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VERSION 2

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

1. INTRODUCTION AND OVERVIEW

1.1 Introduction

The Relevant Level Methodology is used in the Wholesale Electricity Market (WEM) to determine the quantity of Certified Reserve Capacity for an Intermittent Generator. The methodology, which is specified in Appendix 9 of the WEM Rules (Market Rules), is based on the output of candidate Facilities in peak Trading Intervals selected from the five years prior to the certification period.

A key aspect of the methodology is the use of a new measure of demand — known as load for scheduled generation (LSG) — in determining the peak Trading Intervals to be selected.

This help guide discusses how LSG is calculated and used.

1.2 An overview of the Relevant Level Methodology and LSG

The formula for determining the Relevant Level of an Intermittent Generator for a Reserve Capacity Cycle[1] is:

Relevant Level = Facility Average Performance Level – Facility Adjustment Factor

where:

- Facility Average Performance Level is the average Facility output over 60 selected peak Trading Intervals; and
- Facility Adjustment Factor is an adjustment to reflect the variability of the Facility's output, calculated using the variance[2] of the Facility's output over the same 60 peak Trading Intervals.

LSG is the measure used to select the peak Trading Intervals. Peak LSG identifies the Trading Intervals where surplus capacity is lowest[3] and thus when the system is under greatest stress. LSG is calculated (in MWh) as:

- the Total Demand for energy; less
- the Total Intermittent Generator Output.

LSG is determined for a five year period, being the five years up to and including the most recent Hot Season (which ends on 31 March). Thus as shown in Table 1.1 below, for the 2012 Reserve Capacity Cycle, the relevant five year period included the Trading Days from 1 April 2007 to 31 March 2012 inclusive. Information from this period was used to calculate Relevant Levels for the 2014/15 Capacity Year.

1 From the 2012 Reserve Capacity Cycle onwards. For further details see wa.aemo.com.au/RC_2010_25.
2 The Facility Adjustment Factor is also subject to a cap based on the Facility Average Performance Level. See step 17 in Appendix 9 of the Market Rules for further details.
3 Note: Surplus capacity = Capacity (scheduled generation + intermittent generation) less demand,
= scheduled generation less LSG.

In each year of the five year period, LSG is used to determine the 12 peak Trading Intervals, through the following steps undertaken by AEMO.

- For each Trading Interval in a year, LSG is calculated according to the process described in this help guide.
- The Trading Intervals are sorted in order of highest LSG and the top 12 Trading Intervals are selected, with the requirement that these are selected from separate Trading Days.
- The output[4] of each candidate Facility during the 60 selected Trading Intervals over the relevant five year period is then used in determining its Relevant Level.

Table 1: Relevant five year period

Reserve Capacity Cycle	2012	2013	2014
Five year period over which LSG is determined (Trading Days)	1 April 2007 to 31 March 2012	1 April 2008 to 31 March 2013	1 April 2009 to 31 March 2014
Year when Capacity Credits are applied	2014-15	2015-16	2016-17

[4] This will be actual output from the operational date and estimated output prior to the full operational date. An adjustment is made to actual output for Consequential Outages and for Trading Intervals in which the Facility's output was restricted by System Management.

2. CALCULATION OF THE COMPONENTS OF LSG

This section discusses details of how the two key components of LSG — Total Demand and Total Intermittent Generation Output — are calculated.

2.1 Total demand

So as to capture all demand, the Total Demand used in the calculation of LSG is the sum of total sent out generation of all facilities (Operational Load) plus the load that has been curtailed. When there is no Curtailed Load, LSG measures (as the name implies) the load that will be met by Scheduled Generators.

The Curtailed Load is generally zero but may be significant at peak times. This is the sum of:

- ***DSP Reduction***, the total quantity by which all Demand Side Programmes reduced their consumption in response to a Dispatch Instruction;
- ***Interruptible Reduction***, the total quantity by which all Interruptible Loads reduced their consumption in accordance with the terms of an Ancillary Service Contract; and
- ***Involuntary Reduction***, the total quantity of energy not served due to involuntary load shedding (manual and automatic).

2.2 Total intermittent generator output

The Total Intermittent Generator Output is generally just the total metered sent out generation of Intermittent Generators; however there are some circumstances where this will not be the case.

First, adjustments are made to sent out generation for the impact of Consequential Outages and System Management instructions to reduce output. When Consequential Outages occur or a Facility's output is reduced in response to a Dispatch Instruction[5], an estimate of the output of the Facility is used so as to ensure that the true ability of the Facility to produce output during that particular Trading Interval is reflected in the Relevant Level calculation.

For Dispatch Instructions and instructions issued to Balancing Portfolio Facilities, the estimates are calculated by System Management. For Facilities affected by Dispatch Instructions, Market Participants may request System Management to provide a revised estimate for a Trading Interval. If the estimate or revised estimate is lower than the actual metered sent out generation for the Trading Interval, then the actual quantity will be used in the Relevant Level calculation for that Facility.

