INDEPENDENT MARKET OPERATOR

Draft Report: 2016 Maximum Reserve Capacity Price for the 2018-19 Capacity Year

6 November 2015

Executive summary

Each year, the 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 bid price that can be offered in a Reserve Capacity Auction and is also used as the basis to determine 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. It 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 draft report presents the outcome of the draft determination of the MRCP for the 2016 Reserve Capacity Cycle for the 2018-19 Capacity Year (2016 MRCP). The 2016 MRCP value will apply to the 2018-19 Capacity Year that covers the 1 October 2018 to 1 October 2019 period.

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 at full capacity;
- the fixed operating and maintenance (O&M) costs associated with the power station and transmission facilities;
- a margin (Margin M) for legal, approval, financing and insurance costs and contingencies; and
- the weighted average cost of capital (WACC).

The broad methodology employed for determining the 2016 MRCP has remained unchanged from the last four years.

Proposed 2016 MRCP for the 2018-19 Capacity Year

The IMO proposes a value of $156,400 per MW per year for the 2016 MRCP for the 2018-19 Capacity Year. This is a decrease of $8,400 or 5.1 per cent from the 2015 MRCP of $164,800 per MW per year.

[1] Available at: http://www.imowa.com.au/home/electricity/procedures.

Changes from the 2015 MRCP

Table ES.1 shows the year-on-year variation in the input parameters between the 2015 MRCP (for the 2017-18 Capacity Year) and the 2016 MRCP.

Table ES.1: Breakdown of variance between 2015 and 2016 MRCP

	Impact ($)	Impact (%)	MRCP ($)
2015 MRCP			**164,800**
Escalation factors	-2,500	-1.5	162,300
Power station cost	-1,600	-1.0	160,700
Margin M	0	0.0	160,700
Fixed fuel cost	-100	-0.1	160,600
Land cost	-100	-0.1	160,500
Transmission cost	-100	-0.1	160,400
WACC	-4,500	-2.7	155,900
Fixed O&M	500	0.3	156,400
2016 MRCP	**-8,400**	**-5.1**	**156,400**

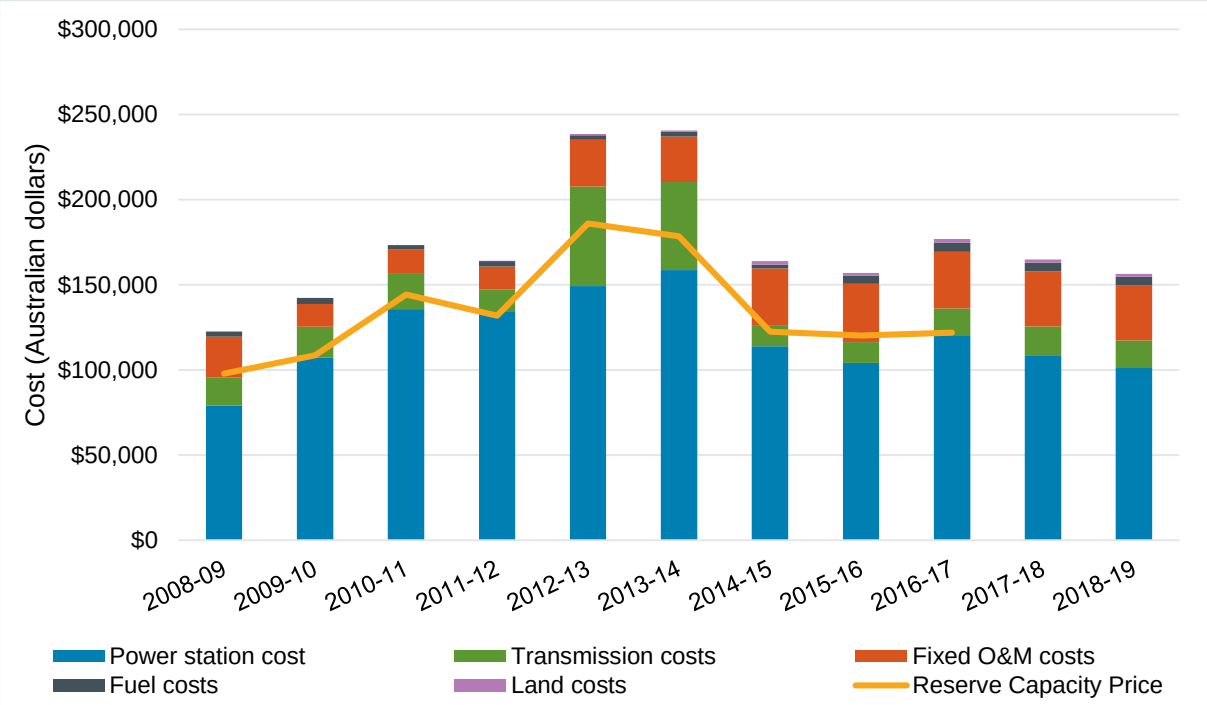
The key changes are:

- WACC has reduced the MRCP by 2.7 per cent, largely due to a reduction in the risk free rate;
- lower escalation factors have reduced the MRCP by 1.5 per cent, largely due to lower commodity prices, lower forecast inflation and labour prices in the year to 30 June 2015; and
- power station costs have reduced the MRCP by 1.0 per cent as a result of lower commodity prices, particularly for copper, steel and cement.

