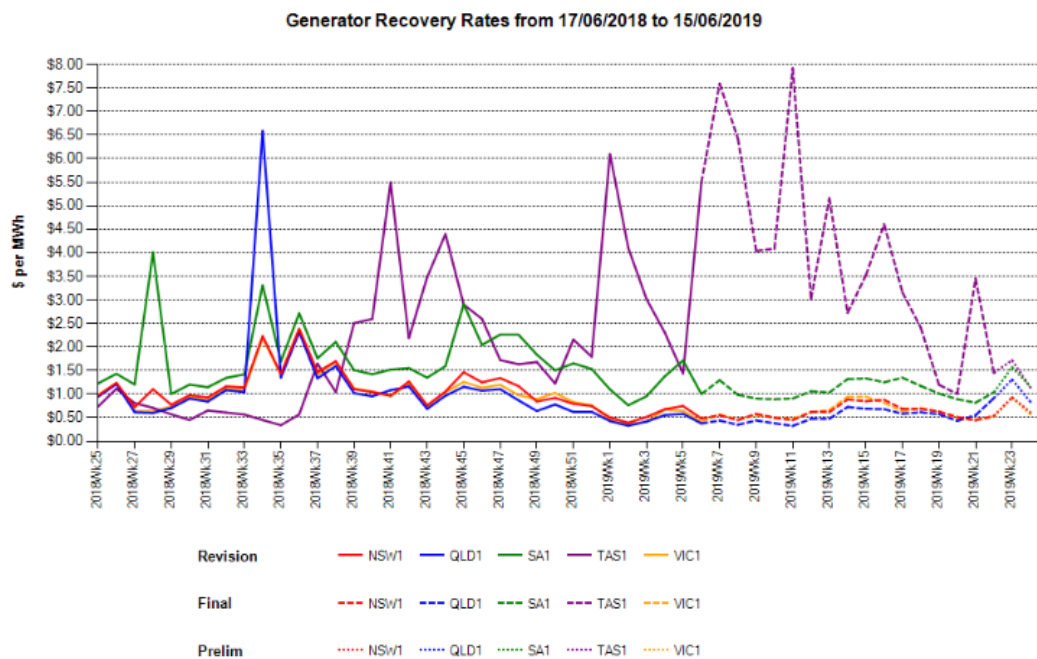
Figure 5 Customer Recovery Rates

Figure 6 Generator Recovery Rates

Appendix E   References

Below is a list of *Ancillary Service* documents referred to throughout this guide. These documents are available on AEMO's website:

Regulation FCAS Contribution Factor Procedure:

http://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Ancillary_Services/Regulation-FCAS-Contribution-Factors-Procedure.pdf

Constraint Formulation Guidelines:

https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Congestion-Information/2016/Constraint_Formulation_Guidelines_v10_1.pdf

Constraint Implementation Guidelines:

http://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Congestion-Information/2016/Constraint-Implementation-Guidelines.pdf

Guide to Ancillary services in the National Electricity Market:

https://www.aemo.com.au/-/media/Files/PDF/Guide-to-Ancillary-Services-in-the-National-Electricity-Market.ashx

NEM Settlement Calendar:

https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Settlements-and-payments/Prudentials-and-payments/Settlement-Calendars

Non-market Ancillary services:

https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3708---*Non-market*-Ancillary-Services.pdf

Regional Benefit Ancillary Service Procedures:

https://www.aemo.com.au/-/media/Files/PDF/Regional-Benefit-Ancillary-Services-Procedure--2015.pdf

Published MPF:

https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/system-operations/ancillary-services/ancillary-services-causer-pays-contribution-factors