For Consequential Outages, the estimates are calculated by AEMO using a methodology provided by System Management.

Second, for each new Facility that has not been operational for all of the five year period, an estimate of the Facility's sent-out generation, as prepared by an expert consultant accredited by AEMO, is used for the period prior to the Facility being operational.

[5] Or, for an Intermittent Generator in the Balancing Portfolio, an equivalent instruction including a Dispatch Order.

The Relevant Level Methodology is designed so that the estimated data for new Facilities does not affect the LSG calculation for other Intermittent Generators. To achieve this, the methodology makes use of two LSG measures based on when a Facility becomes fully operational[6]:

- an Existing Facility LSG (EFLSG), used for all candidate Facilities that have been fully operational since the start of the period for which LSG is being calculated (known as Existing Candidate Facilities); and
- A New Facility LSG (NFLSG), which is calculated separately for each new or upgraded candidate Facility that does not have five years' worth of actual metered output under the configuration for which the Facility is being certified (known as New Candidate Facilities).

The NFLSG calculated for a Trading Interval is identical to the EFLSG from the time the New Candidate Facility is in full operation. Prior to the Full Operation Date the two measures differ simply in that EFLSG is based on actual output of all Intermittent Generators applying for certification, whereas NFLSG also uses the estimated output of the New Candidate Facility[7].

As EFLSG is only based on actual output data, it is does not need to be (and is not) recalculated once it is has been calculated for a particular year. For the 2012 Reserve Capacity Cycle, EFLSG was calculated for every Trading Interval in each of the five years to 31 March 2012; however for subsequent Reserve Capacity Cycles EFLSG is only calculated for the most recent year in the five year period. Thus in 2013, EFLSG was only calculated for the Trading Intervals in the period 1 April 2012 to 31 March 2013 as it had already been calculated for the four previous years. Examples of when EFLSG is calculated and used are provided in Table 2.1 below.

Table 2: When Existing Facility LSG is calculated and used

	Trading Intervals for which LSG is calculated						
	Apr-07 – Mar-08	Apr-08 – Mar-09	Apr-09 – Mar-10	Apr-10 – Mar-11	Apr-11 – Mar-12	Apr-12 – Mar-13	Apr-13 – Mar-14
When EFLSG is determined	2012	2012	2012	2012	2012	2013	2014
Capacity Years when EFLSG is used	2014/15	2014/15 to 2015/16	2014/15 to 2016/17	2014/15 to 2017/18	2014/15 to 2018/19	2015/16 to 2019/20	2016/17 to 2020/21

For each New Candidate Facility, an NFLSG will be calculated based on EFLSG and the actual and estimated data up until the Facility's Full Operation Date.

At times a Facility may be upgraded to expand capacity. As the Relevant Level Methodology uses historical metered output, the additional output of the upgraded Facility will, over time, result in an increase in the Relevant Level valuation. To enable a Facility to receive the benefit of an upgrade once operational, a Market Participant will apply for certification of the upgraded capacity through AEMO's normal certification processes.

[6] The Full Operation Date for a Facility (as defined in Appendix 9) is a date nominated by the Market Participant in the relevant application for certification of Reserve Capacity for the Facility.

[7] For a new candidate Facility:
NFLSG = EFLSG - actual output of the new Facility + estimated output of the new Facility From the Full Operation date, NFLSG will equal EFLSG because from this time actual output will equal estimated output

For the purposes of determining the Relevant Level to be assigned to an upgraded Facility, the Facility will be treated as a New Candidate Facility so that the estimated output of the upgrade does not impact on the valuations assigned to existing Facilities. This is achieved, in effect, by the relevant Market Participant advising the new date on which the Facility became fully operational under the configuration for which certification was sought (i.e. the upgraded configuration). Where a Full Operation Date is not provided, AEMO will assume that the facility is not yet operational and therefore treat the facility as a New Candidate Facility by default.

As EFLSG is based on actual metered output, it is not affected by the decision of a Facility to undertake an upgrade (and seek certification for the upgraded capacity). As always, the NFLSG will equal the EFLSG adjusted for the difference between estimated and actual output of the Facility.

As with other new Facilities, the estimated output of the upgraded Facility will be based on the assessment of an accredited expert. Although there is no explicit requirement for such, AEMO expects that the estimated output would consist of the actual output of the Facility's existing installation generation plus an estimate of the output of the upgraded generation.

3. EXAMPLE OF HOW LSG IS CALCULATED

This section provides an indicative example of how LSG is calculated. The focus of this example is on the difference in calculating LSG for Existing and New Candidate Facilities. In practice, there will be many more Existing Candidate Facilities than New Candidate Facilities.

Table 3.1 below shows information on five fictional Intermittent Generators (IG1 to IG5) which have different Full Operation Dates and dates when they were first certified. Based on this information, the additional columns show whether the Facility is an Existing Candidate Facility, a New Candidate Facility or neither.

