

Independent Market Operator

Draft Report: Maximum Reserve
Capacity Price Review for the 2009/10
Reserve Capacity Year

October 2006

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EXECUTIVE SUMMARY

Each year, the IMO is required to conduct a review of the Maximum Reserve Capacity Price. This Draft Report details the outcome of the review conducted in 2006 to determine the Maximum Reserve Capacity Price for the 2007 Reserve Capacity Cycle. The value used for the 2007 Reserve Capacity Cycle will be effective from 1 October 2009 through to 1 October 2010.

The 2007 Maximum Reserve Capacity Price has been proposed by the IMO to be **\$129,900** per MW per year. The review process has included updating the costs of purchasing a 160MW Open Cycle Gas Turbine (OCGT), and a technical costing review of the prices associated with connection of the power station to the 330 kV transmission system. The technical review also considered the operations and maintenance costs associated with the transmission connection and the OCGT power station.

The Maximum Reserve Capacity Price determined for the 2007 Reserve Capacity Cycle is approximately 6% higher than the similar value determined for the 2006 Reserve Capacity Cycle. The main cost increases have resulted from:

- An increase in the cost of purchasing the 160 MW OCGT (from prices published in the Gas Turbine World Handbook);
- Increases in the transmission connection and O&M costs.

These cost increases have been offset by the reduction in funding allocated to static var compensators.

This draft report is produced in accordance with clause 4.16.6 of the *Wholesale Electricity Market Amending Rules (September 2006)*.

The IMO seeks Submissions on the Draft Report. Information on the public submission process is included in this Draft Report and can also be found in the Reserve Capacity section of the IMO website (www.imowa.com.au)

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INTRODUCTION

Each year the IMO is required to conduct a review of the appropriateness of a number of the components that are used to determine the Maximum Reserve Capacity Price. This Draft Report is produced in accordance with clause 4.16.6 of the *Wholesale Electricity Market Amending Rules (September 2006)* (Market Rules). The IMO is required to assess the appropriateness of the following values, which are used to calculate the Maximum Reserve Capacity Price:

- a) The optimum size of an open cycle gas turbine (OCGT) for the SWIS;
- b) The capital cost of OCGT power stations;
- c) The level of electricity transmission connection costs;
- d) The cost of acquiring and installing fuel tanks sufficient to accommodate 24 hours of liquid fuel storage;
- e) The capital cost of a gas pipeline lateral to allow for dual fuel capability;
- f) The estimate of the fixed operating and maintenance costs for the power station and the transmission facilities listed above;
- g) A margin for legal, approval, financing costs and contingencies.

This Draft Report reviews the appropriateness of each of these values for the 2007 Reserve Capacity Cycle by considering the input parameters that are used in calculating the Maximum Reserve Capacity Price. The Maximum Reserve Capacity Price is calculated in accordance with Appendix 4 of the Market Rules.

The Draft Report is published on the IMO website (www.imowa.com.au) and a public consultation process is undertaken in the interests of including the considerations of stakeholders and other interested parties. Following the public consultation process, the IMO develops a Final Report on the Maximum Reserve Capacity Price which is submitted to the Economic Regulation Authority (ERA) for approval.

Reserve Capacity Cycle Timing

This Draft report is presented for the 2007 Reserve Capacity Cycle. The Maximum Reserve Capacity Price determined for the 2007 Reserve Capacity Cycle will be effective from 1 October 2009 through to 1 October 2010.

General Costing Methodology and Structure of this Draft Report

There are three main components to this review. The first is the determination of the capital cost of an OCGT power station. The second component is the determination of the cost associated with connection of that OCGT to the transmission system, and the third component is the estimation of O&M costs associated with the transmission connection and the OCGT plant.

The first component, that of determining the cost of developing an OCGT, is well specified in Appendix 4 of the Market Rules. The IMO makes comment about the appropriateness of this method as part of this Draft Report.

