INDEPENDENT MARKET OPERATOR

Final report: Maximum Reserve Capacity Price for the 2017-18 Capacity Year

January 2015

Disclaimer

The Independent Market Operator (IMO) has prepared this report under clause 4.16 of the Wholesale Electricity Market Rules (Market Rules) to describe the process it followed in arriving at a proposed revised value for the Maximum Reserve Capacity Price.

Although all due care has been taken in preparing this report, the IMO makes no guarantee that it is completely accurate and accepts no liability for any errors.

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Executive summary

Each year, the Independent Market Operator (IMO) is required to determine the Maximum Reserve Capacity Price (MRCP) in accordance with the Market Procedure: Maximum Reserve Capacity Price (Market Procedure)[1].

The MRCP sets the maximum price that may be offered in a Reserve Capacity Auction and is also used to set an administered Reserve Capacity Price if no auction is required.

The MRCP aims to establish the marginal cost of providing additional Reserve Capacity in each Capacity Year. The MRCP is calculated by undertaking a technical, bottom-up cost evaluation of the entry of a 160 MW open cycle gas turbine (OCGT) generation facility in the Wholesale Electricity Market (WEM) in the relevant Capacity Year.

This report presents the outcome of the determination of the MRCP for the 2015 Reserve Capacity Cycle. The value of the MRCP used in the 2015 Reserve Capacity Cycle will be effective from 1 October 2017 to 1 October 2018 (the 2017-18 Capacity Year).

The methodology for calculating the MRCP is specified in the Market Procedure and includes a technical costing of the following components:

- the capital cost of the 160 MW OCGT power station with inlet cooling, located in the South West interconnected system (SWIS);
- the land cost associated with developing and constructing the power station;
- the costs associated with connecting the power station to the transmission system;
- the cost associated with building liquid fuel storage and handling facilities sufficient for the power station to operate for 14 hours;
- the fixed operating and maintenance (O&M) costs associated with the power station and transmission facilities;
- a margin for legal, approval, financing and insurance costs and contingencies; and
- the weighted average cost of capital (WACC).

The broad methodology employed this year for determining the MRCP is the same as that used for the past three years.

MRCP outcome

The 2015 MRCP proposed by the IMO in this final report is $164,800 per MW per year, approximately 6.8 per cent lower than the 2014 MRCP of $176,800, and 1.7 per cent lower than the value proposed in the draft report.

[1] The Market Procedure is available at: http://www.imowa.com.au/home/electricity/procedures.

Changes since the 2014 MRCP

Table ES.1 shows the change between the 2014 and 2015 MRCP values, broken down by input parameter. This shows that most of the variance has been caused by a decrease in the WACC.

Table ES.1: Breakdown of variance between 2014 and 2015 MRCP

	Variance ($)	Variance (%)	MRCP ($)
2014 MRCP			**176,800**
Escalation factors	-4,400	-2.5	172,400
Power station cost	2,700	1.6	175,100
Margin M	-200	-0.1	174,900
Fixed fuel cost	100	0.1	175,000
Land cost	0	0	175,000
Transmission cost	2,200	1.3	177,200
WACC	-11,500	-6.5	165,700
Fixed O&M	-900	-0.5	164,800
Combined effect	**-12,000**	**-6.8**	**164,800**

The largest changes in the MRCP are as follows:

- WACC decreased from 7.01 per cent in the 2014 MRCP to 5.81 per cent in the 2015 MRCP, accounting for the majority of the decrease in the MRCP. This has largely been caused by reductions in the debt risk premium and the risk free rate (see section 3.1.6 for more detail).
- Jacobs forecasts lower escalation factors compared with the 2014 MRCP. In particular, lower escalation factors for power station capital costs, driven by lower commodity price forecasts, have contributed to a fall in the MRCP (see chapter 2 for more detail).
- Power station costs increased by 2.3 per cent compared to the 2014 determination, partially offsetting the effect of the WACC and escalation factors. This has been mainly associated with a lower exchange rate between the Australian dollar and the Euro (see section 3.1.1 for more detail).
- Transmission connection costs increased by 13.6 per cent compared with the 2014 MRCP. This increase is associated with older projects moving outside the five-year window so that more weight is placed on Western Power's forecasts of shallow transmission connection costs (see section 3.1.3 for more detail).

Changes since the draft report

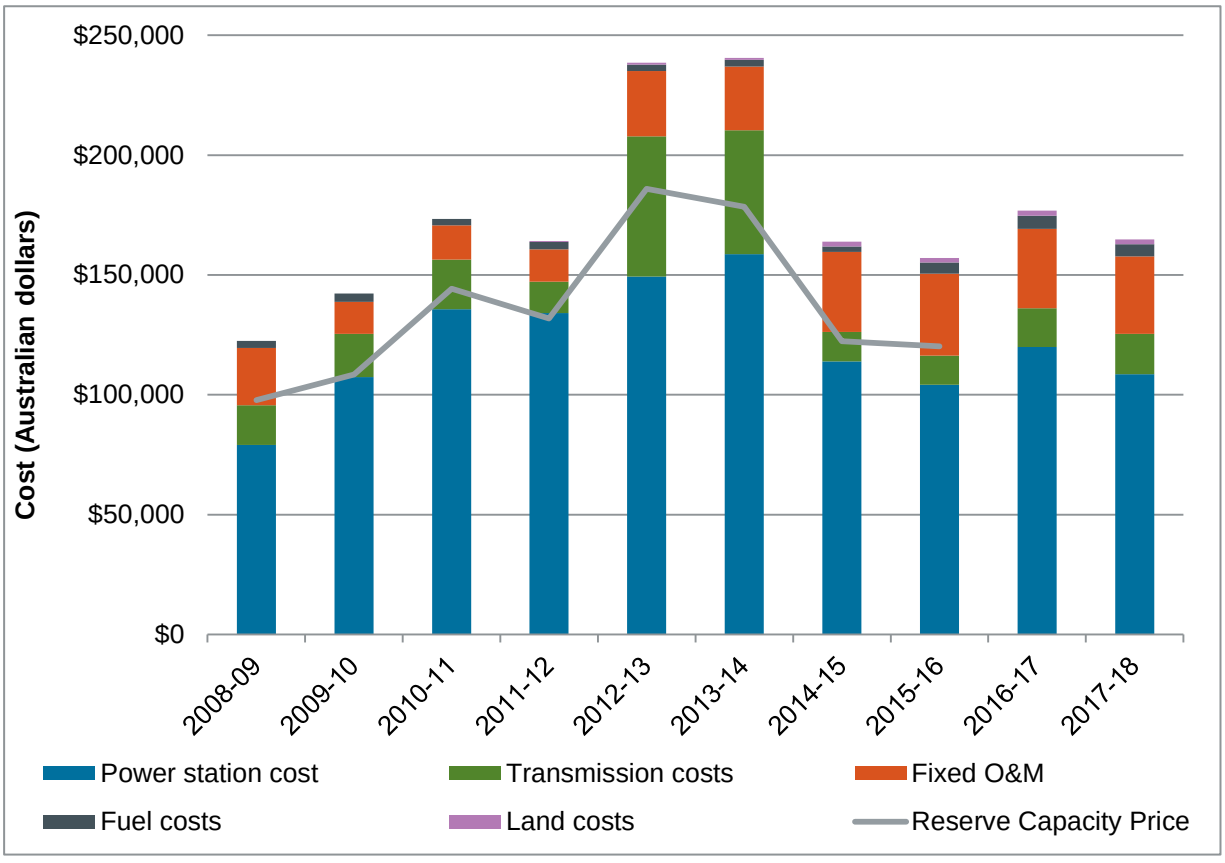
The proposed MRCP is 1.7 per cent lower than the proposed value of $167,600 in the draft report. The following components have changed since the draft report:

- the volatile WACC parameters (risk free rate, inflation and the debt risk premium) have been updated, leading to a decrease in the WACC from 6.1 per cent to 5.81 per cent; and
- the CPI escalation factors have been updated to reflect the latest forecasts from the Reserve Bank of Australia (RBA).

