Independent Market Operator

MRCPWG

Agenda

Meeting No.	8
Location:	IMO Board Room, Level 3, Governor Stirling Tower, 197 St Georges Terrace, Perth
Date:	Thursday, 24 March 2011
Time:	Commencing at 3.00 to 5.00pm

Item	Subject	Responsible	Time
1.	**WELCOME AND APOLOGIES / ATTENDANCE**	**Chair**	5 min
2.	**MINUTES OF PREVIOUS MEETING**	**Chair**	5 min
3.	**ACTIONS ARISING**	**Chair**	5 min
4.	**DEEP CONNECTION COSTS – DRAFT REPORT**	**IMO/SKM**	30 min
5.	**WEIGHTED AVERAGE COST OF CAPITAL – DEBT RISK PREMIUM**	**IMO**	15 min
6.	**SUBMISSIONS FROM 2011 MRCP DETERMINATION**	**IMO**	30 min
7.	**DRAFT MARKET PROCEDURE**	**IMO**	20 min
8.	**GENERAL BUSINESS**	**IMO**	5 min
9.	**NEXT MEETING** Thursday 5 May 2011 (3:00-5:00pm)	**Chair**	5 min

Independent Market Operator

MRCPWG

Minutes

Meeting No.	7
Location:	IMO Board Room Level 3, Governor Stirling Building, 197 St Georges Terrace, Perth
Date:	Thursday 17 February 2011
Time:	Commencing at 3:15 to 4:45pm

Attendees	
Troy Forward	IMO (Chair)
Greg Ruthven	IMO
Monica Tedeschi	IMO
Johan van Niekerk	IMO (Minutes)
Brad Huppatz	Market Generator
Pablo Campillos	DSM Aggregator
Neil Gibbney	Western Power
Neil Hay	System Management
Geoff Glazier	Sinclair Knight Merz (SKM) (3:15 – 4:15pm)
Apologies	
Shane Cremin	Market Generator
Corey Dykstra	Market Customer
Steve Gould	Market Customer
Patrick Peake	Market Generator

Item	Subject	Action
1.	**WELCOME AND APOLOGIES / ATTENDANCE** The Chair opened the 7th meeting of the Maximum Reserve Capacity Price (MRCP) Working Group (Working Group) at 3:15pm. Apologies were noted from Mr Shane Cremin (Market Generator), Mr Corey Dykstra (Market Customer), Mr Steve Gould (Market Customer) and Mr Patrick Peake (Market Generator).	
2.	**MINUTES OF PREVIOUS MEETING** The minutes of the 6th MRCP Working Group meeting, held 20 January 2011, were circulated prior to the meeting. There were no amendments to the minutes and the Working Group agreed to publish them as final.	

Item	Subject	Action
	Action Point: The IMO to publish Meeting 6 minutes on the website as final.	**IMO**
3	**ACTION POINTS** Where actions were not completed Mr Ruthven noted the following: • AP36: The IMO will present a draft updated Market Procedure, allowing for the inclusion of inlet cooling in the power station costs, to the next meeting on 24 March 2011. • AP37: The IMO to initiate a review of the relationship between humidity rates and generator output across a range of locations. This review is still pending. Mr Ruthven confirmed this should be completed in time for the meeting in April. • AP38: The IMO to seek clarification from SKM on the components included in its assessment and seek advice on whether they consider there is a better way to determine Margin M. The Chair questioned whether the Group was confident that the process for calculation of Margin M by SKM was sufficiently robust and transparent. It was agreed that the following actions would be taken: *Action Point: SKM to provide a document with a brief synopsis behind the methodology for generating each component of Margin M.* *Action Point: The IMO to engage an engineering consultant to undertake an exercise to independently provide a Margin M calculation for comparison purposes.* • AP40: Mr Ruthven advised that the Economic Regulation Authority (ERA) was continuing its work on an alternative Debt Risk premium methodology. It was anticipated that this would be available prior to the 24 March 2011 meeting. • AP 43: It was noted that the discussions between SKM and Western Power regarding Connection Costs would be discussed under the next agenda item.	**SKM** **IMO**
4	**DEEP CONNECTION COSTS – DRAFT REPORT** Mr Geoff Glazier confirmed that SKM had prepared a model as agreed which had been provided to Western Power to populate with data. Mr Glazier advised that the figures produced under the recommended methodology resulted in significantly lower Total Transmission Costs (TC) of approximately 30% of the value determined under the current methodology for the 2011 MRCP. Mr Glazier outlined the current discrepancy in definitions between the Market Procedure and Western Power regarding shallow versus deep connection costs and shared versus direct connection assets. Mr Glazier confirmed that it was SKM's opinion that while it was outside their scope, there were good grounds to consider the use of Total Connection Costs (TCC) as the basis for calculating TC.	

