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## 6 Ancillary services and other revenue sources

### 6.1 INTRODUCTION

This chapter describes revenue opportunities available outside the wholesale National Electricity Market (NEM) energy market. Specifically, it describes the opportunities available in the NEM ancillary services market, and existing and proposed government initiatives.

In the context of this chapter:

- ancillary services refer to services provided by registered participants to the Australian Energy Market Operator (AEMO) that allow AEMO to manage power system security; and
- government initiatives refer to State and Federal Government legislation intended to encourage investment in environmentally sustainable generation. These initiatives may provide additional revenue for investors in generation infrastructure.

#### Information sources

This chapter is based on information from the following sources:

- Information relating to ancillary services comes from the ancillary services section of the AEMO website <sup>[1]</sup>.
- Information relating to government initiatives comes from the Ministerial Council on Energy (MCE) <sup>[2]</sup> and State and Federal Government legislation.

#### 6.1.1 Overview

##### Key information

In this chapter:

- Section 6.2 'Ancillary services outlook' provides information about the opportunities available to registered participants to assist with AEMO's management of power system security.
- Section 6.3 'Government initiatives impacting generator revenue' provides information about State and Federal Government initiatives to encourage investment in environmentally sustainable generation.

#### 6.1.2 Changes since the 2008 ES00

Changes since the 2008 ES00 include:

- conclusion of the procurement process and activation of contracts for network control ancillary services (NCAS) and system restart ancillary services (SRAS) for the 2008-2011 period (see Section 6.2 for more information);
- the announcement of a Carbon Pollution Reduction Scheme (CPRS), previously referred to as an Emissions Trading Scheme (ETS), together with a published design (see Section 6.3 for more information); and
- the announcement by the Council of Australian Governments (COAG) regarding an agreed design for a national Renewable Energy Target (RET) scheme that expands on the Mandatory Renewable Energy Target (MRET) scheme (see Section 6.3 for more information).

### 6.2 ANCILLARY SERVICES OUTLOOK

Opportunities exist for registered NEM participants to provide AEMO with ancillary services for power system management through market and non-market arrangements (depending on the type of ancillary service required).

#### Market ancillary services

Market ancillary services, comprising frequency control ancillary services (FCAS), are offered and dispatched through markets separate from the energy market. These services maintain the power system within the frequency operating standards. There is a separate market for each of the eight FCAS categories (see Section 6.2.2 for more information).

#### Non-market ancillary services

Non-market ancillary services are procured by AEMO through a tender process. These services assist with the management of power flow, power system voltages, and power system restoration following a major supply disruption.

### 6.2.1 Providing ancillary services

Registered participants may (but are not compelled to) offer either or both:

- market ancillary services through AEMO’s registration and bidding process; or
- non-market ancillary services through AEMO’s tender process.

Registered participants may register their market ancillary service capabilities at any time, subject to being able to meet the relevant technical requirements. These technical requirements are set out in the Market Ancillary Service Specification <sup>[3]</sup>, which provides a detailed description of the:

- performance parameters;
- metering and data recording requirements; and
- service delivery requirements involved in the provision of each of the services.

Successful tenderers for non-market ancillary services enter into agreements with AEMO for their provision. The invitation to tender (ITT) provides details about the capabilities and facilities AEMO requires. Documents relating to the tender process are published on the AEMO website <sup>[4]</sup>.

### 6.2.2 Market ancillary services

Registered participants can make their plant available to help keep power system frequency within the applicable frequency operating standards by offering FCAS.

There are two types of FCAS <sup>[1]</sup>:

- Contingency services (six different categories) respond to large frequency disturbances following sudden changes in generation or demand. These services include the following:
  1. Fast raise service.
  2. Fast lower service.
  3. Slow raise service.
  4. Slow lower service.
  5. Delayed raise service.
  6. Delayed lower service.
- Regulation services (two different categories) are used for minute-to-minute frequency control, and are automatically and remotely controlled by AEMO. These services include the following:

1. Regulation raise service.
2. Regulation lower service.

AEMO determines FCAS requirements and then implements them as constraint equations <sup>[5]</sup> in the National Electricity Market Dispatch Engine (NEMDE). The market arrangements for the procurement of these services allow registered participants to offer FCAS capabilities to the market that entitle the service provider to an ancillary service payment if the service is enabled.