Historical variation of the MRCP

Figure ES.1 shows the MRCP values for the 2008-09 to 2017-18 Capacity Years. The MRCP has been fairly stable over this period, with the exception of 2012-13 and 2013-14, when high transmission cost estimates caused the MRCP to increase. Individual cost components in the figure include the effect of WACC. The Reserve Capacity Price for 2016-17 has not yet been calculated because of the deferral of the 2014 Reserve Capacity Cycle[2].

Figure ES.1: MRCP comparison, 2008-09 to 2017-18 Capacity Years



As part of the five-yearly review of the MRCP, assisted by the MRCP Working Group (MRCPWG) and finalised in 2011, Sinclair Knight Merz (SKM) reviewed the methodology used by Western Power to calculate total transmission costs. In its analysis, SKM noted that the method used for the 2012-13 and 2013-14 Capacity Years required a broad range of

[2] On 29 April 2014, the IMO received a direction from the Minister for Energy to defer certain aspects of the 2014 Reserve Capacity Cycle. More information is available on the IMO website at http://www.imowa.com.au/home/electricity/reserve-capacity/reserve-capacity-timetable/reserve-capacity-timetable-overview.

assumptions that could lead to inaccuracies and year-to-year volatility. As a result, a modified approach to calculating transmission costs was adopted from the 2012 Reserve Capacity Cycle onward. Please see section 3.3 for more detail on the changes to the methodology used for calculating total transmission costs.

The IMO also notes that the power station cost increased by 101 per cent from 2008-09 to 2013-14, driven by increases in commodity prices and Western Australian labour costs. The introduction of inlet cooling into the design of the theoretical power station, following the five-yearly MRCP methodology review, moderated this increase and was the major reason for the reduction in the power station cost from 2013-14 to 2014-15. This change was implemented because it reflects current market practice. All OCGT generators built in the SWIS since the start of the WEM have incorporated inlet cooling.

Contents

1. Introduction

This final report is produced in accordance with section 4.16 of the Wholesale Electricity Market Rules (Market Rules).

The Maximum Reserve Capacity Price (MRCP) sets the maximum allowable bid that can be made in a Reserve Capacity Auction, and is used as the basis for calculating an administered Reserve Capacity Price if no auction is required. Each year, the Independent Market Operator (IMO) is required to determine the MRCP in accordance with the Market Procedure: Maximum Reserve Capacity Price (Market Procedure)[3]. The proposed revised value for the MRCP is then published in a draft report on the IMO website[4] for public consultation.

Following the public consultation process, the IMO must consider submissions before proposing a final value for the MRCP. This value must be submitted to the Economic Regulation Authority (ERA) for approval, in accordance with clause 4.16.7 of the Market Rules.

This final report presents the updated component costs calculated for the 2015 Reserve Capacity Cycle. The IMO uses publicly available information, combined with advice from independent engineering and economics consultants, as well as Western Power, to update the various input parameters that are used in calculating the MRCP.

Throughout this report, costs and prices are expressed in Australian dollars, unless otherwise specified.

1.1 Reserve Capacity Cycle timing

This final report has been prepared for the 2015 Reserve Capacity Cycle. The MRCP calculated in this final report will be effective from 1 October 2017 to 1 October 2018 (the 2017-18 Capacity Year).

1.2 General costing methodology and structure of this final report

This final report discusses the updated input parameters used to calculate the 2015 MRCP. For a detailed discussion of the methodology used to calculate these parameters, please see the Market Procedure.

The annual calculation of the MRCP requires the IMO to estimate the following costs:

- the capital cost of a 160 MW OCGT power station with inlet cooling, located in the SWIS;
- the land cost associated with developing and constructing the power station;
- the cost associated with connecting the power station to the transmission system;
- the cost associated with building liquid fuel storage and handling facilities for the power station;
- the fixed operating and maintenance (O&M) costs associated with the power station and transmission facilities;

[3] The Market Procedure is available at http://www.imowa.com.au/home/electricity/procedures.
[4] See http://www.imowa.com.au/home/electricity/reserve-capacity/maximum-reserve-capacity-price.

- a margin for legal, approval, financing, insurance costs and contingencies; and
- the weighted average cost of capital (WACC).

In determining the proposed MRCP, the IMO has sought advice from various consultancies and agencies. Table 1.1 shows these organisations and the cost estimates they have provided. These organisations are the same as those employed last year.

Table 1.1: Consultancies and agencies

Organisation	Cost estimate/s provided
Jacobs (previously SKM)[5]	Power station capital costs Margin for indirect costs and contingencies Fixed fuel costs O & M costs
Landgate	Land costs
PricewaterhouseCoopers (PwC)	Debt risk premium
Western Power	Transmission connection costs

1.3 Public consultation

Following publication of the draft report on 4 November 2014, the IMO invited public submissions until 5 December 2014. The IMO received two submissions from:

- Alinta Energy; and
- Community Electricity.

A summary of these submissions and the IMO's response to the issues raised can be found in chapter 5. The full submissions are available on the IMO's website[6].

1.4 MRCP outcome for the 2015 Reserve Capacity Cycle

In accordance with clause 4.16.7 of the Market Rules, the IMO proposes a final revised value of the MRCP of $164,800 per MW per year for the 2015 Reserve Capacity Cycle.

This is a decrease of 6.8 per cent from the 2014 MRCP of $176,800 per MW per year.

Detailed analysis of the changes since the 2014 MRCP is included in this report.

1.5 Supporting documents

The following related documents are available on the IMO website[7]:

- MRCP calculation spreadsheet, final report version;
- WACC parameter calculation spreadsheet, final report version;

[5] In 2014, Jacobs merged with Sinclair Knight Merz (SKM). The new entity is known as Jacobs.
[6] See http://www.imowa.com.au/home/electricity/reserve-capacity/maximum-reserve-capacity-price.
[7] See http://www.imowa.com.au/home/electricity/reserve-capacity/maximum-reserve-capacity-price.

- Jacobs report, dated 8 December 2014, *Review of the Maximum Reserve Capacity Price 2017-2018*;
- PwC letter, dated 28 November 2014, *Estimated debt risk premium using the ERA's bond yield methodology*, final report version;
- *Draft report: Maximum Reserve Capacity Price review for the 2017-18 Capacity Year*;
- MRCP calculation spreadsheet, draft report version;
- WACC parameter calculation spreadsheet, draft report version;
- Jacobs report, dated 7 October 2014, *Review of the Maximum Reserve Capacity Price 2017-2018*;
- PwC letter, dated 10 October 2014, *Estimated debt risk premium using the ERA's bond yield methodology*, draft report version;
- letter from Landgate, dated 4 September 2014, *Land values for Reserve Capacity Price*; and
- Western Power report, dated 23 October 2014, *Total transmission costs estimate for the Maximum Reserve Capacity Price for 2017-18*.