Historical variation of the MRCP

Figure ES.1 shows the MRCP values for the 2008-09 to 2018-19 Capacity Years. The MRCP has been fairly stable over this period, with the exception of 2012-13 and 2013-14 Capacity Years, when high transmission cost estimates caused the MRCP to increase. Individual cost components in the figure include the effect of WACC.

Figure ES.1: MRCP comparisons, 2008-09 to 2018-19 Capacity Year



As part of the five-yearly MRCP methodology review completed in 2011, the design of the theoretical power station was revised to reflect current market practice. Inlet cooling was incorporated into the design as it was observed that all OCGT generators built since market start included inlet cooling. This reduced power station costs calculated in the 2012 MRCP for the 2014-15 Capacity Year.

Changes to transmission use of system network access charges

As part of the Western Australian Government's Electricity Market Review (EMR)[2], the regulation of Western Power's distribution and transmission networks are expected to be transferred to the framework established under the National Electricity Rules on 1 July 2018. This will result in the cessation of the transmission use of system (TUOS) charge for generators.

The EMR team has requested that the IMO indicate in its draft and final MRCP reports:

- the impact of the removal of the TUOS charge on the MRCP for the 2018-19 Capacity Year; and
- it is likely that transition provisions will be introduced prior to 1 July 2018, to allow the recalculation of the MRCP.

[2] Further information is available at: https://www.finance.wa.gov.au/cms/Public_Utilities_Office/Electricity_Market_Review/Network_Regulation.aspx.

The IMO has determined that the removal of the TUOS charge will reduce the proposed 2016 MRCP value of $156,400 by $10,300 to $146,100 per MW per year.

Invitation for submissions

The IMO invites submissions on the proposed 2016 MRCP and the supporting information. The deadline for submissions is **4:00 PM (Western Standard Time)** on **4 December 2015**.

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1. Introduction

This draft report is produced in accordance with clause 4.16.6 of the Wholesale Electricity Market (WEM) 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 IMO is required to determine the MRCP in accordance with the Market Procedure: Maximum Reserve Capacity Price (Market Procedure)[3]. The proposed 2016 MRCP value is published in this draft report on the IMO website[4] for public consultation.

Following the public consultation process, the IMO must consider submissions before submitting a final 2016 MRCP value to the Economic Regulation Authority (ERA) for approval in accordance with clause 4.16.7 of the Market Rules.

This draft report presents the component costs calculated for the 2016 Reserve Capacity Cycle for the 2018-19 Capacity Year. The IMO uses publicly available information, combined with advice from independent engineering and economics consultants, Western Power and the Western Australian Land Information Authority (Landgate) to update the MRCP input parameters.

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

1.1 Reserve Capacity Cycle timing

This draft report has been prepared for the 2016 Reserve Capacity Cycle. The MRCP proposed in this draft report would be effective from 1 October 2018 to 1 October 2019.

1.2 General costing methodology and structure of this draft report

This draft report discusses the input parameters used to calculate the 2016 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 open cycle gas turbine (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 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] Available at http://www.imowa.com.au/home/electricity/procedures.
[4] Available at: http://www.imowa.com.au/home/electricity/reserve-capacity/maximum-reserve-capacity-price.

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

In determining the proposed 2016 MRCP, the IMO 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: Consultants and agencies

Organisation	Cost estimates provided
Jacobs Group (Australia) (Jacobs)	Power station capital costs Margin for indirect costs and contingencies Fixed fuel costs O&M costs
Landgate	Land costs
PricewaterhouseCoopers (PwC)	Debt risk premium (DRP)
Western Power	Transmission connection costs

1.3 Proposed 2016 MRCP for the 2018-19 Capacity Year

The IMO proposes a value of $156,400 per MW per year for the 2016 MRCP for the 2018-19 Capacity Year. This is a decrease of $8,400 or 5.1 per cent from the 2015 MRCP of $164,800 per MW per year. A detailed analysis of the changes since the 2015 MRCP is included in the body of this report.

1.4 Supporting documentation

The following related documents are available on the IMO website[5]:

- MRCP calculation spreadsheet, draft report version;
- Jacobs report dated 15 October 2015, *Review of the Maximum Reserve Capacity Price 2018-2019*;
- PwC letter dated 9 October 2015, *Estimated debt risk premium using the ERA's "bond yield" methodology*;
- WACC parameter calculation spreadsheet, draft report version;
- Landgate report dated 8 September 2015, *Land values for the Maximum Reserve Capacity Price for 2016*; and
- Western Power report dated 19 October 2015, *Total Transmission Cost Estimate for the Maximum Reserve Capacity Price for 2018/19*.

[5] Available at: http://www.imowa.com.au/home/electricity/reserve-capacity/maximum-reserve-capacity-price.

2. Escalation of costs

The Market Procedure describes the escalation factors that are applied to determine the 2016 MRCP costs incurred in 2018 based on data from 2015.

The 2016 MRCP calculation is based on a theoretical power station that would commence operation on 1 October 2018. In line with the Market Procedure, capital costs are escalated to 1 April 2018 and fixed O&M costs are escalated to 1 October 2018.

Table 2.1 shows the escalation factors used by the IMO to prepare the proposed 2016 MRCP.