Transmission connection costs associated with connecting an OCGT to the transmission system have been estimated by Sinclair Knight Merz (SKM), who were retained by the IMO for this purpose. The IMO has published the SKM report in the Reserve Capacity section of the IMO website (www.imowa.com.au)

Operations and Maintenance costs associated with the OCGT and the Transmission assets were also analysed by SKM. This is a similar methodology that was adopted in a similar review conducted in 2005/2006.

Maximum Reserve Capacity Price Outcome for the 2007 Reserve Capacity Cycle

Following the review of the Maximum Reserve Capacity Price for the 2007 Reserve Capacity Cycle the IMO proposes the Maximum Reserve Capacity Price to be **\$129,900** per MW per year.

The main upward cost drivers have been increases associated with the OCGT and transmission costs. Downward pressures have primarily resulted from a change in the transmission costing model, which has seen the removal of static var compensators for reactive support.

This Draft Report first discusses the issue of cost escalation. This was raised previously in the public consultation process conducted in support of the determination of the Maximum Reserve Capacity Price for the 2008/09 Reserve Capacity Year. The following section lists the input parameters that are used in the Maximum Reserve Capacity Price calculation of Appendix 4 of the Market Rules. This section will allow the reader to verify the correct computation of the Maximum Reserve Capacity Price, in accordance with the Market Rules. A request for submissions on this Draft Report is then provided, giving details of the submission process. The report then concludes with a discussion of the outcome of the Maximum Reserve Capacity Price review process.

ESCALATION OF COSTS

One of the outcomes from the review conducted last year was the apparent increase in construction related costs that have been experienced over the past few years. Following the review and public consultation process conducted at the end of 2005, the IMO increased the costs allocated to transmission construction components within the Maximum Reserve Capacity Price calculation. Presented below are official CPI rates as provided by the Australian Bureau of Statistics.

CPI

The following CPI values are quoted by the Australian Bureau of Statistics for the period June 2005 and June 2006.

CPI June 2005 148.4

CPI June 2006 154.3

Where the CPI is the weighted average of eight capital cities.

These values result in an inflation rate of 3.98% over the period of June 2005 through June 2006 and are provided here as a reference for the Industry Escalation discussion below.

Industry Escalation

This year, the IMO requested that SKM provide an assessment of the cost escalation for the transmission capital and O&M costs between 2005 and 2006. SKM conducted an analysis of a number of publicly available indices, and compared the impact of these to increases in actual component and construction costs. SKM determined that the transmission costing outcomes between 2005 and 2006 should be indexed at 5.48%. SKM has also referenced this escalation parameter against their internal costing database for transmission capital and O&M costs.

A similar analysis was conducted for the generator O&M costs that were provided in the SKM report titled "2006 Review of 160MW OCGT Transmission Link Pricing and GT fixed O&M". This analysis showed an increase of 4.25% in costs between 2005 and 2006. A copy of the SKM report can be found on the IMO website (www.imowa.com.au).

The IMO proposes to use a cost escalation of 5.48% for transmission related components and 4.25% for generation related components when translating 2006 costs into costs to June 2007 for the purposes of the Maximum Reserve Capacity Price. Therefore, it is the IMO's view that the most appropriate methodology for estimating future cost escalation (between 2006 and 2007) is to use those values determined for the 2005 to 2006 period by SKM.

INPUT PARAMETERS TO THE MAXIMUM RESERVE CAPACITY PRICE CALCULATION

US CPI

In accordance with Appendix 4 of the Market Rules, CPI values have been sourced for the United States of America. CPI information was sourced from the following US Bureau of Labor Statistics website:

<ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt>

This information shows the following CPI information:

June 2004:	189.7
June 2005:	194.5
June 2006:	202.9

Appendix 4 of the Market Rules indicates that the US CPI must be forecast to June of the year in which the Reserve Capacity Auction would take place, in this case June 2007. The IMO is not in a position to provide detailed speculation on the future level of this value. The IMO therefore proposes to use a simple linear extrapolation of the CPI from June 2006 to June 2007 using the period June 2005 to June 2006. This results in the following equation:

$$\frac{USCPI[2006]^2}{USCPI[2005]}$$

The extrapolated CPI for June 2007 becomes:

June 2007:	211.663
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Therefore, the terms used in the Maximum Reserve Capacity Price calculation are:

USCPI[2006]:	202.9
USCPI[2007]:	211.7

Exchange Rate

The Market Rules indicate that the Australian/US exchange rate to be used “is the forecast Australian dollar to United States of America dollar, made in year t-x, for midway through year t, based on the Australian Federal Government’s budget forecasts.” The IMO believes that given the speculative nature of an exchange rate forecast, it is appropriate in this case to simply adopt the most recent exchange rate available.

The Australian/US exchange rate as quoted by the Reserve Bank of Australia (13 October 2006) for the month ending August 2006 was 0.7627. This information can

be found at <http://www.rba.gov.au/Statistics/Bulletin/F11hist.xls>. The IMO has based the exchange rate at June 2007 on the latest available monthly information, as at the end of August 2006. Therefore, for the purposes of the Maximum Reserve Capacity Price calculation,

ER[2007]: 0.7627

Capacity Parameter CAP

The optimum size of an OCGT is one that is expected to be the last procured machine required to fulfilling the Reserve Capacity Reliability Criterion. In this case, the IMO considers the appropriate capacity for an OCGT is approximately 160 MW and there is no basis for changing the size, denoted as CAP. A capacity of 160 MW does represent a reasonably cost-efficient size of power station, when the OCGT prices listed in the Gas Turbine World Handbook are assessed. Reducing CAP below 100 MW appears to result in substantial increases to the OCGT cost.

The IMO has initiated a high-level review of the Maximum Reserve Capacity Price methodology, but it is not viable to conduct this review in the timeframe required for the 2007 Reserve Capacity Cycle.

CAP: 160 MW

GAS Turbine Price

As at the time of this review, the most current version of Gas-Turbine World is the 2006 edition. The lowest quoted price of the three open cycle gas turbines with capacities closest to 160MW is US\$180,000/MW for a Siemens SGT5-2000E machine.

GTP[2006]: US\$360/MW.

Capital Cost of an OCGT

In accordance with Appendix 4 of the Market Rules, the capital cost of an open cycle gas turbine in Australian dollars is expressed as PC[t] and is calculated by the following formula.

$$PC[2007] = GTP[2006] \times (USCPI[2007]/USCPI[2006]) \times ER[2007]$$

It is still appropriate to include an allowance for low NOx burners which are commonly specified to meet environmental standards. A margin of 5% will be included in the Margin M for this purpose. Using the term NOx to represent the low nitrous-oxide emissions component, PC[t] is now represented by the following equation:

$$PC[2007] = GTP[2006] \times (USCPI[2007]/USCPI[2006]) \times ER[2007] \times (1 + NOx)$$

PC[2007] therefore becomes:

PC[2007]: A \$517,103 per MW

The IMO proposes to use the value above in the determination of the Maximum Reserve Capacity Price for the 2007 Reserve Capacity Cycle.

D – Real Interest Rate

The real interest rate has been calculated in accordance with Appendix 4 of the Market Rules by estimating the Commonwealth 10 Year Bond Rate (real) plus a Margin for Debt of 1.5%. The Real Commonwealth 10 Year Bond Rate for 30 June 2017 was found by interpolation between the Indicative Mid Rates of Commonwealth Government Securities with maturity dates of 20 August 2015 and 20 August 2020 respectively. This information was current as at 9 October 2006. The data used in this calculation are included at Appendix A for reference.