2. Escalation of costs

The Market Procedure describes the escalation factors that are applied to costs determined for the MRCP. Escalation factors are used to estimate a future cost, based on a cost calculated on current data.

The calculation for the 2015 MRCP is based on a theoretical power station that would begin operating on 1 October 2017. In line with the Market Procedure, capital costs are escalated to 1 April 2017 and fixed O&M costs are escalated to 1 October 2017. The various input costs have been provided to the IMO at different dates (see chapter 3).

Table 2.1 shows the escalation factors used by the IMO to prepare the MRCP value.

Table 2.1: Escalation factors

Escalation factor	Financial year				
	2014-15	2015-16	2016-17	2017-18	2018-19
Power station capital cost	2.97%	4.00%	3.10%	3.00%	3.51%
Generation O&M cost	3.54%	3.82%	3.69%	3.65%	3.65%
Connection asset O&M cost	4.25%	4.25%	4.25%	4.25%	4.25%
CPI	2.00%	3.00%	2.75%	2.50%	2.50%
Transmission connection cost	-1.68%	-1.68%	-1.68%	-1.68%	-1.68%

Escalation factors are based on forecast price movements, where possible. Labour costs are projected based on long-run historical trends, based on the labour price index published by the Australian Bureau of Statistics (ABS).

The escalation factors have been determined as follows:

- Reserve Bank of Australia (RBA) forecasts are used for the consumer price index (CPI) rates, as required by the Market Procedure. The mid-point of the RBA's target for inflation (2 to 3 per cent) is used outside the range of these forecasts (2017-18 and onward).
- Power station capital cost escalation factors have been calculated by Jacobs, and are published in its report. Jacobs has calculated this escalation factor by weighting historical and forecast price movements for specific inputs, including steel, copper and labour. The weighting of each input cost is proportional to its contribution to total capital costs for the power station.
- Connection asset O&M escalation factors have also been calculated by Jacobs and are published in its report. Jacobs has noted in previous years that fixed O&M costs for connection assets are largely determined by labour costs; therefore, labour cost forecasts have been used to escalate connection asset O&M costs. These forecasts are determined from the 10 year average growth in the ABS's wage price index for the utilities sector.
- Power station O&M escalation factors have also been calculated by Jacobs, based on weighting labour escalation rates and the CPI.

- Transmission cost escalation factors are calculated by Western Power, based on the average annual change in cost estimates for a fixed transmission connection scope, as required by section 2.4 of the Market Procedure.

The escalation factors used for the power station capital costs are lower than for the 2014 MRCP. All of the components of this escalation factor have decreased compared to the previous year. In particular, forecasts for copper, steel and engineering construction costs have decreased significantly. The updated price forecasts for copper and steel reflect recently observed lower prices for these commodities. Engineering construction cost forecasts have been reduced as a result of fewer major projects currently underway, reducing demand for these services. Similarly, labour costs are forecast to be lower as demand for labour in the mining industry falls.

The remainder of the escalation factors are similar to those calculated last year.

The CPI escalation factors have been updated since the draft report, following the release of the RBA's November 2014 Statement on Monetary Policy.

Further detail on the development of the escalation factors can be found in the supporting documents on the IMO's website[8].

[8] See http://www.imowa.com.au/home/electricity/reserve-capacity/maximum-reserve-capacity-price.

3. Input parameters to the Maximum Reserve Capacity Price

3.1 Capital costs (CAPCOST)

3.1.1 Power station capital costs (PC)

The IMO engaged Jacobs to provide generation plant capital costs for a 160 MW OCGT power station located in the SWIS, as for last year's determination. This is the eighth year that Jacobs (previously SKM) has provided this estimate to the IMO. The scope provided to Jacobs was the same as last year.

The methodology used by Jacobs to calculate the power station capital costs is the same as last year. Jacobs has used Siemens' SGT5-2000E 173 MW OCGT plant as the reference equipment, and obtained quotes directly from Siemens[9]. Costs were then benchmarked against similar completed projects in Australia.

Jacobs has identified the component costs that are likely to be scalable with generator size and those components that are likely to be fixed. It has adjusted only the scalable costs in estimating the capital cost for a nominal 160 MW generator.

The expected Capacity Credit allocation was estimated for the nominal 160 MW generator by scaling the expected performance of the Siemens unit at conditions of 41 degrees Celsius and 30 per cent relative humidity.

For the 2015 MRCP:

PC = $865,836 per MW.

This has decreased by 1.5 per cent compared to the costs determined for the 2014 MRCP calculation, and has not changed since the draft report, while total capital costs for the power station, as provided by Jacobs, have increased by 2.3 per cent as at June 2014. This has been offset by the power station capital cost escalation factor, used to calculate the price as at April 2017, which has decreased compared to the 2014 MRCP (see chapter 2).

3.1.2 Legal, financing, insurance, approvals, other costs and contingencies (M)

'M' is a margin that covers legal, financing, insurance, approvals, other costs and contingencies. Jacobs has provided an estimate of these costs for this year's determination of the MRCP. This is the seventh year that Jacobs (SKM) has determined this value for the IMO.

Margin M is estimated from the costs associated with recent, comparable developments, excluding any abnormal costs that are particular to certain projects. Costs are scaled for a 160 MW power station where relevant. Margin M is added as a fixed percentage of the capital cost of developing the power station.

For the 2015 MRCP:

M = 19.97 per cent.

[9] Jacobs notes that this is now the only model in active production with characteristics appropriate for the MRCP calculation.

This value is 0.13 percentage points lower than the value used for the 2014 MRCP, and has not changed since the draft report. Margin M has decreased as a result of the capital expenditure estimate increasing at a faster rate than the costs that make up margin M. While the capital expenditure estimate increased by 1.7 per cent between the 2014 and 2015 MRCPs, the estimate of margin M costs increased at a slightly slower rate of 1.6 per cent.

3.1.3 Transmission connection costs (TC)

For the 2015 MRCP, Western Power calculated the transmission connection cost estimate as part of its obligations under the Market Procedure.

The transmission connection cost estimate provided for this MRCP determination is based on actual connection costs and access offers that were identified by Western Power. As the connection costs for individual projects are confidential between Western Power and the project developer, Western Power has provided an audit report verifying the data used in the calculation.

The transmission connection cost calculation uses actual connection costs for projects completed within a five-year window, and weights each connection cost according to the year that the facility began, or is expected to begin, operating. If there is no project data available for a year, Western Power estimates the shallow connection cost consistent with the Market Procedure. Western Power has advised that this estimate of the shallow connection cost is higher than the capital contributions for facilities within the five-year window.

This methodology for calculating the transmission connection cost was implemented following the five-year review of the MRCP, assisted by the Maximum Reserve Capacity Price Working Group (MRCPWG) and finalised in 2011. The new methodology was used for the first time by Western Power for the 2012 MRCP. In its analysis for the MRCPWG, SKM noted that the method employed by Western Power for the 2010 and 2011 MRCPs (for the 2012-13 and 2013-14 Capacity Years) required a broad range of assumptions that could lead to inaccuracy and year-to-year volatility.

The transmission connection costs estimated using the new methodology are lower than the estimates provided by Western Power for the 2010 and 2011 MRCPs. This suggests that the estimates for 2010 and 2011 were not reflective of actual capital contributions made by project developers that either secured a connection or were provided an access offer.