Item	Subject	Action
	Mr Glazier advised that it was simpler to use this basis for the calculation of TC as it would be problematic, although still possible, for Western Power to extract Deep Connection Costs (DCC) under the current methodology as there was no clear division between shallow and deep connection costs. Mr Glazier explained that the primary reason for the significantly lower value of 30% (of the current method value), under the proposed methodology was that recent connections were typically opportunistic in accessing transmission connection, confirming that this was not necessarily what was envisioned when the current methodology was agreed. Mr Glazier confirmed that to some extent the use of the forecasting margin would give some scope for adjusting the TC result on an annual basis. It was noted that whilst the projected costs continued to be calculated based on a model 160MW Open Cycle Gas Turbine (OCGT), the preferred methodology utilised input data including that in respect of smaller generators in order to have a large enough sample size and in order to access annual actual access offer data. Mr Glazier confirmed that in respect of the current year, actual connection offers from Western Power were used. There could be issues if there were no access offers in any future years but that allowances could be made if such a situation arose. Mr Glazier confirmed that the preferred methodology was based on the approach of an efficient capacity provider connecting to the network, balancing all expenses including land and connection costs. The Chair asked, and Mr Gibbney confirmed he was comfortable with SKM's proposed methodology. In addition Mr Gibbney stated that while he didn't disagree with SKM's proposal it would likely see a downward movement in TC. Mr Brad Huppatz questioned whether adoption of the preferred methodology would sufficiently incentivise prospective investors. Mr Neil Hay stated that the process should aim to not only seek economic efficiency but also useability as well as encourage prospective investors to not only seek out least cost connections but also those that result in overall system reliability. Mr Glazier advised that many new connections were being made near existing switchyards where there was available capacity (spare connection bays) possibly leading to savings in the region of $3-4M for new entrants when compared with the current methodology. Mr Glazier confirmed that it was envisioned that there would not be undue volatility in TC from year to year but that SKM could in conjunction with Western Power produce a trend-line graph with no scale to provide a signal to prospective investors on the likely future trend in costs. *Action Point: SKM in conjunction with Western Power to produce a trend-line graph of the trend in TC.* Mr Glazier advised that efficient participants would most likely continue to find innovative and economically efficient ways to connect to the network and that as a result this should be taken	 **SKM/Wester Power**

Item	Subject	Action
	into account in the process of generating the TC for the MRCP process. Mr Glazier outlined the weightings used within the preferred methodology and that the challenge was to calculate the long run marginal cost of network connection while ensuring that year on year changes in connection costs were reasonably stable. The Chair stated that in his opinion the process seemed reasonable, however suggested that due to there being a relatively large number of Members missing from the meeting that it would be best to continue the discussion at the next meeting. *Action Point: Include ongoing discussion of Deep Connection Costs Report on agenda for next Meeting.* It was confirmed that that there was an awareness of issues surrounding data and generation plant size for inclusion in modelling, and that care would need to be taken to ensure that the inclusion of small generation projects did not lead to undue downward bias in the TC calculation. It was agreed that SKM would provide more detail surrounding the forecast margin at the next meeting and continue discussions with Western Power leading up to the next meeting to provide additional clarity surrounding data used for TC calculation. *Action Point: SKM to provide more detail surrounding the forecast margin and data validity at the next meeting.*	**IMO** **SKM**
5	**WEIGHTED AVERAGE COST OF CAPITAL METHODOLOGY – UPDATED DRAFT REPORT AND MEMBER FEEDBACK** Mr Ruthven confirmed that the updated Draft Report was included in the agenda pack and detailed the feedback that had been received from Members. Mr Ruthven explained the IMO's recommendation to include debt issuance costs in the Weighted Average Cost of Capital (WACC) calculation and to remove those same costs from Margin M in the Deep Connection Cost (DCC) calculation in order to avoid any overlap. The Working Group agreed to accept the IMO's recommendation regarding debt issuance costs. *Agreed Outcome: Debt issuance costs to be included in the WACC calculation and no longer included in Margin M within the DCC calculation.* It was noted that, contrary to the recommendation of PwC, the gearing ratio would be maintained at 40% as the Group believed there was no compelling argument for change. *Agreed Outcome: Gearing ratio to be maintained at 40%.* It was agreed that the WACC report from PwC would be accepted on that basis and once the report was updated it would be published. *Action Point: IMO to publish final WACC report.* Mr Ruthven confirmed that the IMO would go ahead with the	**IMO**