Table 2.1: Escalation factors

Escalation factor	Financial year			
	2015-16 (%)	2016-17 (%)	2017-18 (%)	2018-19 (%)
Power station capital cost	0.38	4.16	3.48	4.44
Generation O&M cost	3.50	3.50	3.51	3.51
Connection asset O&M cost	4.10	4.10	4.10	4.10
Consumer price index (CPI)	2.50	2.50	2.50	2.50
Transmission connection cost	-2.22	-2.22	-2.22	-2.22

Where possible, escalation factors are based on forecast price movements. Labour costs and price indexes are based on projected long-run historical trends published by the Australian Bureau of Statistics.

The escalation factors have been determined as follows:

- The CPI escalation factor has been calculated using the Reserve Bank of Australia's (RBA) forecasts. The mid-point of the RBA's target for inflation (2 to 3 per cent) is used to determine the escalation rates from 2018-19.
- Power station capital cost escalation factors have been calculated by Jacobs for the annual forecast year as at 30 June 2015. Jacobs has calculated this escalation factor by weighting historical and forecast price movements for specific inputs including copper, steel and cement, as well as 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 published in this report have also been calculated by Jacobs using the Australian Electricity Gas Water Labour Price. These forecasts are determined from the 10 year average growth in the labour price index.
- Power station O&M escalation factors have also been calculated by Jacobs, based on a weighted average of 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.

With the exception of the escalation factors for the power station costs, all other components of the escalation factors have decreased compared to the previous year. In particular,

forecasts for copper, steel, cement have decreased between June 2014 and June 2015, reflecting recently observed lower prices of these commodities. Engineering construction cost forecasts in WA have fallen as a result of reduced infrastructure investment as resources projects move from the construction to production phase. Similarly, labour costs are forecast to be lower as demand for labour continues to decline due to the wind back in mining investment.

Further detail on the development of the escalation factors can be found in the related documents.

3. Input parameters to the MRCP calculation

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 for the determination of the 2016 MRCP. The scope provided to Jacobs was consistent with previous years.

The methodology used by Jacobs to calculate the power station capital costs was consistent with previous years'. Jacobs has used Siemens' SGT5-2000E 178 MW OCGT plant as the reference equipment, and obtained quotes directly from Siemens[6]. Jacobs then benchmarked these costs 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 proposed 2016 MRCP, **PC = $834,782 per MW**.

This has decreased by 3.6 per cent compared to the value used for the 2015 MRCP. The decrease is largely due to the reduction in commodity prices, particularly steel, copper and cement. Total capital costs for the power station, as provided by Jacobs, have decreased by 1.5 per cent as at June 2015. However, the power station capital cost escalation factor, used to calculate the price as at April 2018, has marginally increased compared to the 2015 MRCP (section 2 contains more detail).

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 the determination of the 2016 MRCP.

Margin M is estimated from the costs associated with recent, comparable developments, excluding any abnormal costs that are specific to certain projects. The 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 proposed 2016 MRCP, **M = 20 per cent**.

It should be noted that the IMO has been advised that the value for Margin M of 19.97 per cent originally quoted by Jacobs for the 2015 MRCP was incorrect. The correct value was 20.03 per cent, 0.06 percentage points higher, which Jacobs attributes to manual entry error. The IMO notes that correcting the Margin M factor error would have no impact on the 2015 MRCP.

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

Margin M for the proposed 2016 MRCP is 0.03 percentage points lower than the corrected value used for the 2015 MRCP. The decrease in Margin M is attributed to a 1.7 per cent reduction in project management costs and costs that are a factor of overall engineering, procurement and construction prices, slightly offset by an increase in legal costs.

3.1.3 Transmission connection costs (TC)

As part of its obligations under the Market Procedure, the transmission connection cost estimates were provided by Western Power for the determination of the 2016 MRCP. This is based on actual connection costs and access offers 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 accuracy of 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.

The methodology for calculating transmission connection costs was revised following the 2011 review of the MRCP methodology (as required under clause 4.16.9 of the Market Rules), assisted by the Maximum Reserve Capacity Price Working Group. Western Power used the revised methodology for the 2012 MRCP determination onward. The transmission connection costs estimated were lower than the estimates provided by Western Power for the 2010 and 2011 MRCP. This suggests that the 2010 and 2011 estimates were not reflective of actual capital contributions made by project developers that either secured a connection or were provided an access offer.

For the proposed 2016 MRCP, **TC = $160,280 per MW**.

Transmission connection costs have decreased by 0.6 per cent compared to the value used for the 2015 MRCP. This decrease is associated with lower escalation factors (section 2 contains more detail).

The IMO notes that, with the exception of 2010 and 2011, the transmission connection cost component of the MRCP has been relatively stable.

3.1.3.1 Easement costs

The IMO provides an estimate of easement costs for the direct connection scope to help Western Power determine transmission connection cost estimates.

The easement cost has been estimated in the same way as in previous years and is as follows:

- the easement is assumed to have an area of 12 hectares (2 kilometres long and 60 metres wide);
- it is assumed 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 2015 MRCP); and

- the purchase price per hectare has been calculated by using the cost of land parcels valued by Landgate (including transfer duty) (section 3.1.5 contains more detail).