For the 2015 MRCP:

TC = $161,194 per MW.

Transmission connection costs have increased by 13.6 per cent compared to last year, and have not changed since the draft report. This increase is associated with older projects moving outside the five-year window so that more weight is placed on Western Power's forecasts of shallow transmission connection costs.

The IMO notes that, as reported last year, outside of the 2010 and 2011 MRCPs, the transmission connection cost component of the MRCP has continued to be relatively stable.

3.1.3.1 Easement costs

The IMO provides an estimate of easement costs for the direct connection scope described in step 2.4.2 of the Market Procedure to help Western Power determine transmission connection cost estimates.

The easement cost has been estimated in the same way as last year as follows:

- The easement is assumed to have an area of 12 hectares (2 km long and 60 m wide).
- The IMO assumes that a developer may not need to purchase the full 12 hectares, instead securing easement rights for some or all of the land. The IMO has therefore estimated easement costs to be 50 per cent of the purchase value of the land, consistent with the 2014 MRCP.
- The purchase price per hectare has been calculated by dividing the average cost of the land parcels valued by Landgate (including transfer duty) by three hectares (see section 3.1.5 for a full discussion of land cost estimates).

To meet the requirements of the transmission connection cost calculation (see section 2.4 of the Market Procedure), the IMO has escalated the easement cost to 30 June 2015 using the relevant CPI escalation factor (see Table 2.1). Further escalation of the easement cost to 1 April 2017 occurs within the transmission connection cost calculation where required.

The IMO has calculated an easement cost (as at 30 June 2015) of **$5,234,885**, which has not changed since the 2014 MRCP or the draft report.

3.1.4 Fixed fuel costs (FFC)

Fixed fuel costs for the determination of the 2015 MRCP were estimated by Jacobs. This is the third year that Jacobs (SKM) has performed this estimate for the IMO. The scope provided was the same as last year.

Jacobs provided its estimate as at 30 June 2014, which has been escalated to 1 April 2017 using the CPI escalation rates in Table 2.1.

For the 2015 MRCP:

FFC = $7,282,060.

Fixed fuel costs have increased by 1.1 per cent compared to last year. This is largely as a result of an increase in the cost of installing the storage tanks. The fuel prices used for this estimate exclude excise and GST.

This cost has decreased by 1.7 per cent compared to the draft report, as a result of slightly lower CPI escalation rates and a revision to the cost of fuel for the first filling of the storage tanks.

3.1.5 Land costs (LC)

The IMO engaged Landgate to update the land cost estimates for the MRCP calculation. This is the seventh year that Landgate has provided valuations to the IMO.

The land valuations from Landgate are based on guidelines in the Market Procedure. Valuations were made for seven locations in regions where development of a power station in the SWIS is most likely. These regions are:

- Collie;
- Kemerton Industrial Park;
- Pinjar;
- Kwinana;
- North Country (Geraldton and Eneabba); and
- Kalgoorlie.

Land sizes and costs were determined in accordance with the Market Procedure. Three hectare sites were used for all regions except Kemerton, where the minimum land size is five hectares. This approach is the same as that used for the 2014 MRCP.

Landgate's valuations were completed as at 30 June 2014, and exclude transfer duty (previously known as stamp duty). The IMO has added the applicable transfer duty to the cost of each land parcel, using the online calculator from the Office of State Revenue[10]. In accordance with the Market Procedure, the IMO has calculated the mean of the seven valuations, and escalated this to 1 April 2017 using the CPI escalation rates (see Table 2.1).

For the 2015 MRCP:

LC = $2,751,637.

Total land costs have increased by 1 per cent compared to the 2014 MRCP and have decreased by 0.2 per cent compared to the draft report as a result of updated CPI escalation factors. The increase from the 2014 MRCP reflects increases in land prices for the Collie, Geraldton and Eneabba regions.

3.1.6 Weighted average cost of capital (WACC)

The IMO engaged PwC to calculate the debt risk premium (DRP) and calculated the remaining WACC components from publicly available information.

The calculations for the risk free rate and inflation are provided in a spreadsheet published on the IMO's website[11]. The corporate tax rate is 30 per cent, which is consistent with last year.

WACC is determined according to the pre-tax real Officer WACC formulation, with bond yields considered in both the costs of equity and debt. The nominal risk free rate is

[10] Available at: https://rol.osr.wa.gov.au/Calculators/faces/Calculators?_afrLoop=482854060468439&_afrWindowMode=0&_adf.ctrl-state=1bjwmmsfw6_4.

[11] See http://www.imowa.com.au/home/electricity/reserve-capacity/maximum-reserve-capacity-price.

determined from observed yields of Commonwealth Government bonds, while the DRP is derived from observed yields of corporate bonds.

The IMO notes that the WACC used for the determination of the MRCP has been volatile in recent years. This volatility has reflected turbulence in global financial markets, largely as a result of concerns over sovereign debt levels in Europe and the slow rate of economic recovery in the United States. Financial market volatility has led investors to prefer lower risk investments such as government and high quality corporate bonds, including Australian Government bonds.

Appendix A contains a more detailed description of WACC, including the calculation steps.

For the 2015 MRCP:

WACC = 5.81 per cent.

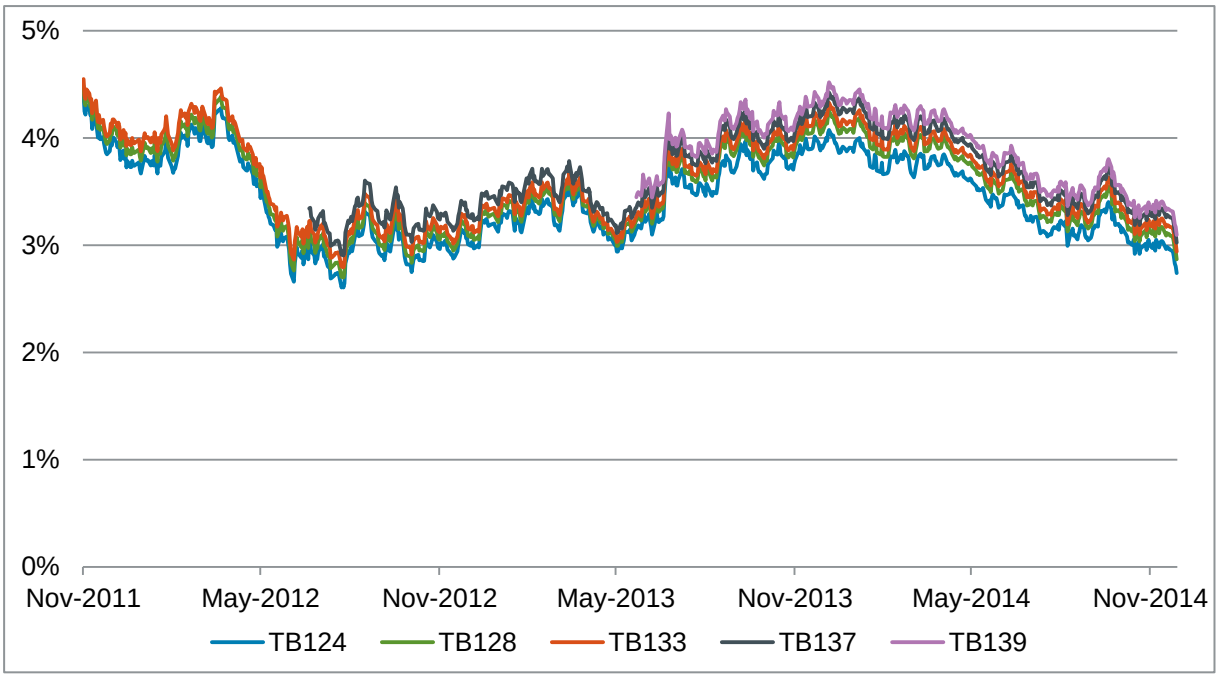
This is lower than the WACC of 7.01 per cent used in the 2014 MRCP, and lower than the value of 6.10 per cent proposed in the draft report.