The Real Commonwealth 10 Year Bond Rate is calculated as 2.41%. The parameter D is:

D 0.0391

Fixed Fuel Costs

The Fixed Fuel Costs (ie. the costs associated with the installation of fuel capacity) calculated in 2005/06 will be escalated for the 2006/07 determination of Maximum Reserve Capacity Price. An escalation rate of 5.48% will be used to reflect the escalation of costs within the electricity and construction industries. The FFC[2006] was A\$3.075M. FFC[2007] therefore becomes

FFC[2007] A\$3.243500 M

Transmission Connection Costs

SKM were retained to provide estimates of connecting a 160MW OCGT to the 330KV transmission system. In 2006, the total transmission connection cost was estimated at A\$14.410M and later revised to A\$17.516M following the public consultation and review process. It is noted that this price included a significant component for the funding of Static Var Compensators (SVCs). This methodology has been changed for the 2007 Maximum Reserve Capacity Price Review and is discussed in detail.

For this price review, a range of different options were costed as part of the SKM work package. The SKM report can be found in the Reserve Capacity section of the IMO website (www.imowa.com.au). The IMO has elected to use a more complex case than last year, which is now characterised by:

Line Length:	2km
Terrain:	50% Flat/50% Undulating
Urban/Rural:	50% Urban/50% Rural
No Road Crossings per km:	1

Transmission connection costs for the Turn-in and Turn-out configuration are shown in Table 1.

Table 1 Transmission Connection Costs

ITEM	Cost Estimate (2006)	Cost Estimate (2007)
Site Establishment	\$ 1,128,545	\$ 1,190,389
Line Tee-in	\$ 242,247	\$ 255,522
Switchyard	\$ 2,992,259	\$ 3,156,235
Tie Line	\$ 664,753	\$ 701,181
Subtotal	\$ 5,027,804	\$ 5,303,327
EPCM@15%	\$ 754,171	\$ 795,499
Total	\$ 5,781,975	\$ 6,098,826

The 2006 costs provided by SKM are further escalated by 5.48% to represent costs in 2007 figures. The 2005/06 review also included a component for deep connection costs and network reinforcement costs associated with new generation development. A value of A\$10.25M was used in the 2005/06 Maximum Reserve Capacity Price review. The IMO is now of the understanding that deep connection costs are likely to be borne managed through either:

- capital contributions by the generation proponents; or
- as a shared asset augmentations connection cost, distributed through the asset base of and recovered by the Network Operator from all network users via tariffs; or
- a combination of these methods.

The 2005/06 Maximum Reserve Capacity Price estimation also included the cost of an SVC. However, the IMO does not consider this to be an essential requirement as part of the Maximum Reserve Capacity Price. The reason for this is that an SVC is typically needed in conjunction with a generator remote from the load centre and is therefore a major component of the location-specific connection costs to be considered by the developer. There are other locations in the network where connections will not require an SVC

The TC therefore becomes:

$$TC[2007] = A\$ 6,098,826$$

TC[2007] = A\$ 6.098800 M (rounded)

The review conducted by SKM appears to have appropriately captured the costs associated with connection of a 160MW OCGT to the 330 kV transmission system. SKM have used their comprehensive cost database to analyse transmission connection costs and have evaluated price escalation factors in a robust manner.

Margin M

The margin M is included to cover legal, approval and financing costs and contingencies. This term was set in 2005 and 2006 at 15%. The IMO believes this is appropriate in 2007. Margin M therefore is:

$$M = 0.15$$

Capital Cost

The term CAPCOST[t] refers to the total capital cost, expressed in million Australian Dollars in year t, assumed for a 160 MW OCGT. This is calculated using the following formula:

$$CAPCOST[t] = PC[t] \times (1 + M) \times (1 + 1.5 \times D + 0.5 \times D^2) + TC[t] + FFC[t]$$

CAPCOST[2007] = A \$110,142,307

Fixed Operation and Maintenance Costs

Fixed Transmission O&M Costs

These costs have been estimated by SKM. Details of the costing methodology used by SKM can be found in the SKM report. Transmission O&M costs make up part of the total fixed O&M costs referenced by the term FIXED_O&M[t] in Maximum Reserve Capacity Price calculation of Appendix 4 of the Market Rules.

Transmission O&M Costs: A\$249 per MW per year.