To meet the requirements of the transmission connection cost calculation, the IMO has escalated the easement cost to 30 June 2016 using the relevant CPI escalation factor (as presented in Table 2.1). Further escalation of the easement cost to 1 April 2018 is carried out by Western Power in line with the transmission connection cost estimate methodology.

For the proposed 2016 MRCP, **the easement cost (as at 30 June 2016) = $5,112,812**.

This is a decrease of 2.3 per cent compared to the value used for the 2015 MRCP and is due to a fall in land values in the Collie, Eneabba, Kwinana and Pinjar regions.

3.1.4 Fixed fuel costs (FFC)

Fixed fuel costs for the determination of the 2016 MRCP were estimated by Jacobs. The scope of works provided to Jacobs was the same as previous years.

Jacobs provided its estimate as at 30 June 2015, which has been escalated to 1 April 2018 using the CPI escalation rates in Table 2.1.

For the proposed 2016 MRCP, **FFC = $7,124,703**.

Fixed fuel costs have decreased by 2.2 per cent compared to the value used for the 2015 MRCP. This is largely associated with a decrease in the price of diesel fuel, which has been estimated at $0.74 per litre, 18.7 per cent lower than the previous year. International oil prices have fallen by approximately 50 per cent since June 2014 which has affected the price of diesel. Therefore, the cost of the first fill of the storage tank has fallen to $600,300, compared to $742,400 included in the 2015 MRCP. These costs exclude taxes (where taxes include carbon costs, excise and GST) but include transportation and delivery costs.

3.1.5 Land costs (LC)

The IMO engaged Landgate to update the land cost estimates for the determination of the 2016 MRCP in line with the Market Procedure. The same approach to develop these costs was used as last year. Valuations were made for six regions where development of a power station in the SWIS is most likely, namely:

- Collie;
- Kalgoorlie;
- Kemerton Industrial Park;
- Kwinana;
- North Country[7]; and
- Pinjar.

[7] Defined as Geraldton and Eneabba.

Three hectare sites were used for all regions except Kemerton, where the minimum land size is five hectares.

Landgate's valuations were completed as at 30 June 2015 and exclude transfer duty (previously known as stamp duty). The IMO has added the applicable transfer duty to the cost of the land parcel using the Office of State Revenue's online calculator[8]. The IMO has calculated the average of the six valuations and escalated this to 1 April 2018 using the CPI escalation rates (as presented in Table 2.1).

For the proposed 2016 MRCP, **LC = $2,669,521**.

Total land costs have decreased by 3.0 per cent compared to the value used for the 2015 MRCP. The slowdown in the WA economy, driven by a weakening resources sector, has reduced demand for industrial property, resulting in lower sales and land prices. This has specifically affected the Collie, Kwinana, North Country and Pinjar regions.

3.1.6 Weighted average cost of capital (WACC)

The IMO engaged PwC to calculate the DRP. The remaining WACC components are calculated from publicly available information. The risk free rate and inflation calculations are published on the IMO's website[9]. The current corporate tax rate is 30 per cent, which is consistent with previous years.

WACC is determined according to the Capital Asset Pricing Model (CAPM), with bond yields considered in both the costs of equity and debt. The nominal risk free rate is determined from observed yields of Commonwealth Government bonds, while the DRP is derived from observed yields of corporate bonds.

The IMO notes that in recent years, the WACC used for the determination of the MRCP has been volatile. Growth in the Australian economy has weakened, predominantly driven by a substantial fall in mining investment. This is largely due to a weak global economy, falling commodity prices as China's growth falls and increased uncertainty in financial markets. Interest rates are expected to remain low due to slow economic recovery resulting in limited inflationary pressure.

The IMO notes that the risk free rate and the DRP for this draft report were calculated from market observations ending in September 2015. These parameters will be updated using the latest available data for the final 2016 MRCP. The decrease in the real risk free rate of return has been partially offset by an increase in the DRP compared to the 2015 MRCP.