The nominal risk free rate has decreased from 4.23 per cent for the 2014 MRCP to 3.32 per cent in this report, and has decreased by 0.3 percentage points since the draft report. The risk free rate has been calculated from Treasury bond yields in the same way as last year.

The forecast inflation rate has remained roughly the same as that used for the draft report.

Figure 3.1 shows the daily yield for a selection of Treasury bonds with maturity dates roughly 10 years from now. Treasury bond yields have decreased since the last calculation of the MRCP in late 2013, resulting in a decrease in the nominal risk free rate. In addition, bond yields have decreased further since the calculation of the nominal risk free rate for the draft report in October.

Figure 3.1: RBA bond yields, November 2011 to November 2014



The risk free rate and DRP for this final report have been calculated using market observations from November 2014.

3.1.6.1 Debt risk premium (DRP)

The Market Procedure states that "the IMO must determine the methodology to estimate the DRP, which in the opinion of the IMO is consistent with current Australian accepted regulatory practice."

The IMO notes that Australian regulators have used multiple methodologies for calculating the DRP since the global financial crisis, as the availability of bond market data declined. Australian regulators have yet to implement a common methodology.

For the 2013 MRCP, the DRP was determined using the ERA's bond yield approach for the first time. The ERA applied this methodology in its *Final decision on WA Gas Networks Pty Ltd proposed revised access arrangement for the Mid-West and South-West Gas Distribution System.* The methodology was appealed to the Australian Competition Tribunal (ACT) and was upheld in June 2012, leading the IMO to consider that the methodology represented current accepted Australian regulatory practice. The IMO applied this methodology using bonds with a BBB credit rating.

The ERA published its *Rate of Return Guidelines (Meeting the Requirements of the National Gas Rules)* on 16 December 2013[12], in which it proposed to continue the use of the bond yield approach, and has applied this approach in recent determinations[13].

The IMO notes that the ERA has recently adopted a modified bond yield approach to calculate the DRP in its *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution System*[14]. This methodology uses a larger sample of bonds issued by Australian utilities, both in Australian and in international markets, to estimate a bond yield curve to calculate a 10-year DRP. However, the IMO also notes that this decision remains in draft form, and is currently in the public consultation phase.

The Australian Energy Regulator (AER) also published its *Better Regulation: Rate of Return Guideline* on 17 December 2013[15]. The AER proposes to continue using a third party data service provider (such as Bloomberg) as the source of benchmark cost of debt estimates. The AER also proposes moving to a trailing average portfolio approach to calculating the return on debt. This method assumes that part of an entity's debt associated with its regulated asset base is re-financed each year. However, this method is considered inappropriate for the financing assumptions for a new asset, and therefore has not been considered for the MRCP.

In recent draft decisions[16], the AER has used a combination of Bloomberg and RBA data to calculate a 10-year DRP. However, this is not considered appropriate for the MRCP as the RBA data includes bonds in the BBB 'band', that is, bonds rated higher or lower than BBB. The IMO also notes that these recent decisions remain in draft form.

12 Available at: http://www.erawa.com.au/gas/gas-access/guidelines/rate-of-return-guidelines.
13 See, for example, http://www.erawa.com.au/rail/rail-access/weighted-average-cost-of-capital for more information.
14 Available at: http://www.erawa.com.au/cproot/12938/2/20141014%20D129552%20%20GDS%20-%20ATCO%20-%20AA4%20-%20Draft%20Decision%20-%20PUBLIC.pdf.
15 Available at: http://www.aer.gov.au/node/18859.
16 See, for example, http://www.aer.gov.au/sites/default/files/AER%20%E2%80%93%20Draft%20decision%20Essential%20Energy%20distribution%20determination%20%E2%80%93%20Attachment%203%20%E2%80%93%20Rate%20of%20return%20%E2%80%93%20November%202014.pdf.

For the 2015 MRCP, the IMO considers it appropriate to calculate the DRP using the bond yield approach on Australian bonds, consistent with the 2014 MRCP. As noted above, the bond yield approach has been applied in numerous decisions by the ERA since 2011 and was upheld by the ACT. Consequently, the IMO considers that this methodology represents current accepted Australian regulatory practice.

The IMO notes that the sample of bonds used in the bond yield approach results in an average term to maturity of less than five years. The IMO notes that the recent approaches used by the ERA and AER have sought to overcome this shortcoming, but given that they have only been applied in draft regulatory decisions to date, the IMO does not consider these methodologies to represent "accepted" regulatory practice at this time.

The IMO will continue to monitor regulatory practice in relation to the DRP for future MRCP determinations.

3.1.7 Capital costs (CAPCOST)

'CAPCOST' refers to the total capital cost, expressed in millions of Australian dollars, for a 160 MW OCGT power station. This is calculated from the costs determined in sections 3.1.1 to 3.1.6 as follows:

$$\text{CAPCOST} = \left((\text{PC} \times (1 + \text{M}) + \text{TC}) \times \text{CC} + \text{FFC} + \text{LC}\right) \times (1 + \text{WACC})^{\frac{1}{2}}$$

where CC is the expected Capacity Credit allocation (see section 4.3).

For the 2015 MRCP:

CAP_COST = $196,083,112.

3.2 Fixed operation and maintenance costs (ANNUALISED_FIXED_O&M)

3.2.1 Generation

Jacobs determined the fixed O&M costs for the generator assets using the same methodology as last year. This is the ninth MRCP for which Jacobs (SKM) has provided the estimate of these costs.

An annuity is calculated based on the first 15 years of cost estimates provided by Jacobs. The Jacobs report shows the total fixed O&M costs of the power station to year 15 as $32,325,000 in June 2014 dollars. This cost is then annualised and escalated to 1 October 2017 (the date on which these costs are expected to commence) using the power station O&M escalation factors.

For the 2015 MRCP:

Generation fixed O&M costs = $16,107 per MW per year.

This cost has increased by 3.4 per cent compared to the value used for the 2014 MRCP, mainly as a result of slightly higher escalation factors.

3.2.2 Switchyard and transmission

Jacobs provided the fixed O&M costs of the switchyard and transmission line assets using the same methodology as last year. This is the ninth MRCP for which Jacobs has provided an estimate of these costs.

An annuity is calculated from the first 15 years of costs provided by Jacobs. The Jacobs report details the total fixed O&M costs for the switchyard and transmission line assets as at 30 June 2014. This cost is annualised and escalated to 1 October 2017 (the point at which these costs are assumed to start), using the connection asset O&M escalation factor.

For the 2015 MRCP:

Transmission fixed O&M costs = $489 per MW per year.