Table 6.1 lists the frequency control capabilities currently registered with AEMO.

**Table 6.1 Registered Frequency Control Ancillary Service Capabilities**

Frequency Control Ancillary Service (FCAS)	NEM Registered Amount (MW) <sup>1</sup>	Tasmanian Registered Amount (MW) <sup>2</sup>	
Contingency	Fast raise	4,481	348
	Fast lower	3,961	429
	Slow raise	8,190	2,196
	Slow lower	6,232	1,377
	Delayed raise	7,732	2,101
	Delayed lower	8,462	2,111
Regulation	Raise	4,831	2,171
	Lower	4,799	2,181

1. Excluding Tasmania.

2. Listed separately due to the region’s specialised FCAS requirements and the nature of the interconnection with Victoria.

### 6.2.3 Non-market ancillary services

There are two types of non-market ancillary services:

- Network control ancillary services (NCAS) is a collective term for two network control services that include:
  - reactive power ancillary services (RPAS), for assisting with the control of power system voltages; and
  - network loading control ancillary services (NLCAS), for controlling network transfers following contingency events.
- System restart ancillary services (SRAS) assist other generating units to start following a major supply disruption.

AEMO determines the requirements for each non-market ancillary service by applying the relevant procedure. These procedures include the:

- NCAS Quantity Procedure <sup>[6]</sup>, and
- SRAS Quantity Guidelines <sup>[7]</sup>.

New non-market ancillary service agreements (involving NCAS and SRAS) commenced on 1 July 2008 and will be in place until 30 June 2011, with an option for AEMO to extend for another 12 months.

#### 6.2.4 Network control ancillary services (NCAS)

Table 6.2 lists the results of the NCAS procurement process conducted during 2008. Table 6.3 lists the estimated annual procurement costs of these services.

These services are critical for securing the reliable operation of the power system by providing the capability to:

- meet power system security and reliability standards; and
- enhance the net value of spot market trading by increasing transmission network power transfer capability.

NCAS providers may receive any one or more of the following types of ancillary service payments:

- Availability.
- Enabling.
- Compensation.
- Testing.

The following regulatory instruments define the NCAS provision and procurement processes:

- NCAS Description <sup>[8]</sup>.
- NCAS Quantity Procedure <sup>[6]</sup>.
- Tender Guidelines for NCAS <sup>[9]</sup>.

#### Network Support and Control Services (NSCS) review

Under Clause 3.1.4(a1)(4) of the Rules, AEMO is required to conduct a review of NCAS. This review is referred to as the Network Support and Control Services (NSCS) review. According to Clause 3.1.4(a1)(4) of the Rules, this includes a <sup>[10]</sup>:

- review of the responsibilities of AEMO and transmission network service providers

(TNSPs) for the provision of reactive power support;

- review of the formulation of generic network constraint equations within central dispatch that depend on the provision of NCAS; and
- program to assess the potential implementation of market mechanisms for the recruitment and dispatch of NCAS.

The NSCS review, commenced by NEMMCO during 2008, has now issued a draft determination <sup>[11]</sup>.

#### Reactive power ancillary services (RPAS)

Table 6.2 lists the RPAS procured under the tender process.

Registered participants are actively encouraged to provide AEMO with RPAS, the indicative requirements for which are determined by AEMO according to the NCAS Quantity Procedure <sup>[6]</sup>.

RPAS is capable of supplying reactive power to, or absorbing reactive power from, the transmission network. This capability assists with controlling the power system within voltage and stability limits determined by AEMO, and is offered in addition to similar transmission or distribution system capabilities provided as a condition of connection.

The power system is operated so it can withstand credible contingency events, which include the loss of:

- transmission lines and transformers;
- transmission reactive power sources (capacitors, reactors, and Static VAR Compensators (SVCs));
- loads; and
- generating units.