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

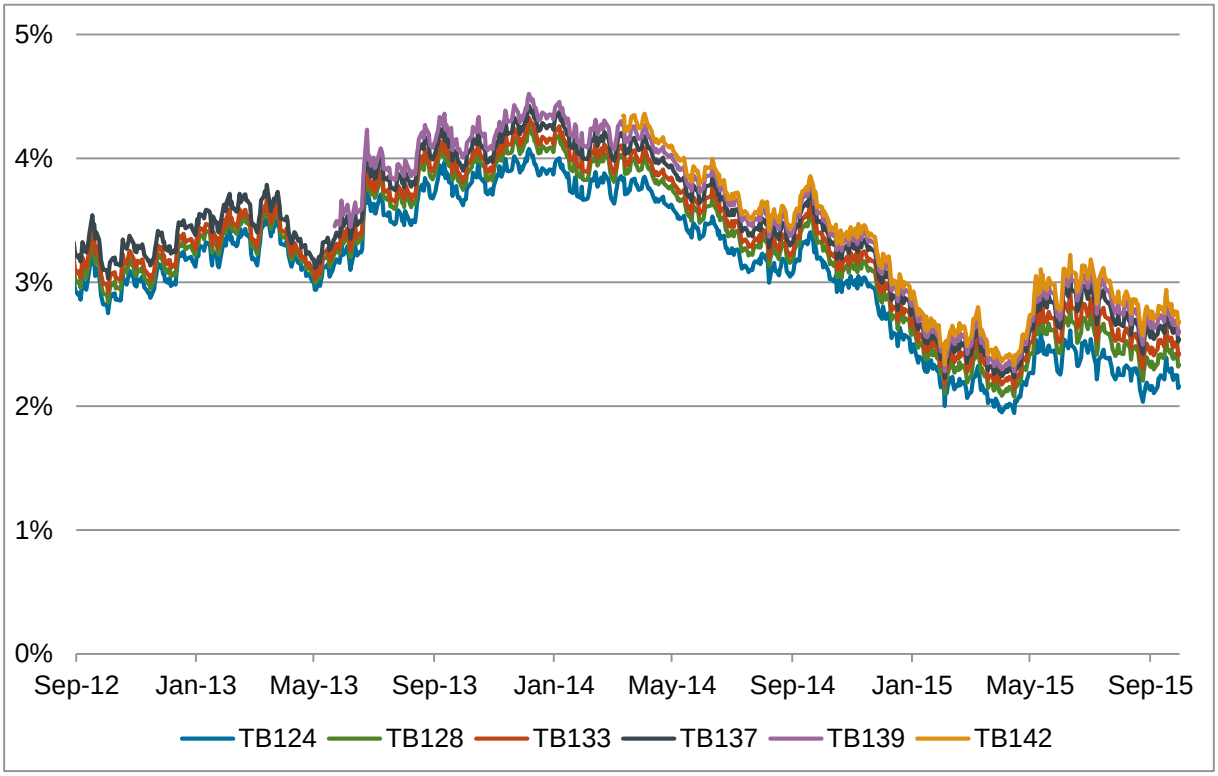
For the proposed 2016 MRCP, **WACC (real terms) = 5.30 per cent**.

This is lower than the WACC (real terms) of 5.81 per cent used for the 2015 MRCP, largely as a result of a decrease in the real risk free rate of return. The nominal risk free rate of return was calculated from Treasury bond yields in the same way as last year, adjusted for inflation to determine the real risk free rate of return. The nominal risk free rate has decreased to 2.75 per cent from 3.32 per cent in 2015.

[8] Available at: https://rol.osr.wa.gov.au/Calculators/faces/Calculators?_afrLoop=247790592985840&_afrWindowMode=0&_adf.ctrl-state=re8l3w9ui_4.
[9] See http://www.imowa.com.au/home/electricity/reserve-capacity/maximum-reserve-capacity-price.

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 slightly since the last calculation of the MRCP in late 2014, resulting in a decrease in the nominal risk free rate.

Figure 3.1: RBA bond yields, September 2012 to September 2015



3.1.6.1 Debt risk premium

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." Since the global financial crisis, the IMO notes that Australian regulators have used multiple methodologies for calculating the DRP as bond market data has become more difficult to obtain. Australian regulators have yet to implement a common methodology.

The IMO uses the ERA's current bond yield methodology, published in the "Rate of Return Guidelines"[10] with Standard and Poor's BBB rated bonds in estimating the DRP.

The ERA has recently adopted a modified bond yield approach to calculate the DRP in its "Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution System"[11] on 1 July 2015. 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.

The IMO notes that while the ERA has deviated from its Rate of Return Guidelines in this decision, the Rate of Return Guidelines have not been amended and the ATCO decision is currently the only decision in which this methodology has been used. Therefore, the IMO

[10] Available at: https://www.erawa.com.au/gas/gas-access/guidelines/rate-of-return-guidelines.
[11] Available at: http://www.erawa.com.au/cproot/12938/2/20141014%20D129552%20%20GDS%20-%20ATCO%20-%20AA4%20-%20Draft%20Decision%20-%20PUBLIC.pdf.

considers that the modified bond yield methodology is yet to be established as accepted Australian regulatory practice and has not adopted it for the 2016 MRCP determination.

The IMO further notes that the Australian Energy Regulator's (AER) methodology[12] differs from the ERA's. The AER uses a third party data service provider (such as Bloomberg) as the source of benchmark cost of debt estimates, and specifies the use of a trailing average portfolio approach to calculating the return on debt. The IMO understands that the AER has continued to use the Rate of Return Guidelines in its recent access arrangement decisions[13]. However, this method is considered inappropriate for the financing assumptions for a new asset, and therefore has not been considered in the determination of the 2016 MRCP.

For the 2016 MRCP, the IMO considers it appropriate to calculate the DRP using the bond yield approach on Australian bonds, consistent with the 2015 MRCP. The bond yield approach has been applied in numerous decisions by the ERA since 2011 and the IMO considers that this methodology is still representative of current accepted Australian regulatory practice.

The IMO will continue to monitor regulatory practice in relation to the DRP calculation for future MRCP determinations and amend the methodology accordingly.

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 component costs determined in sections 3.1.1 to 3.1.6 as follows:

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

For the proposed 2016 MRCP, **CAP_COST = $189,508,003**.

3.2 Fixed operating 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 previous years.

An annuity is calculated based on 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 $32,955,000 in June 2015 dollars. This cost is then annualised and escalated to 1 October 2018 (the date on which these costs are expected to commence) using the power station O&M escalation factors.

For the proposed 2016 MRCP, **Generation fixed O&M costs = $16,330 per MW per year.**

This cost has increased by 1.4 per cent compared to the value used for the 2015 MRCP, mainly as a result of an increase in forecast CPI.