This cost has increased by 4.0 per cent compared to the value used for the 2014 MRCP, largely associated with higher switchyard operating and maintenance costs.

3.2.3 Network access charges

Western Power's price list provides the various charges for network access and related services that apply for generation facilities. It is assumed that the power station is connected to the transmission system, so reference tariff TRT2 is used for the MRCP.

The IMO has determined the network access charge based on the 2014-15 price list approved by the ERA[17].

As the use of system charge varies by location, the IMO has considered the list of locations nominated in step 2.7.1 of the Market Procedure and used the unit price for the most expensive of those locations. Muja has the highest price among the power stations located in the regions listed in the Market Procedure for 2014-15 and its price is used for the MRCP.

Costs are assumed as at 30 June 2014 and have been escalated to 1 October 2017. The CPI escalation factor has been used, as required by step 2.5.6(c) of the Market Procedure.

For the 2015 MRCP:

Fixed network access costs = $10,975 per MW per year.

This cost has decreased by 3.6 per cent compared to the value used in the 2014 MRCP. A decrease in Western Power's use of system charge, as well as slightly lower CPI escalation rates, offset an increase in Western Power's control system service charge. This cost has decreased slightly from the draft report because of updated CPI escalation factors.

3.2.4 Insurance costs

The Market Procedure specifies that the fixed O&M component of the MRCP must include annual insurance costs to cover power station asset replacement, business interruption and public and products liability as required under network access arrangements with Western Power.

[17] See http://www.erawa.com.au/electricity/electricity-access/western-power-network/annual-price-lists-for-network-charges for more information.

Ideally, the IMO would source an insurance cost estimate from a reputable company in a publishable report. However, this has proven to be challenging. Insurance companies and brokers prefer to remain anonymous as they do not wish to harm their competitive position. Engineering companies such as Jacobs are not willing to provide insurance cost estimates, and there is no central industry body for insurance.

The IMO has received updated advice on insurance costs from an independent broker. The IMO has used this advice to calculate insurance premiums as follows:

- asset replacement and business interruption insurance is estimated as $574,153 a year as at 1 April 2017, calculated as 0.24 per cent of the limit of liability at that date. The limit of liability has been determined as the sum of the capital construction cost, value of fuel and the potential refund liability during the period of re-construction. The percentage used to calculate the premium is based on advice from an independent insurance broker.

  For the purpose of asset replacement insurance, the capital construction cost and value of fuel are calculated as:

  $$PC \times (1 + M) \times CC + FFC$$

  where

  PC is the power station capital cost (see section 3.1.1), M is margin M (see section 3.1.2), CC is the expected Capacity Credit allocation (see section 4.3), and FFC is the fixed fuel cost (see section 3.1.4).

  For business interruption insurance, the IMO has included the potential refund liability for the facility for two years. While a construction period of one year is assumed in the application of WACC in the MRCP calculation, a period of time would be required prior to the commencement of any reconstruction work following a loss event (for example, for procurement of services, building approvals and any demolition or clearing works). The weighting of capacity refunds to peak demand periods means that a Market Participant may be required to refund two years' worth of capacity payments in a period of less than 15 months.

- public and products liability insurance is estimated as $100,800 per year as at 30 June 2014, based on a limit of $50 million for any one occurrence.

- a cost of $20,000 a year as at 30 June 2014 has been included to cover the cost of an annual insurance site survey.

Based on the information considered by the IMO, the premium rates are consistent with the following assumptions:

- a newly constructed generation facility with on-site diesel storage;

- location in a rural region of the SWIS, without cyclone risk;

- inclusion of coverage for machinery breakdown; and

- deductibles of $25,000 to $50,000 for public and products liability insurance, $500,000 for property damage and 60 days for business interruption insurance.

The premiums above include the 2 per cent terrorism levy and 10 per cent stamp duty.

Insurance costs have been escalated to 1 October 2017 (the point at which these costs are expected to start) using the CPI escalation factor.

For the 2015 MRCP:

Insurance costs = $4,737 per MW per year.

This cost has decreased by 22.5 per cent compared to the value from last year. This decrease is a result of the lower insurance percentage, which has reduced business interruption and asset replacement insurance premiums, and a decrease in public and products liability insurance based on a quote received from an independent insurance broker.

Insurance premiums have fallen in the past year as a result of increased competition and lower risk, particularly for property insurance in the electricity industry. Fewer claims related to natural disasters have also reduced premiums.

Insurance costs have decreased slightly compared to the draft report as a result of updated CPI escalation factors.

3.2.5 Total fixed operation and maintenance costs

For the 2015 MRCP:

ANNUALISED_FIXED_O&M = $32,307 per MW per year.

Total fixed operating and maintenance costs have decreased by 2.7 per cent compared to the previous year, as a result of changes in the components discussed above.

4. Maximum Reserve Capacity Price calculation

4.1 Annualised capital costs (ANNUALISED_CAPCOST)

The annualised capital cost is calculated using:

- the capital cost of $196,083,112 (see section 3.1.7);
- the WACC of 5.81 per cent (see section 3.1.6); and
- a term of 15 years as required by the Market Procedure.

For the 2015 MRCP:

ANNUALISED_CAPCOST = $19,938,596 per year.

4.2 Annualised fixed operation and maintenance costs (ANNUALISED_FIXED_O&M)

The components of the total annualised fixed O&M costs are discussed in detail in section 3.2. For the 2015 MRCP:

ANNUALISED_FIXED_O&M = $32,307 per MW per year.

4.3 Expected Capacity Credit allocation (CC)

Jacobs has estimated the output of the reference facility at 41 degrees Celsius, which gives the expected Capacity Credit allocation for the facility. Jacobs scaled the expected performance of the reference Siemens OCGT to represent a nominal 160 MW generator.

For the 2015 MRCP:

CC = 150.5 MW.

4.4 Calculation

The MRCP is calculated, as specified in the Market Procedure, as follows:

$$\text{MRCP} = \text{ANNUALISED\_FIXED\_O\&M} + \frac{\text{ANNUALISED\_CAP\_COST}}{\text{CC}}$$

The MRCP for the 2015 Reserve Capacity Cycle is therefore calculated to be $164,789, which has been rounded to the nearest $100 as follows:

MRCP = $164,800 per MW per year.

Appendix B provides a summary of the MRCP calculation, including its key components, for the 2015 MRCP.

The 2015 final MRCP is 6.8 per cent lower than the 2014 MRCP and 1.7 per cent lower than the draft 2015 MRCP.

Table 4.1 shows the change between the 2014 and 2015 MRCP values, broken down by input parameter. This shows that most of the variance was caused by a decrease in WACC and escalation factors. WACC decreased as a result of a reduction in the debt risk premium and the risk free rate (see section 3.1.6), while escalation factors, particularly for power station capital costs, declined because of falls in commodity prices such as copper and steel (see chapter 2). This was partly offset by increases in the power station capital costs, primarily associated with a weakening in the exchange rate between the Euro and the Australian dollar (see section 3.1.1), and increases in transmission costs (see section 3.1.3).