Item	Subject	Action
	revision of the Market Procedure taking account of the agreed revisions.	
6	**SUBMISSIONS FROM 2011 MRCP DETERMINATION** Mr Ruthven detailed the issues raised in submissions received during the 2011 MRCP determination. It was confirmed that the current basis for calculation of escalation factors was to use historical price movements to escalate prices forward to the coming year. Mr Ruthven confirmed that the IMO had held discussions with SKM surrounding forward looking models and that SKM have a well established methodology for providing information to regulatory authorities including the Australian Energy Regulator (AER), particularly for switchyard and transmission construction costs. Mr Ruthven confirmed that the weightings used by SKM for the power station capital cost were based on observations of private entities which have less visibility than regulated entities (e.g. network operators). The weightings for this escalator were developed specifically for this paper and have not been refined over several years, as is the case for the switchyard and transmission cost escalators. Mr Pablo Campillos queried as to whether any other party could provide this. In order to provide more clarity in this area it was agreed that this could be reviewed at the same time as the external review of Margin M as discussed earlier in the meeting. *Action Point: IMO to engage an engineering consultant to independently provide a view on forward-looking cost escalation factors.* With regard to insurance costs Mr Ruthven confirmed that these were not included in the fixed Operating Costs as the level of these costs were dependent on plant utilisation and that this should be priced-in based on the generators expected energy sales based on utilisation levels, which ultimately were a variable cost. It was noted by the Working Group that this may not be the case for a peaking power station with a 2% capacity factor. The comments regarding volatility in the MRCP were noted and it was agreed that further discussion, if required, would take place in future meetings. Regarding comments surrounding the variability of land parcels in differing locations it was agreed that any further discussion, if required, would take place in future meetings. The comments regarding the term to be used (currently 15 years) for recovery of capital costs in the MRCP calculation were noted. It was agreed that the IMO would distribute a summary of the impact of any change in the period used on the MRCP, in time for the next meeting. *Action Point: The IMO to provide a summary of the impact of an increase in the period used on the MRCP.*	**IMO** **IMO**
5	**GENERAL BUSINESS** Mr Huppatz queried whether allowance was made for expected	

Item	Subject	Action
	refund exposure within the MRCP calculation. It was noted for an OCGT that this would likely be in the region of 1-2% over the life of the plant. It was agreed that it was reasonable to include this on the agenda for discussion at the next meeting. *Action Point: Include an agenda item for discussion of the impact of refund exposure within the MRCP calculation process.*	**IMO**
6	**NEXT MEETING** Mr Ruthven noted that the next meeting would be held on Thursday 24 March 2011.	
7	**CLOSED:** The Chair declared the meeting closed at 4:45 pm.	

Agenda Item 3: MRCPWG - Action Points

Legend:

Unshaded	Unshaded action points are still being progressed.
Shaded	Shaded action points are actions that have been completed

#	Meeting Arising	Responsibility	Action	Status/Progress
36	Meeting 5	IMO	The IMO to update the Market Procedure to allow for the inclusion of inlet cooling in the power station costs, with the ability for the Consultant to specify the cost-effective technology type.	Completed. Inlet cooling is incorporated in the draft Market Procedure presented to Meeting 8 (24 March 2011).
37	Meeting 5	IMO	The IMO to initiate a review of the relationship between humidity rates and generator output across a range of locations.	Pending. Data to be presented at 5 May 2011 meeting.
38	Meeting 5	IMO	The IMO to seek clarification from SKM on the components included and excluded in its assessment and seek advice on whether they consider there is a better way to determine Margin M.	Completed. SKM summary report provided as Appendix A to this summary of action points. Margin M to be discussed at 5 May 2011 meeting after receipt of independent advice from WorleyParsons. See also Action 46.
40	Meeting 6	ERA / IMO	ERA to provide details of proposed alternative Debt Risk Premium methodology to IMO.	Completed. This is to be discussed under Agenda item 5.