[12] Available at: http://www.aer.gov.au/node/18859.
[13] See: https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements?f[0]=type%3Aaccc_aer_access_arrangement.

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 previous years.

An annuity is calculated from 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 2015. This cost is annualised and escalated to 1 October 2018 (the point at which these costs are assumed to start), using the connection asset O&M escalation factor.

For the proposed 2016 MRCP, **Transmission fixed O&M costs = $502 per MW per year**.

This cost has increased by 2.7 per cent compared to the value used for the 2015 MRCP, largely associated with higher switchyard O&M costs.

3.2.3 Network access charges

Western Power's network access tariffs and prices list (Price List) provides the various charges for network access and related services that apply for generation facilities. The IMO has determined the network access charge based on the 2015-16 Price List approved by the ERA[14].

It is assumed that the power station is connected to the transmission system, so Transmission Reference Tariff 2 has been used to determine the 2016 MRCP.

As the network access charge varies by location, the IMO has considered the list of six regions nominated in the Market Procedure and used the unit price for the most expensive location. Muja has the highest price among the power stations located in the regions listed in the Market Procedure for 2015-16 and its price has been used to determine the 2016 MRCP.

Costs are assumed at 1 July 2015 and have been escalated by CPI to 1 October 2018.

For the proposed 2016 MRCP, **Fixed network access costs = $11,150 per MW per year**.

This cost has increased by 1.6 per cent compared to the value used for the 2015 MRCP. Increased control system service charges and use of system charges are the main drivers in the increase of network access costs for the 2016 MRCP.

As part of the Western Australian Government's Electricity Market Review (EMR)[15], the regulation of Western Power's distribution and transmission networks are expected to be transferred to the framework established under the National Electricity Rules on 1 July 2018. This will result in the cessation of the transmission use of system (TUOS) charge for generators.

The EMR team has requested that the IMO indicate in its draft and final MRCP reports:

- the impact of the removal of the TUOS charge on the MRCP for the 2018-19 Capacity Year; and

[14] See http://www.erawa.com.au/electricity/electricity-access/western-power-network/annual-price-lists-for-network-charges for more information.
[15] Further information is available at: https://www.finance.wa.gov.au/cms/Public_Utilities_Office/Electricity_Market_Review/Network_Regulation.aspx.

- it is likely that transition provisions will be introduced prior to 1 July 2018, to allow the recalculation of the MRCP.

The IMO has determined that the removal of the TUOS charge will reduce the proposed 2016 MRCP value by $10,300 per MW per year to $146,100 per MW per year.

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.

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, who derive no benefit from providing estimates to the IMO, prefer to remain anonymous to protect 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 used updated advice on insurance costs from an independent broker to calculate insurance premiums as follows:

- Asset replacement and business interruption insurance is estimated as $551,923 per year as at 1 April 2018, calculated as 0.24 per cent of the limit of liability at that date, as provided by the independent broker. 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 re-construction period.

  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 (section 3.1.1);
  - M is margin M (section 3.1.2);
  - CC is the expected Capacity Credit allocation (section 4.3); and
  - FFC is the fixed fuel cost (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 determination of the MRCP, 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 $108,900 per year as at 30 June 2015 which includes 10 per cent transfer duty and 10 per cent GST, for a limit of $50 million for any one occurrence.
- A cost of $20,000 per year as at 30 June 2015 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 assumptions that the insurance covers:

- a newly constructed generation facility with on-site diesel storage;
- the facility being located in a rural region of the SWIS, without cyclone risk;
- 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.

Insurance costs have been escalated to 1 October 2018 (the point at which these costs are expected to commence) using the CPI escalation factor.

For the proposed 2016 MRCP, **Insurance costs = $4,641 per MW per year**.

This cost has decreased by 2.0 per cent compared to the value used for the 2015 MRCP, as a result of lower business interruption and asset replacement insurance premiums.

Insurance premiums have continued to fall in the past year as a result of fewer natural disasters and manufacturing claims across most industry segments, including electricity generation.

3.2.5 Total fixed operating and maintenance costs

For the proposed 2016 MRCP, **ANNUALISED_FIXED_O&M = $32,623 per MW per year**.

Total fixed operating and maintenance costs have increased by 1.0 per cent compared to the value used for the 2015 MRCP, largely as a result of the changes in the components discussed in sections 3.2.1 to 3.2.3.

4. Proposed 2016 MRCP for the 2018-19 Capacity Year

4.1 Annualised capital costs (ANNUALISED_CAPCOST)

The annualised capital cost is calculated using:

- the capital cost of $189,508,003 (section 3.1.7);
- the WACC (real terms) of 5.30 per cent (section 3.1.6); and
- a term of 15 years as required by the Market Procedure.

For the proposed 2016 MRCP, **ANNUALISED_CAPCOST = $18,628,774 per year**.

4.2 Annualised fixed operating 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 proposed 2016 MRCP, **ANNUALISED_FIXED_O&M = $32,623 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 provides 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 proposed 2016 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 proposed 2016 MRCP is therefore calculated to be $156,402. The MRCP is rounded to the nearest $100 and therefore, **MRCP = $156,400 per MW per year**.

The proposed 2016 MRCP is 5.1 per cent lower than the 2015 MRCP.