Table 4.1: Breakdown of variance between 2014 and 2015 MRCP

	Variance ($)	Variance (%)	MRCP ($)
2014 MRCP			**176,800**
Escalation factors	-4,400	-2.5	172,400
Power station cost	2,700	1.6	175,100
Margin M	-200	-0.1	174,900
Fixed fuel cost	100	0.1	175,000
Land cost	0	0	175,000
Transmission cost	2,200	1.3	177,200
WACC	-11,500	-6.5	165,700
Fixed O&M	-900	-0.5	164,800
Combined effect	**-12,000**	**-6.8**	**164,800**

Appendix C provides further details of the changes in various components of the MRCP from last year, while Appendix D shows a comparison of the 2015 MRCP to previous years.

5. Stakeholder input

The IMO published the draft report and supporting documents for the 2013 MRCP on its website and initiated a consultation process on 4 November 2014. The IMO directly advised Rule Participants and other industry stakeholders on the same day and published announcements in the West Australian and Australian Financial Review on 5 November 2014. The submission deadline was 5 December 2014.

The IMO received submissions from Alinta Energy and Community Electricity.

Copies of the submissions can be found on the IMO's website[18]. A summary of the issues raised in the submissions and the IMO's response is given in Table 5.1 on the following pages.

[18] See http://www.imowa.com.au/home/electricity/reserve-capacity/maximum-reserve-capacity-price.

Table 5.1: IMO's responses to issues raised in public submissions

Submitter	Comment	IMO's response
Alinta Energy	Alinta notes its continued concern that the WACC used to determine the MRCP is more appropriate for funding state network infrastructure rather than private investment in generation assets in the WEM.	The WACC used in the MRCP is calculated using the pre-tax real Officer WACC, consistent with Australian regulatory practice. This model allows for consideration of different risk profiles, influenced by two parameters – the credit rating and beta of the benchmark entity. For example, the ERA assumed a credit rating of A- when determining the WACC for Western Power's 2013 to 2017 Access Arrangement (AA3). The ERA also determined the risk free rate from the 5 year Commonwealth Government securities yield (linked to the duration of the access arrangement period). By contrast, the MRCP is based on a credit rating of BBB, which results in higher estimates for beta and the DRP. In addition, the risk free rate is calculated for a 10 year term (linked to the maximum duration for a Special Price Arrangement), which results in a higher risk free rate. The IMO considers that the use of a BBB credit rating to determine these parameters adequately reflects the risks of constructing generation assets.
Alinta Energy	Alinta notes that PwC highlights in its report that the DRP is likely to be underestimated as the average term to maturity of the sampled bonds is only 4.74 years, lower than the IMO's target of 10 years. Alinta supports the IMO in considering the appropriateness of interpolating the proposed DRP to ensure that it reflects bonds with an average term to maturity of 10 years. This would also ensure greater consistency with recent valuations of the DRP by other regulators. For example the ERA has recently proposed a DRP of 2.27 per cent in its draft decision on the most	The IMO considers that this would not be consistent with current accepted regulatory practice, which is reflective of the current state of debt markets. While developing the bond yield approach, the ERA stated that using an extrapolation to determine a 10 year estimate would be impractical and potentially unreliable, and considered that using a sample of real bonds with shorter maturity dates is preferable[19]. The IMO notes that the ERA's recent *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution System*[20] includes some amendments to the bond yield approach, including the use of international bonds issued by Australian entities to calculate the debt risk premium. However, the IMO also notes that this decision remains in draft form, and is currently in the public consultation

[19] See the ERA's Discussion Paper – Measuring the Debt Risk Premium: A Bond-Yield Approach, available at: http://www.erawa.com.au/gas/gas-access/regulatory-discussion-papers/estimating-the-debt-risk-premium.
[20] Available at: http://www.erawa.com.au/cproot/12938/2/20141014%20D129552%20%20GDS%20-%20ATCO%20-%20AA4%20-%20Draft%20Decision%20-%20PUBLIC.pdf.

Submitter	Comment	IMO's response
	recent ATCO access arrangement.	phase. The ERA has not updated its Rate of Return Guidelines, which are considered by the IMO to be reflective of current regulatory practice, to reflect the new approach to calculating the DRP used in this draft decision. However, the IMO will continue to monitor the regulatory environment.
Community Electricity	Community requests clarification of whether the cost reductions associated with runback schemes are being appropriately included in the total transmission costs.	The methodology for calculating the total transmission costs uses actual capital contributions paid by project developers, so any cost reductions associated with the adoption of runback schemes would be implicitly included in the calculation. However, as required by section 2.4.1(b) of the Market Procedure, for financial years where there are no contributions made, Western Power estimates the shallow connection cost for the fixed scope specified in section 2.4.2 of the Market Procedure. This fixed scope does not include any assumptions in relation to the level of service that would be provided. The IMO notes that few new generation facilities have connected to the SWIS in recent years, making the transmission calculation more reliant on the fixed scope shallow connection cost estimate. The IMO considers that this element of the Market Procedure should be reviewed during the next 5 yearly review of the MRCP methodology under clause 4.16.9 of the Market Rules, which is expected to commence in 2015. The IMO has included this issue in the issues register that it is maintaining in preparation for this review.
Community Electricity	Community supports the continued use of the ERA's bond yield approach to estimating the debt risk premium.	The IMO notes Community Electricity's support.
Community Electricity	Community notes that the cost estimate is based on a standard generator that does not exist, necessitating scaling of a 173 MW OCGT to 160 MW. Community also requests assurance that the manufacturer's quote is drawn from a 'live' application rather than an academic enquiry that won't lead to a sale.	The IMO considers that the scaling approach applied by Jacobs represents the best application of the current Market Procedure, which requires that the MRCP be representative of an industry standard liquid-fuelled 160 MW OCGT power station. The cost estimate uses budgetary pricing information for the generating equipment, plus estimates for installation costs, and other plant and infrastructure, based on a database of actual project costs. The pricing from

Submitter	Comment	IMO's response
		the supplier is in response to a budgetary pricing inquiry, rather than being drawn from an actual live project, as there are currently no similar projects in Australia (as a result of lack of demand growth and existence of excess capacity in both the National Electricity Market and the WEM). In the absence of live projects for comparative purposes, the IMO considers this to be the best application of the current Market Procedure. The IMO considers that this element of the Market Procedure should be reviewed during the next 5 yearly review of the MRCP methodology under clause 4.16.9 of the Market Rules, which is expected to commence in 2015. The IMO has included this issue in the issues register that it is maintaining in preparation for this review.

Appendix A. Weighted average cost of capital

The pre-tax real Officer WACC is used for the determination of the MRCP. The formulae for calculating WACC are as follows:

$$WACC_{real} = \left(\frac{1 + WACC_{nominal}}{1 + i}\right) - 1$$

and;

$$WACC_{nominal} = \left(\frac{1}{1 - t(1 - \gamma)}\right) R_e \frac{E}{V} + R_d \frac{D}{V}$$

where the nominal return on equity is calculated as:

$$R_e = R_f + \beta_e \times MRP$$

and the nominal return on debt is calculated as:

$$R_d = R_f + (DRP + d)$$

Table A.1 shows the WACC parameters estimated for the 2015 MRCP compared with those estimated for the 2014 MRCP. PwC calculated the debt risk premium and the IMO has determined the remaining annual parameters. The more volatile parameters (highlighted in the table) were recalculated for this final report to ensure that the most up to date information was included.