#	Meeting Arising	Responsibility	Action	Status/Progress
43	Meeting 6	SKM / Western Power	SKM and Western Power to discuss data availability in order to supply data to SKM with a view to further investigating option 2 (Forecast DCC based on Historic Connection Costs Data).	Completed.
44	Meeting 6	MRCPWG	Working Group members to provide feedback on the SKM report to the IMO by 5pm on Thursday 3 February 2011.	Completed.
45	Meeting 7	IMO	The IMO to publish Meeting 6 minutes on website as final.	Completed.
46	Meeting 7	SKM	SKM to provide a document with a brief synopsis behind the methodology for generating each component of Margin M.	Completed. SKM summary report provided as Appendix A to this summary of action points. Margin M to be discussed at 5 May 2011 meeting after receipt of independent advice from WorleyParsons (Action 47). See also Action 38.
47	Meeting 7	IMO	IMO to engage an engineering consultant to undertake an exercise to independently provide a Margin M calculation for comparison purposes.	In progress. WorleyParsons appointed to perform work for completion in early April **(subject to agreement of terms and conditions for services)**. See also Action 52.
48	Meeting 7	SKM / Western Power	SKM and Western Power to produce a trend-line graph showing the trend in TC.	Completed. Included in SKM Research Report.
49	Meeting 7	IMO	Include ongoing discussion of Deep Connection Costs Report on agenda for next meeting.	Completed. Included in meeting agenda.
50	Meeting 7	SKM	SKM to provide more detail surrounding the forecast margin and data validity at the next meeting.	Completed. Included in SKM Research Report.
51	Meeting 7	IMO	IMO to publish final WACC report.	Completed.

#	Meeting Arising	Responsibility	Action	Status/Progress
52	Meeting 7	IMO	IMO to engage an engineering consultant to independently provide a view on forward-looking cost escalation factors.	In progress. WorleyParsons appointed to perform work for completion in early April. See also Action 47.
53	Meeting 7	IMO	IMO to provide a summary of the impact of an increase in the period used on the MRCP.	Complete. Provided to members with meeting papers for discussion under Agenda Item 6.

IMO Reserve Capacity Price

PROCESS FOR THE CALCULATION OF THE TERM M

-
- 15 March 2011

-
- 15 March 2011

Sinclair Knight Merz
ABN 37 001 024 095
Cnr of Cordelia and Russell Street
South Brisbane QLD 4101 Australia
PO Box 3848
South Brisbane QLD 4101 Australia
Tel: +61 7 3026 7100
Fax: +61 7 3026 7300
Web: www.skmconsulting.com

LIMITATION: This report has been prepared on behalf of and for the exclusive use of Sinclair Knight Merz Pty Ltd's Client, and is subject to and issued in connection with the provisions of the agreement between Sinclair Knight Merz and its Client. Sinclair Knight Merz accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

Contents

Document history and status

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
Rev 0	17 March 2011	Alex Lambe	Geoff Glazier	17 March 2011	Rev 0

Distribution of copies

Revision	Copy no	Quantity	Issued to

Printed:	17 March 2011
Last saved:	17 March 2011 02:19 PM
File name:	Document2
Author:	Alex Lambe
Project manager:	Alex Lambe
Name of organisation:	Independent Market Operator
Name of project:	Process for the Calculation of the Term M
Name of document:	
Document version:	Rev 0
Project number:	

1. Introduction

The IMO has requested SKM to provide a summary of the process it uses to calculate the Term M component of the MRCP calculation for further consideration by the MRCP Working Group.

To this end, this document summarises the process used by SKM in the determination of the Term M and articulates some of the challenges in working with the highly confidential and irregular data set that underpins the M calculation.

2. Background

Section 1.14 of the IMO's market procedure for making a determination of the maximum reserve capacity price version 1.1, introduces and defines the term 'M' as; "*a margin to cover legal, approval, and financing costs and contingencies.*"[1]

SKM understands that the inclusion of term 'M' within the calculation provides a means to account for specific additional indirect costs that would be expected to be incurred by the developers of the Power Station upon which the Maximum Reserve Capacity Price is based.