Table 4.1 shows the change between the 2015 and 2016 MRCP values, broken down by input parameter. This shows that most of the variance was caused by a decrease in WACC, escalation factors and power station costs. WACC decreased as a result of a reduction in the risk free rate (section 3.1.6), while escalation factors and power station costs declined because of falls in commodity prices such as copper, steel and cement (section 2 and section 3.1.1).

Table 4.1: Breakdown of variance between 2015 and 2016 MRCP

	Variance ($)	Variance (%)	MRCP ($)
2015 MRCP			**164,800**
Escalation factors	-2,500	-1.5	162,300
Power station cost	-1,600	-1.0	160,700
Margin M	0	0.0	160,700
Fixed fuel cost	-100	-0.1	160,600
Land cost	-100	-0.1	160,500
Transmission cost	-100	-0.1	160,400
WACC	-4,500	-2.7	155,900
Fixed O&M	500	0.3	156,400
2016 MRCP	-8,400	-5.1	**156,400**

5. Invitations for submissions

The IMO invites submissions on the proposed 2016 MRCP and the supporting information.

5.1 Submission guidelines

Submissions must be made in writing, should clearly address issues that interested parties consider relevant to this review and should provide supporting evidence or calculations where appropriate.

In keeping with the principle of open and transparent processes, all submissions will be published on the IMO website. If confidential information is provided in a submission as supporting evidence, it must be clearly marked as confidential, and will be excluded when the submission is published.

5.2 Making a submission

The IMO prefers to receive submissions by email to capacity@imowa.com.au. Written submissions may also be sent to the IMO by post, addressed to:

Independent Market Operator
Attn: A/Group Manager, Development and Capacity
PO Box 7096
Cloisters Square, Perth, WA 6850

The deadline for submission is **4:00 PM (Western Standard Time)** on **4 December 2015.**

General enquiries may be directed to Ross Stottelaar or Neetika Kapani on (08) 9254 4300.

5.3 Workshop

Following the close of submissions, the IMO may hold a workshop on the proposed 2016 MRCP to discuss any contentious issues that have arisen as part of the consultation process. Submissions and issues raised at the workshop will be considered in developing the final 2016 MRCP to be submitted to the ERA for approval.

Appendix A. Weighted average cost of capital (WACC)

The pre-tax real 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

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

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 proposed 2016 MRCP compared with the values used for the 2015 MRCP. PwC calculated the DRP and the IMO has determined the remaining annual parameters using publicly available information. The more volatile parameters (highlighted in the table) will be recalculated before the IMO publishes the final report to ensure that the most up to date information is included.

Table A.1: WACC parameters for the 2015 and 2016 MRCP

Parameter	Notation	2016 value	2015 value
Nominal risk free rate of return (%)	R_f	2.75	3.32
Expected inflation (%)	i	2.50	2.52
Real risk free rate of return (%)	R_{fr}	0.24	0.78
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	1.993	1.68
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 proposed 2016 MRCP, **WACC = 5.30 per cent**.

Appendix B. Calculation of the MRCP

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

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

where:

MRCP is the Maximum Reserve Capacity Price to apply in a Reserve Capacity Auction, expressed in Australian dollars per MW per year;

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 weighted average cost of capital (WACC); and

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

Table B.1: MRCP components for 2015 and 2016

	2016 value	2015 value	Unit
MRCP	**156,400**	**164,800**	**AU$/MW/year**
ANNUALISED_FIXED_O&M	32,623	32,307	AU$/MW/year
ANNUALISED_CAPCOST	18,628,774	19,938,596	AU$/year
- CAPCOST	189,508,003	196,083,112	AU$
- WACC	5.30	5.81	%
- Term of finance	15	15	Years
CC	150.5	150.5	MW

Appendix C. Comparison of the 2015 and proposed 2016 MRCP

Table C.1: Comparisons between 2015 and proposed 2016 MRCP

	2016	2015	Units
PC	834,782	865,836	$/MW
M	20.00	19.97[16]	%
TC	160,280	161,194	$/MW
FFC	7,124,703	7,282,060	$
LC	2,669,521	2,751,637	$
CAP_COST	189,508,003	196,083,112	$
Term of finance	15	15	Years
WACC	5.30	5.81	%
ANNUALISED_CAPCOST	**18,628,774**	**19,938,596**	**$/Year**
CC	150.5	150.5	MW
ANNUALISED_CAPCOST	18,628,774	19,938,596	$/Year
ANNUALISED_FIXED_O&M	32,623	32,307	$/MW/Year
MRCP	**156,400**	**164,800**	**$/MW/Year**

[16] The corrected figure is 20.03 per cent, however, the value of 19.97 per cent was used for the 2015 MRCP (further detail is provided in section 3.1.2).