Inadequate reactive power capabilities require a more conservative approach to power system operations to maintain voltages within secure limits. Depending on the location of the credible contingency event, generation might be constrained to avoid load shedding.

As a result, RPAS enhances the net value of spot market trading by enabling higher network power flows under normal operating conditions.

**Network loading control ancillary services (NLCAS)**

Table 6.2 lists the NLCAS procured under the tender process.

Registered participants are actively encouraged to provide AEMO with NLCAS so that, following a transmission network contingency event, flows on interconnected network elements are kept within their thermal ratings (including short-term ratings).

The AEMO central dispatch process corrects interconnector flows in the longer term (after several dispatch intervals), but under extreme operating conditions this might not be fast enough to keep network elements within short-term ratings.

The availability of the procured NLCAS allows greater use of inter-regional network capabilities when a circuit is limited by a thermal rating, and it is enabled when:

- Victoria and South Australia are in a Lack of Reserve 2 (LOR2) condition; and
- operation of the interconnector between Murray and Dederang is at risk of being limited by its short-term rating.

The Murray and Dederang (loss of circuit) NLCAS may also be enabled when, in AEMO’s reasonable opinion, the resulting increase in NCAS costs will not exceed the expected increase in benefits of trade from the spot market.

Without adequate network loading control capabilities, pre-contingent power flows would be limited (to prevent credible contingency events causing network loadings to exceed ratings) and a supply shortfall could arise, which may cause load shedding.

As a result, NLCAS enhances the net value of spot market trading by enabling higher network power flows under normal operating conditions.

**Table 6.2 Network Control Ancillary Service Tender (2008) - Indicative Requirements and Procured Amounts <sup>[8]</sup>**

Region	NCAS Type	Indicative NCAS Quantity 2008/09-2010/11	NCAS Procured for 2008/09-2010/11	NCAS Procured for 2007/08
Queensland	RPAS – reactive power absorption in synchronous condenser mode.	170 MVar	354 MVar	424 MVar
	RPAS – reactive power generation in synchronous condenser mode.	See table note 1.	385 MVar	582 MVar
New South Wales	RPAS – reactive power generation in generating mode.	450 MVar	552 MVar (Jul 2008-Sep 2010) 532 MVar (Sep 2010-Jul 2011)	405 MVar
	RPAS – reactive power absorption in synchronous condenser mode.	790 MVar	1,520 MVar	1,140 MVar
	RPAS – reactive power generation in synchronous condenser mode.	See table note 1.	1,580 MVar	1,155 MVar
Victoria	NLCAS	350 MW	350 MW	350 MW
Tasmania	RPAS – reactive power generation in synchronous condenser mode.	170 MVar	0 MVar <sup>2</sup>	264 MVar
	RPAS – reactive power absorption in synchronous condenser mode.	60 MVar	0 MVar <sup>2</sup>	30 MVar

1. NEMMCO published a list of constraint equations with the most binding instances during the 2007/08 financial year, as an indication of the requirements for reactive power generation in synchronous condenser mode. Services were procured to meet reactive power absorption requirements for system security purposes and to enhance power flow.

2. The requirements for RPAS in synchronous condenser mode in Tasmania were not met due to insufficient RPAS tender responses. AEMO will still be able to meet its power system security obligations, including the use of directions.

**Table 6.3 Estimated Annual And Actual Network Control Ancillary Service Procurement Costs (2008/09-2010/11) <sup>[8]</sup>**

Region	NCAS Type	Total Estimated Annualised Costs	Total Actual Costs 2007/08
Queensland	RPAS	\$2.6 M	\$4.4 M
New South Wales	RPAS	\$31.1 M	\$33 M
Victoria	NLCAS	\$3 M	\$2.5 M
Tasmania	RPAS	\$0 M	\$0.78 M
NEM	RPAS+NLCAS	\$36.7 M	\$39.9 M

### 6.2.5 System restart ancillary services (SRAS)

Registered participants are actively encouraged to provide AEMO with SRAS so that sufficient restart resources are available to restore the power system in the event of a major supply disruption (a total or partial system shutdown).