The indirect costs are then incorporated into the capital cost determination as a margin, i.e. a fixed percentage, added to the capital cost:

Page 11 of the IMO's Market Procedure for Maximum Reserve Capacity Price identifies how the Term M fits into the maximum reserve capacity price calculations, being:

> *"The value of CAPCOST[t] is to be calculated as:*
>
> *CAPCOST[t] = (PC[t] x (1 +* ***M****) x CAP + TC[t] + FFC[t] + LC[t]) x (1+ WACC)^2*
>
> *Where:*
> *PC[t] is the capital cost of an open cycle gas turbine power station in year t, expressed in Australian dollars in year t per MW;*
> ***M is a margin to cover legal, approval, and financing costs and contingencies****;[Emphasis added]*
> *TC[t] is the cost of electricity transmission assets required to connect an open cycle gas turbine power station to the SWIS, plus an estimate of the costs of augmenting the shared network to facilitate the connection of the open cycle gas turbine power station, expressed in Australian million dollars in year t;*
> *FFC[t] is the fixed fuel costs and must represent the fixed costs associated with an on-site liquid storage tank with sufficient capacity for 24 hours of Liquid Fuel including the cost of keeping this tank half full at all times expressed in Australian million dollars in year t;*
> *LC[t] is the cost of land purchased in year [t]; and*
> *WACC is the Weighted Average Cost of Capital."*

---

[1] IMO 2008, "Market Procedure for Determination of the Maximum Reserve Capacity Price, 04 December, P11, Available as a download from: http://www.imowa.com.au/f711,54740/54740_Market_Procedure_for_Maximum_Reserve_Capacity_Price.pdf.

In calculating a suitable figure for ‘M,’ SKM estimates the Legal, Approval and Financing costs for a generic 160MW open cycle gas turbine plant, being the “*Power Station upon which the maximum reserve capacity price shall be based*” as defined in Section 1.5 of the IMO’s proposed methodology.

3. Calculation of the Term M

The term M costs have been estimated from in-house data and knowledge of comparable recent developments. SKM compares and correlates the costing data of several projects to develop a generic OCGT legal; approval and financing cost estimate for a generic 160 MW liquid fuelled open cycle gas turbine plant. Where applicable, varying costs are each normalised and any abnormal cost variations relating to unique or unusual project factors removed.

Table 1 shows the most recent SKM estimate for the term 'M' as defined in Appendix 4 of the WEM Rules, with due consideration given to standard industry practices. These costs include:

- legal costs associated with the design and construction of the power station;
- approval costs including environmental consultancies and approvals, and local, state and federal licensing, planning and approval costs;
- Cost of Raising Capital; and
- Owners project management and engineering costs.

Table 1 Estimate of term 'M'

Component of 'M'	% of Total EPC
Project Management	1.9%
Project Insurance	1.5%
Contingencies	5.0%
Cost of Raising Capital	4.0%
Environmental Approvals	0.7%
Legal Costs	1.2%
Owners Engineers - Part A (Including concept design, specification, tendering, contract negotiations)	0.4%
Owners Engineers - Part B (Including Construction Phase OE Costs, oversee project, witness tests & Commissioning)	3.0%
Initial Spares requirements	0.8%
Site Services (Provision of potable water, construction power, communications, domestic sewerage etc. at site)	0.1%
Total M as a percentage of CAPEX	**18.6%**
Multiplier in CAPEX equation 2	(1 + 0.186)

Further commentary on the calculation of each component of the term M is provided below.

3.1. Project Management and Contingency

The project management cost was derived from knowledge gained through undertaking a number of comparable EPC projects and due diligence reviews over the past 5 years. SKM note that in the most recent review it had limited recent (past year) data to draw from for this metric.

3.2. Project Insurance

The insurance cost was derived from knowledge gained through undertaking a number of comparable EPC projects and due diligence reviews over the past 5 years. In addition, SKM has sought input from recent discussions between SKM and major energy project insurers.

3.3. Cost of Raising Capital

The figure for the 'Cost of Raising Capital' has been estimated based on a fully underwritten project to build a 160MW OCGT power station; this is dependent on the nature of capital markets at the time of the capital raising process. This estimate incorporates the mandate fees of the Lead Arranger and the establishment fees of the Finance Providers. In the most recent report on the term M, SKM has referenced previous historic data, two Western Australian projects, and sought estimates from one company that provides Lead Arranger services in Western Australia.

3.4. Environmental Approvals and Legal Costs

Due to a lack of relevant recent data, in the most recent report SKM escalated the historic environmental approvals costs and legal costs at CPI and divided this by the PC(t) capital cost in the same report. This on the basis that these costs are linked to the price movements in Australia whist the PC(t) base is driven largely by international labour and commodity price trends.

3.5. Owners Engineers Costs, Initial Spares requirements and Site Services

These costs were derived from knowledge gained through undertaking a number of comparable EPC projects and due diligence reviews over the past 5 years.