This is determined by taking the average of the first 15 years of Transmission costs determined by SKM and presented in Table 8 of the report "2006 Review of 160MW OCGT Transmission Link Pricing and GT fixed O&M". The 2006 costs provided in the SKM report have been escalated to 2007 figures using an escalation of 5.48%.

Fixed OCGT O&M Costs

Fixed O&M costs for a 160 MW OCGT have been estimated by SKM. The first 15 years of costs are included to represent the funding basis considered in Appendix 4 of the Market Rules. The SKM report details the total fixed O&M costs of the OCGT to year 15 as A \$21,535,995 in 2006 terms. This is then escalated at 4.25% to 2007 values equates to A \$9,355 per MW per year.

Generation O&M Costs: A \$9,355 per MW per year.

Insurance Costs as an O&M Cost

The IMO believes it appropriate to fund insurance to a level required to cover replacement costs of the capital equipment. The IMO believes it is not appropriate to fund insurance at a level which provides any cover for lost income or the contractual and risk position of the proponent. Therefore, an allowance of 0.5% of the capital replacement cost has been included in the Fixed O&M costs. Table 2 shows the insurance costs included as fixed O&M costs within the Maximum Reserve Capacity Price.

Table 2 Insurance Costs

<i>ITEM</i>	<i>Value</i>
Transmission Capital Costs [2007]	
Tie Line	\$ 701181
Switchyard	\$ 3,156,235
Generation Capital Costs [2007]	
Generator	\$41,368,222
Total [2007]	\$45,225,638
Insurance Premium	0.005
Total Insurance Costs	\$1,413 per MW per year

Total Fixed O&M Costs

The total Fixed O&M Costs are presented in Table 3 below.

Table 3 Fixed Operation and Maintenance Costs

<i>ITEM</i>	<i>Cost Estimate (per MW per year)</i>
Transmission Fixed O&M [2007]	\$ 249
OCGT Fixed O&M [2007]	\$9,355
Insurance as Fixed O&M [2007]	\$1,413
Total	\$ \$11,017 per MW per year

FIXED_O&M: \$11,017 per MW per year

Annualised Capital Cost

The Weighted Average Cost of Capital (WACC) is calculated using the real Commonwealth 10 year bond rate of 2.41%, a margin for debt of 0.015 and a margin for equity of 0.151.

The resulting WACC is 0.0935.

The annualised capital cost, using a capital cost of \$110,142,307 , a WACC of 0.0935 and a term of 15 years becomes:

ANNUALISED_CAPCOST[2007]: A\$13,947,700 per year

Summer De-rating Factor

A summer de-rating factor of 1.18 is outlined in the Market Rules.

SDF: 1.18

Factor K

Factor K is set so that the net present value of 10 years worth of payments escalated on a CPI-1% basis is equivalent to the payment stream from 10 years worth of unescalated payments. The forecast GDP increases from the 2006 Statement of Opportunities Report have been used as a proxy to CPI. A WACC of 9.35% represents the rate of return.

Table 4 Inflation Rates used to Determine Factor K

Year	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
Inflation Rate (CPI)	2.8	4.0	4.5	3.7	3.7	4.2	4.0	4.0*	4.0*	4.0*

Note: Some inflation values estimates are beyond the forecast horizon of the SOO. These are denoted by *

To increase fidelity of the computation, this year NPV calculations have been conducted on a monthly basis. This also replicates the monthly Reserve Capacity payment regime. The factor K has been computed as:

K: 1.1409

Maximum Reserve Capacity Price

The Maximum Reserve Capacity Price is calculated using the following equation from Appendix 4 of the Market Rules.

$$PRICECAP[2007] = K \times \left(\begin{array}{l} FIXED_O \& M[2007] + \\ ANNUALISED_CAPCOST[2007] / CAP / SDF \end{array} \right)$$

Using the values determined by the IMO and presented in the above sections, PRICECAP for the 2007 Reserve Capacity Cycle is determined to be \$129,927.16, which is rounded to:

PRICECAP[2007]: \$129,900 per MW per year

A Maximum Reserve Capacity Price of \$129,900 per MW per year is proposed by the IMO. This represents an increase of 6.04% of the price determined for the 2006 Reserve Capacity Cycle.