A generating unit providing SRAS is capable of:

- self-starting without using external power system energy supplies; and
- sending out sufficient amounts of electricity to enable other large generating units to restart.

SRAS services are categorised as either <sup>[12]</sup>:

- primary services, which must have a:
  - demonstrated ability to meet all technical requirements; and
  - combined availability and reliability of at least 90%; or
- secondary services, which must have a:
  - demonstrated ability to meet a specified subset of the technical requirements;
  - capability to meet the remaining technical requirements; and
  - combined availability and reliability of at least 60%.

On 3 November 2006, NEMMCO released an Interim System Restart Standard <sup>[13]</sup> that was approved by the Reliability Panel. This standard includes:

- a single outcome-based system-restoration requirement (40% of supply restored in 4 hours in an affected electrical sub-network), in the event of a major supply disruption, to apply across the NEM; and

- guidelines with respect to:
  - the reliability of each restart service class, being primary restart services (highly dependable) and secondary restart services (less dependable);
  - determining electrical sub-networks, which will form the basis for SRAS procurement; and
  - procuring diverse and strategically located primary and secondary restart services.

The following regulatory instruments define the SRAS provision and procurement processes:

- SRAS Description <sup>[12]</sup>.
- SRAS Quantity Guidelines <sup>[7]</sup>.
- Boundaries of Electrical Sub-Networks <sup>[14]</sup>.
- SRAS Assessment Guidelines <sup>[15]</sup>.

#### SRAS procurement

The SRAS Quantity Guidelines recommend that, where practicable, at least two services are to be allocated to each of 10 electrical sub-networks <sup>[7]</sup>.

SRAS providers receive the following different types of ancillary service payments:

- Availability.
- Testing.
- Usage.

The tender process to provide SRAS for the NEM was completed prior to the start of the 2008/09 financial year. The resulting SRAS contracts commenced on 1 July 2008 and will be in place until 30 June 2011 <sup>[16]</sup>.

Table 6.4 lists the SRAS quantities procured for each electrical sub-network for this period. Table 6.5 lists the estimated annual procurement costs of these services.

**Table 6.4 System Restart Ancillary Services Procured (2008-2011) <sup>[16]</sup>**

Electrical Sub-network	Number of Services Procured for 2008-2011
Queensland North	2
Queensland Central	2
Queensland South	2
New South Wales North	2 (3 expected from Q2 2010)
New South Wales South	2
Victoria North and West	1
Victoria Latrobe Valley	1
South Australia	2 (3 expected from Q3 2009)
Tasmania North	2 (3 expected from Q2 2010 )
Tasmania South	1

**Table 6.5 Estimated Annual System Restart Ancillary Service Procurement Costs (2008-2011) <sup>[16]</sup>**

Electrical Sub-network	Total Estimated Annualised Costs
Queensland North	\$1.2 M
Queensland Central	\$2.5 M
Queensland South	\$1.2 M
New South Wales North	\$8.1M (\$9.2M expected from Q2 2010)
New South Wales South	\$7.5 M
Victoria North and West	\$3.2 M
Victoria Latrobe Valley	\$1.6 M
South Australia	\$2.1M (\$3M expected from Q3 2009)
Tasmania North	\$3M (\$2.5M expected from Q3 2008)
Tasmania South	\$1.6M (\$2.6M expected from Q3 2008)
Total	\$32.4M (\$34.5M expected from 2010)

### 6.3 GOVERNMENT INITIATIVES IMPACTING GENERATOR REVENUE

Renewable generation infrastructure creates electricity from non-depletable fuel sources. Renewable energy projects include hydroelectric, solar, wind, bioenergy, wave, tidal, and geothermal generation. New technologies may also provide more cost-effective renewable energy options in the future.

The State and Federal Governments have developed policies and initiatives to encourage

investment in renewable or environmentally friendly forms of generation infrastructure.