Table A.1: WACC parameters for the 2014 and 2015 MRCP

Parameter	Notation	2015 value	2014 value
Nominal risk free rate of return (%)	R_f	3.32	4.23
Expected inflation (%)	i	2.52	2.5
Real risk free rate of return (%)	R_{fr}	0.78	1.69
Market risk premium (%)	MRP	6	6
Asset beta	β_a	0.5	0.5
Equity beta	β_e	0.83	0.83
Debt risk premium (%)	DRP	1.68	2.03
Debt issuance cost (%)	d	0.125	0.125
Corporate tax rate (%)	t	30	30
Franking credit value	γ	0.25	0.25
Debt to asset ratio (%)	D/V	40	40
Equity to total asset ratio (%)	E/V	60	60

For the 2015 MRCP:

WACC = 5.81 per cent.

Appendix B. Calculation of the Maximum Reserve Capacity Price

The MRCP is calculated as described in the Market Procedure, which specifies the following formula:

$$MRCP = ANNUALISED\_FIXED\_O\&M + \frac{ANNUALISED\_CAP\_COST}{CC}$$

where:

MRCP is the Maximum Reserve Capacity Price to apply in a Reserve Capacity Auction.

ANNUALISED_FIXED_O&M is the annualised fixed operating and maintenance costs for the power station and any associated electricity transmission facilities, expressed in Australian dollars per MW per year.

ANNUALISED_CAPCOST is the CAPCOST, expressed in Australian dollars, annualised over a 15 year period using the WACC.

CC is the expected Capacity Credit allocation determined with the power station capital cost, expressed in MW.

Table B.1: MRCP components, 2014 and 2015 MRCP

	2015 value	2014 value	Unit
MRCP	**164,800**	**176,800**	**AU$/MW/year**
ANNUALISED_FIXED_O&M	32,307	33,238	AU$/MW/year
ANNUALISED_CAPCOST	19,938,596	21,607,992	AU$/year
CAPCOST	196,083,112	196,690,723	AU$
WACC	5.81	7.01	%
Term of finance	15	15	Years
CC	150.5	150.5	MW

Appendix C. Comparison between the 2014 and 2015 MRCPs

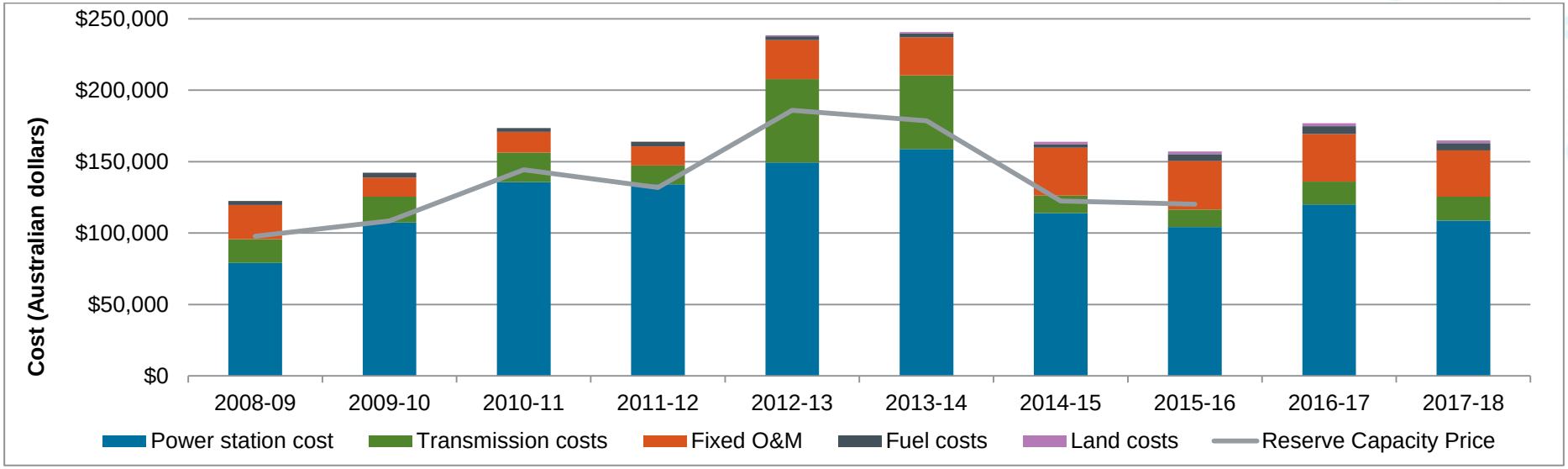
Table C.1: Comparison between 2014 and 2015 MRCPs

	2015	2014	Units
PC	865,836	878,793	$/MW
M	19.97	20.10	%
TC	161,194	141,910	$/MW
FFC	7,282,060	7,206,386	$
LC	2,751,637	2,733,933	$
CAP_COST	196,083,112	196,690,723	$
Term of finance	15	15	Years
WACC	5.81	7.01	%
ANNUALISED_CAPCOST	**19,938,596**	**21,607,992**	**$/Year**
CC	150.5	150.5	MW
ANNUALISED_CAPCOST	19,083,112	21,607,992	$/Year
ANNUALISED_FIXED_O&M	32,307	33,238	$/MW/Year
MRCP	**164,800**	**176,800**	**$/MW/Year**

Table C.2: Breakdown of variance between 2014 and 2015 MRCPs

	Variance ($)	Variance (%)	MRCP ($)
2014 MRCP			**176,800**
Escalation factors	-4,400	-2.5	172,400
Power station cost	2,700	1.6	175,100
Margin M	-200	-0.1	174,900
Fixed fuel cost	100	0.1	175,000
Land cost	0	0	175,000
Transmission cost	2,200	1.3	177,200
WACC	-11,500	-6.5	165,700
Fixed O&M	-900	-0.5	164,800
Combined effect	**-12,000**	**-6.8**	**164,800**

Appendix D. Variation in Maximum Reserve Capacity Price and constituent costs



	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Power station cost	$79,110	$107,404	$135,701	$134,019	$149,306	$158,710	$113,971	$104,178	$119,942	$108,649
Transmission costs	$16,558	$18,017	$20,672	$13,151	$58,493	$51,621	$12,328	$12,164	$16,127	$16,860
Fixed O&M	$23,900	$13,363	$14,392	$13,431	$27,335	$26,649	$33,384	$34,239	$33,238	$32,307
Fuel costs	$2,907	$3,456	$2,631	$3,151	$2,615	$2,825	$2,239	$4,680	$5,442	$5,061
Land costs	NA	NA	NA	$293	$769	$818	$1,972	$1,783	$2,064	$1,912
MRCP	$122,500	$142,200	$173,400	$164,100	$238,500	$240,600	$163,900	$157,000	$176,800	$164,800
Excess capacity	6.43%	11.44%	2.19%	5.83%	8.99%	14.59%	13.79%	11.02%	NA	NA
Reserve Capacity Price	$97,837	$108,459	$144,235	$131,805	$186,001	$178,477	$122,427	$120,199	NA	NA

Appendix E. Abbreviations

CAPM – Capital Asset Pricing Model

CPI – consumer price index

DRP – debt risk premium

ERA – Economic Regulation Authority

MRCP – Maximum Reserve Capacity Price

MRCPWG – Maximum Reserve Capacity Price Working Group

MW – megawatt

OCGT – open cycle gas turbine

O&M – operating and maintenance

PwC – PricewaterhouseCoopers

RBA – Reserve Bank of Australia

SKM – Sinclair Knight Merz

SWIS – South West interconnected system

WACC – weighted average cost of capital

WEM – Wholesale Electricity Market