REQUEST FOR SUBMISSIONS

The IMO invites submissions from all sectors of the Western Australian energy industry, including end users, on the proposed Maximum Reserve Capacity Price for the 2009/10 Reserve Capacity year. Following receipt of public submissions, the IMO will reassess the Maximum Reserve Capacity Price prior to submission to the ERA for approval.

Submissions must be made in writing and be no longer than five pages in length (12 point font). The IMO strongly encourages those making submissions to provide evidence supporting any claims regarding the appropriateness of the values used by the IMO to determine the Maximum Reserve Capacity Price for the 2007 Reserve Capacity Cycle. In keeping with the principle of open and transparent processes, the IMO will only accept submissions that may be made public and will subsequently publish all submissions on the IMO website.

Submissions should be addressed to:

Patrick Peake
Manager, System Capacity
Independent Market Operator

By post:
PO Box 7096, Cloisters Square
Perth, WA, 6850

By email:
imo@imowa.com.au
By facsimile:
+61 8 9254 4399

The deadline for submissions is:

4.00PM Western Standard Time on Friday, 3 November 2006.

General enquiries may be directed to Troy Forward on (08) 9254 4304 or Patrick Peake on (08) 9254 4301.

CONCLUSION

The IMO has conducted a review of the main factors used to the determination of the Maximum Reserve Capacity Price. For the 2007 Reserve Capacity Cycle, the IMO proposes that the Maximum Reserve Capacity Price be set at \$129,900 per MW per year.

The Maximum Reserve Capacity Price of **\$129,900** per MW per year represents an increase of 6.04% above the 2006 price. The main cost increases have been in the purchase price of a 160 MW OCGT, as listed in the Gas Turbine World Handbook, and increases in the prices associated with transmission components, which are estimated to be in the order of approximately 5.5%. Counteracting these cost increases has been the removal of static var compensators from the transmission costing model. This is a discretionary item resulting from choice of location when selecting a power station site and is therefore not a necessary component within the funding model.

The review conducted to support the analysis of the factors contributing to the Maximum Reserve Capacity Price included the selection of a more detailed transmission connection option and a detailed review of escalation parameters that have influenced transmission prices between 2005 and 2006.

As part of the review, the IMO calls for submissions from the Western Australian energy industry, including end users, on the proposed Maximum Reserve Capacity Price for the 2009/10 Reserve Capacity year.

APPENDIX A COMMONWEALTH BOND RATES

Item	Issue Date	T1405	T1406
		Maturity Date 20-Aug-15	Maturity Date 20-Aug-20
1	12-Sep-2006	2.505	2.335
2	13-Sep-2006	2.500	2.320
3	14-Sep-2006	2.505	2.325
4	15-Sep-2006	2.555	2.370
5	18-Sep-2006	2.575	2.390
6	19-Sep-2006	2.570	2.385
7	20-Sep-2006	2.485	2.300
8	21-Sep-2006	2.495	2.305
9	22-Sep-2006	2.435	2.245
10	25-Sep-2006	2.400	2.205
11	26-Sep-2006	2.405	2.205
12	27-Sep-2006	2.450	2.240
13	28-Sep-2006	2.450	2.240
14	29-Sep-2006	2.450	2.245
15	2-Oct-2006	2.470	2.255
16	3-Oct-2006	2.435	2.230
17	4-Oct-2006	2.460	2.255
18	5-Oct-2006	2.495	2.280
19	6-Oct-2006	2.500	2.290
20	9-Oct-2006	2.580	2.365
20-day Moving Average		2.48600	2.28925
Rate Delta		-0.197	
Date Delta (DAYS)		1,827.000	
Start Date		20-Aug-15	
Target Date		30-Jun-17	
End date		20-Aug-20	
Interpolated Rate		2.41277	

Source Data

http://www.rba.gov.au/Statistics/HistoricalIndicativeMidRates/2005_to_2006.xls