Initiatives directly affecting the NEM include the:

- Federal Government's:
  - Carbon Pollution Reduction Scheme (CPRS) <sup>[17-19]</sup>; and
  - National Renewable Energy Target (RET) scheme <sup>[20;21]</sup>;
- Queensland State Government's Gas Electricity Certificates (GECs) scheme <sup>[22-26]</sup>;
- New South Wales State Government's:
  - Greenhouse Gas Reduction Scheme (GGAS) <sup>[27-29]</sup>; and
  - New South Wales Renewable Energy Target (NRET) scheme <sup>[30]</sup>;
- Victorian State Government's Victorian Renewable Energy Target (VRET) scheme <sup>[31]</sup>; and
- South Australian State Government's Climate Change and Greenhouse Emissions Reduction Act <sup>[32]</sup>.

A detailed listing of State and Federal Government initiatives can be found on the MCE website <sup>[2]</sup>.

AEMO does not administer any of the schemes listed in this section.

See Chapter 8, Section 8.3, for information about State and Federal Government greenhouse policy initiatives that influenced the development of the energy and maximum demand projections, due to their impact on the:

- economic outlooks; and
- projections of non-scheduled generation.

## 6.4 REFERENCES

- [1] NEMMCO, 8/01. "Guide to Ancillary Services in the National Electricity Market.", <http://www.aemo.com.au/electricityops/ancillaryservices.html>
- [2] Ministerial Council on Energy (MCE), 5/09. "National and State Renewable Energy Initiatives.", <http://www.ret.gov.au/Documents/mce/documents/NationalAndStateRenewableEnergyInitiatives20060222142535.pdf>
- [3] NEMMCO, 2/04. "Market Ancillary Service Specification.", <http://www.aemo.com.au/electricityops/ancillaryservices.html>
- [4] NEMMCO, 11/08. "NCAS tender process documents.", <http://www.aemo.com.au/electricityops/ncasprocure.html>
- [5] NEMMCO, 4/06. "FCAS Constraints Guides.", <http://www.aemo.com.au/electricityops/ancillaryservices.html>
- [6] NEMMCO, 7/09. "NCAS Quantity Procedure.", <http://www.aemo.com.au/electricityops/ncas.html>
- [7] NEMMCO, 7/07. "SRAS Quantity Guidelines.", <http://www.aemo.com.au/electricityops/sras.html>
- [8] NEMMCO, 7/09. "NCAS Description.", <http://www.aemo.com.au/electricityops/ncas.html>
- [9] NEMMCO, 7/09. "NCAS Tender Guidelines.", <http://www.aemo.com.au/electricityops/ncas.html>
- [10] NEMMCO, 1/09. "Review of Network Support & Control Services : Final Scoping Paper.", <http://www.aemo.com.au/electricityops/168-0089.html>
- [11] NEMMCO, 1/09. "Review of Network Support & Control Services - Draft Determination Report.", <http://www.aemo.com.au/electricityops/168-0089.html>
- [12] NEMMCO, 7/07. "SRAS Description.", <http://www.aemo.com.au/electricityops/sras.html>
- [13] NEMMCO, 11/06. "Interim System Restart Standard.", <http://www.aemo.com.au/electricityops/160-0279.html>
- [14] NEMMCO, 7/08. "Boundaries of Electrical Sub-Networks.", <http://www.aemo.com.au/electricityops/sras.html>
- [15] NEMMCO "SRAS Assessment Guidelines.", <http://www.aemo.com.au/electricityops/sras.html>
- [16] NEMMCO, 7/08. "System Restart Ancillary Service Tender Process 2008 : Notice to Market.", <http://www.aemo.com.au/electricityops/sras.html>
- [17] Australian Government Department of Climate Change, 12/08. "Carbon Pollution Reduction Scheme: Australia's Low Pollution Future White Paper." Whitepaper Summary Of Policy Decision, <http://www.climatechange.gov.au/whitepaper/report/index.html>
- [18] Australian Government Department of Climate Change, 5/09. "Strengthening Australia's 2020 Carbon Pollution Target, Fact Sheet.", [http://www.climatechange.gov.au/emissionstrading/pubs/carbon\\_pollution\\_target.pdf](http://www.climatechange.gov.au/emissionstrading/pubs/carbon_pollution_target.pdf)
- [19] Australian Government Department of Climate Change, 5/09. "Emissions-intensive trade-exposed assistance program (EITE).", <http://www.climatechange.gov.au/whitepaper/assistance/index.html>
- [20] Council of Australian Governments, 30/4/09, "Council of Australian Governments' Meeting.", [http://www.coag.gov.au/coag\\_meeting\\_outcomes/2009-04-30/index.cfm](http://www.coag.gov.au/coag_meeting_outcomes/2009-04-30/index.cfm)
- [21] Federal Government Department of Climate Change, 16/6/09, "Australia's Renewable Energy Target.", <http://www.climatechange.gov.au/renewabletarget/index.html>