IG1 is an Existing Candidate Facility from the 2012 Reserve Capacity Cycle onwards because it is fully operational in 2005, well before the start of the five year period relevant to 2012 Reserve Capacity Cycle (1 April 2007 to 31 March 2012). Although IG2 becomes fully operational in 2007 it is after the beginning of the relevant period and so for the 2012 Reserve Capacity Cycle it is classed a New Candidate Facility. From the 2013 Reserve Capacity Cycle onwards it becomes an Existing Candidate Facility[8].

IG3 is fully operational in 2005; however the Facility is subsequently upgraded and the upgraded Facility only becomes fully operational in late 2007. As a result IG3 is initially classed as a New Candidate Facility and becomes an Existing Candidate Facility from the 2013 Reserve Capacity Cycle.

Table 3: Examples of Existing Candidate Facilities and New Candidate Facilities

Facility	Date fully operational	Year first certified	Reserve Capacity Cycle (relevant five year period, April to March)					
			2012 (2007 – 2012)	2013 (2008 – 2013)	2014 (2009 – 2014)	2015 (2011 – 2015)	2016 (2012 – 2016)	2017 (2013 – 2017)
IG1	1 Oct 2005	2005	ECF	ECF	ECF	ECF	ECF	ECF
IG1	1 Jun 2007	2007	NCF	ECF	ECF	ECF	ECF	ECF
IG3 Upgrade	1 Jun 2005 1 Oct 2007	2005 2007	NCF	ECF	ECF	ECF	ECF	ECF
IG4	1 Jun 2011	2011	NCF	NCF	NCF	NCF	NCF	ECF
IG5	1 Nov 2013	2013	-	NCF	NCF	NCF	NCF	NCF

Legend: ECF = Existing Candidate Facility, NCF = New Candidate Facility

Similarly:

- IG4 is an Existing Candidate Facility from the 2017 Reserve Capacity Cycle; and
- IG5 is an Existing Candidate Facility from the 2019 Reserve Capacity Cycle.

The metered output of all Facilities that are candidate Facilities at the time of calculation are used in calculating EFLSG; this includes the metered output of a candidate Facility before it is fully operational[9].

[8] It is possible — but would appear unlikely — that a Facility is fully operational in a year prior to having applied for certification

[9] Note that a Facility may produce metered output in a year when EFLSG is calculated but is not a candidate Facility at the time; in such case, this metered output is not registered as Total Intermittent Generator Output for the purposes of calculating EFLSG.

In 2012, EFLSG was calculated for every Trading Interval in the period 1 April 2007 to 31 March 2012. In the above example, in 2012 IG1 to IG4 are all candidate Facilities, so any metered output from these facilities is used in calculating EFLSG for this period. Note that the metered output of a Facility that was previously a candidate Facility but does not apply for certification will not be included in the calculation of EFLSG.

For the 2013 Reserve Capacity Cycle, EFLSG was calculated for the Trading Intervals in the additional year ending 31 March 2013. For these Trading Intervals, EFLSG incorporates the metered output of the candidate Facilities IG1 to IG5.

In the above example, in 2012 NFLSG is calculated for each of the Facilities IG2 to IG4. For IG2, NFLSG is the same as EFLSG from 1 June 2007 (when it becomes operational). Between 1 April 2007 and 1 June 2007, NFLSG for IG2 is equal to EFLSG adjusted for estimated output of that Facility.

An example of the application is shown in Table 3.2 below for a few selected Trading Intervals in the year ending 31 March 2008, which span the Full Operational Date of the candidate Facilities. In all cases the EFLSG is simply the sum of the operational load less the total actual output of the certified Facilities. Note that because IG5 was not a certified Facility in this year its output is excluded.

Table 4: Example for three selected Trading Intervals[10]

Date and time	1 May 2007 (3:00 to 3:30pm)	1 July 2007 (3:00 to 3:30pm)	1 February 2008 (3:00 to 3:30pm)
Total demand in MWh	2,000	1,900	2,900
IG1 - Actual	19	25	80
IG2 - Actual - Estimated	10 12	12 n/a	25 n/a
IG3 - Actual - Estimated	6 8	8 12	12 n/a
IG4 - Actual - Estimated	0 10	0 15	3 18
Total Certified generation (sum of actual output)	**35**	**45**	**120**
LSG measures			
Existing Facility LSG	**1,965**	**1,855**	**2,780**
New Facility LSG for IG2	EFLSG + 10 – 12 = 1,963	EFLSG	EFLSG
New Facility LSG for IG3	EFLSG + 6 – 8 = 1,963	EFLSG + 8 – 12 = 1,851	EFLSG
New Facility LSG for IG4	EFLSG + 0 – 10 = 1,955	EFLSG + 0 – 15 = 1,840	EFLSG + 3 – 18 = 2,765

As IG2 to IG4 are New Candidate Facilities, a separate NFLSG is determined for each of the Facilities. Recall that although IG3 had been operational since 2005 it was upgraded and so the upgraded Facility is treated as a New Candidate Facility for calculating LSG.

[10] This does not represent actual data.