Appendix D. Variation in MRCP and constituent costs

Figure D.1: MRCP comparisons, 2008-09 to 2018-19 Capacity Year

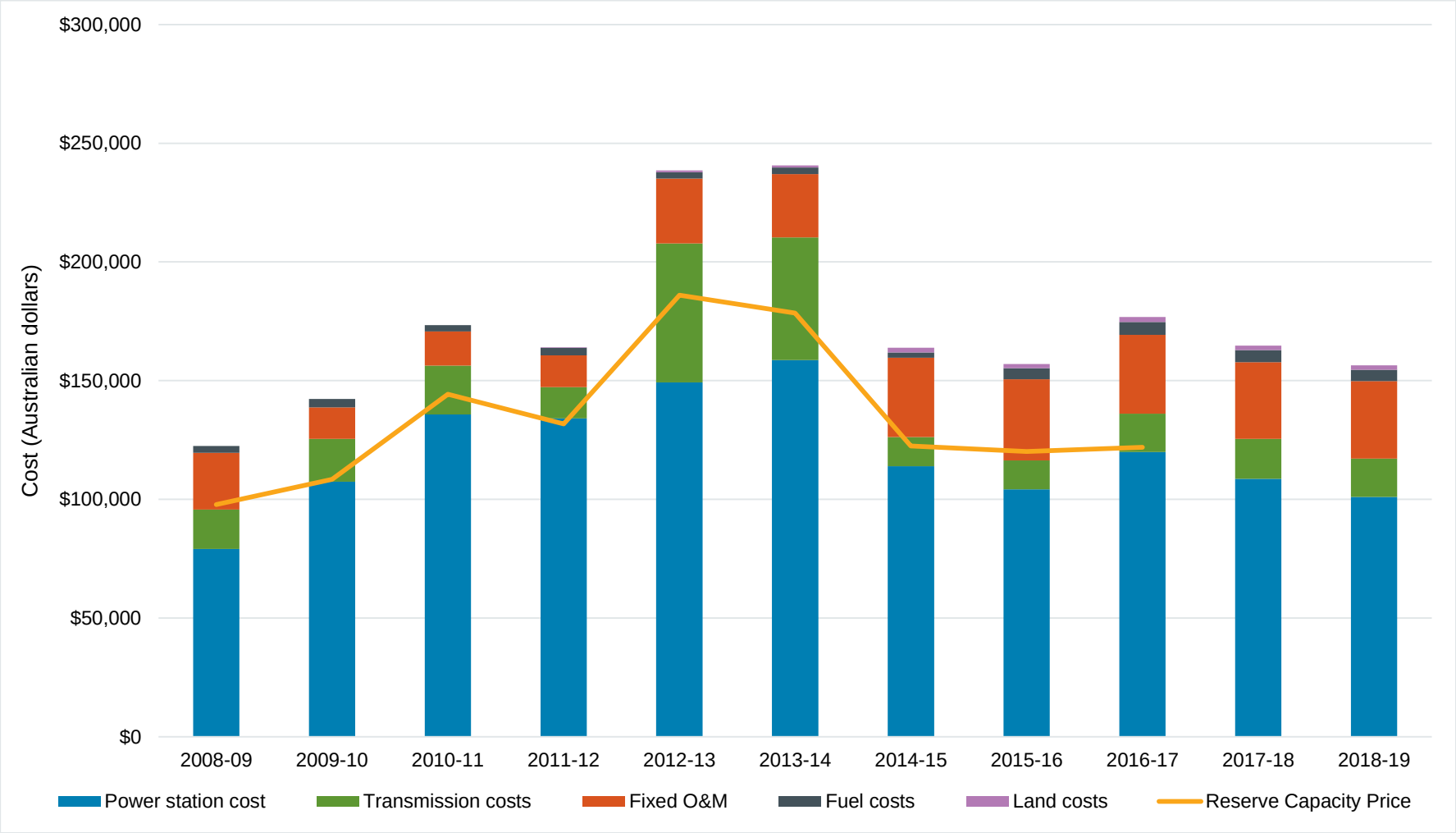


Table D.1: MRCP comparisons, 2008-09 to 2018-19 Capacity Year

	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Power station cost	$79,110	$107,404	$135,701	$134,019	$149,306	$158,710	$113,971	$104,178	$119,942	$108,649	$101,047
Transmission costs	$16,558	$18,017	$20,672	$13,151	$58,493	$51,621	$12,328	$12,164	$16,127	$16,860	$16,168
Fixed O&M	$23,900	$13,363	$14,392	$13,431	$27,335	$26,649	$33,384	$34,239	$33,238	$32,307	$32,623
Fuel costs	$2,907	$3,456	$2,631	$3,151	$2,615	$2,825	$2,239	$4,680	$5,442	$5,061	$4,775
Land costs	NA	NA	NA	$293	$769	$818	$1,972	$1,783	$2,064	$1,912	$1,789
MRCP	$122,500	$142,200	$173,400	$164,100	$238,500	$240,600	$163,900	$157,000	$176,800	$164,800	$156,400
Excess capacity	6.43%	11.44%	2.19%	5.83%	8.99%	14.59%	13.79%	11.02%	23.28%	NA	NA
Reserve Capacity Price	$97,837	$108,459	$144,235	$131,805	$186,001	$178,477	$122,427	$120,199	$121,899	NA	NA

Appendix E. Abbreviations

AER – Australian Energy Regulator

CAPM – Capital Asset Pricing Model

CPI – consumer price index

DRP – debt risk premium

EMR – Electricity Market Review

ERA – Economic Regulation Authority

MRCP – Maximum Reserve Capacity Price

MW – megawatt

OCGT – open cycle gas turbine

O&M – operating and maintenance

PwC – PricewaterhouseCoopers

RBA – Reserve Bank of Australia

SWIS – South West interconnected system

TUOS – transmission use of system

WACC – weighted average cost of capital

WEM – Wholesale Electricity Market