- [22] Queensland Government Department of Mines and Energy, 4/09. "Gas Electricity Certificates (GECs).", [http://svc115.wic512d.server-web.com/Energy/gas\\_electricity\\_certificates.cfm](http://svc115.wic512d.server-web.com/Energy/gas_electricity_certificates.cfm)
- [23] Queensland Government, 6/07. "Climatesmart 2050.", [http://www.dme.qld.gov.au/Energy/energy\\_policy.cfm](http://www.dme.qld.gov.au/Energy/energy_policy.cfm)
- [24] Queensland Government Department of Mines and Energy, 2/6/08, "Smart Energy Policy.", [http://www.dme.qld.gov.au/Energy/energy\\_policy.cfm](http://www.dme.qld.gov.au/Energy/energy_policy.cfm)
- [25] The Queensland Government, 11/07. "Electricity Amendment Act 2004 - Chapter 5A.", <http://www.legislation.qld.gov.au/LEGISLTN/ACTS/2004/04AC050.pdf>
- [26] The Queensland Government, 7/07. "Electricity Amendment Regulation 2006 - Chapter 6.", <http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/E/ElectricR06.pdf>
- [27] The New South Wales Government, 9/07. "Greenhouse Gas Reduction Scheme.", [http://www.greenhousegas.nsw.gov.au/overview/scheme\\_documents.asp](http://www.greenhousegas.nsw.gov.au/overview/scheme_documents.asp)
- [28] The New South Wales Government, 7/07. "Electricity Supply Act 1995 No 94 - Part 8A.", <http://www.legislation.nsw.gov.au/scanview/inforce/s/1/?TITLE=%22Electricity%20Supply%20Act%201995%20No%2094%22&nohits=y>
- [29] The New South Wales Government, 8/07. "Electricity Supply (General) Regulation 2001 - Part 8A.", [http://www.legislation.nsw.gov.au/scanview/inforce/s/1/?SRTITLE=%22Electricity%20Supply%20\(General\)%20Regulation%202001%22&nohits=y](http://www.legislation.nsw.gov.au/scanview/inforce/s/1/?SRTITLE=%22Electricity%20Supply%20(General)%20Regulation%202001%22&nohits=y)
- [30] New South Wales Government, 11/06. "NSW Renewable Energy Target Explanatory Paper.", <http://www.deus.nsw.gov.au/Publications/NRET%20Explanatory%20Paper%20FINAL.pdf>
- [31] The Victorian Government, 8/07. "Victorian Renewable Energy Act 2006.", [http://www.legislation.vic.gov.au/Domino/Web\\_Notes/LDMS/PubLawToday.nsf/2184e627479f8392ca256da50082bf3e/7D199ABC80FD1252CA257331000B0A26/\\$FILE/06-72a003.pdf](http://www.legislation.vic.gov.au/Domino/Web_Notes/LDMS/PubLawToday.nsf/2184e627479f8392ca256da50082bf3e/7D199ABC80FD1252CA257331000B0A26/$FILE/06-72a003.pdf)
- [32] Government of South Australia Sustainability and Climate Change Division Department of the Premier and Cabinet, 3/7/07, "Climate Change and Greenhouse Emissions Reduction Act 2007.", <http://www.legislation.sa.gov.au/LZ/C/A/CLIMATE%20CHANGE%20AND%20GREENHOUSE%20EMISSIONS%20REDUCTION%20ACT%202007.aspx>