3.6. Impact of Availability of data over the Past 12 months

Projects that provide a suitable source of data have been notably scarce in the last 12 months, due to both lack of investor confidence and increases in the tightening of financing processes, as a result of the Global Financial Crisis (GFC). For some components of the calculation this has required SKM to escalate previous data using Australian CPI and calculate this escalated cost as a percentage of the PC(t). This process is seen as a fall back, and in some cases supporting, solution to the use of a pool of recent project data.

3.7. Impact of Confidentiality on the Process of Managing Data

Due to the confidential nature of much of the information in the underlying data for this calculation resides behind confidentiality mechanisms (Chinese Walls) within SKM. This necessitates a process of aggregation across multiple projects by the SKM staff that have access to this data within the confidentiality mechanism. This aggregated / averaged information is then provided to the authors of the Term M report. Through this process, a range of disconnected averaging calculations are undertaken to build up the final factors. SKM does not and cannot maintain a central data sheet with the source data for this calculation.

Agenda Item 4: Deep Connection Cost Methodology – Research Report by Sinclair Knight Merz

1. BACKGROUND

The IMO appointed Sinclair Knight Merz (SKM) to undertake a review of the calculation methodology to be applied in determining Deep Connection Costs (DCC). SKM has prepared its research report, which is attached as Appendix A.

The research report builds on the interim discussion report prepared by SKM and presented at the 17 February 2011 meeting. The report provides detailed background commentary on the meaning and role of connection costs within the WEM, evaluation of the existing DCC methodology against a defined set of assessment criteria and comparison of the proposed alternative methodologies against the same assessment criteria. In particular, SKM describes its preferred methodology as an approach which calculates a weighted average of actual connection costs for liquid-fuel plant, with weights defined so that greater emphasis is given to more recent data.

An overview of the preferred methodology is provided including details on generators to be included, scope of connection costs, pro-rating capacity costs, escalation of capital costs, weighting of yearly cost to the calculated cost, forecasting margins, treatment of years with no relevant connections and integration into the Market Procedure.

It was agreed at the previous meeting that Western Power and SKM would discuss data availability in order to populate the model based on option 2 (Forecast DCC based on Historic Connection Costs Data) as well as produce a trend line graph for Transmission Costs. SKM has prepared a research report, which is attached.

The research report is provided to the MRCPWG for its evaluation and consideration.

2. RECOMMENDATION

The IMO recommends that the MRCPWG:

- **Discuss** the SKM research report and the recommendations contained within.

*

Calculation Methodology to be Applied in Determining Deep Connection Costs

RESEARCH REPORT

- Rev 2
- 17 March 2011

Calculation Methodology to be Applied in Determining Deep Connection Costs

RESEARCH REPORT

- Rev 2
- 17 March 2011

Sinclair Knight Merz
ABN 37 001 024 095
11th Floor, Durack Centre
263 Adelaide Terrace
PO Box H615
Perth WA 6001 Australia
Tel: +61 8 9469 4400
Fax: +61 8 9469 4488
Web: www.skmconsulting.com

Contents

Document history and status

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
Rev 0	13-1-2011	Geoff Glazier	David Healy		Interim Discussion Report
Rev 1	14 -1 -2011	Geoff Glazier	Scott Maves	14-1-2011	Final Report
Rev 2	17 -3 -2011		Geoff Glazier	17-3-2011	Final report with WP Data

Distribution of copies

Revision	Copy no	Quantity	Issued to
0	Electronic	1	Client
1	Electronic	1	Client
2	Electronic	1	Client

Printed:	22 March 2011
Last saved:	22 March 2011 09:36 AM
File name:	Document2
Author:	Geoff Glazier
Project manager:	Geoff Glazier
Name of organisation:	Independent Market Operator
Name of project:	Calculation Methodology to be Applied in Determining DCC
Name of document:	Research Report
Document version:	Rev 2
Project number:	WP04128

1. Executive Summary

This report follows a Interim Discussion Report provided to the Maximum Reserve Capacity Price Working Group and provides SKM's recommended Deep Connection Cost (DCC) calculation methodology.

The scope of this study was to undertake the following:

- Analyse any assumptions made by Western Power and the IMO in the estimation of the DCC used in the Maximum Reserve Capacity Price (MRCP) calculation for the 2010 Reserve Capacity Cycle and recommend adopting or replacing those assumptions. Where an assumption is recommended to be replaced, SKM will, if required, propose alternative assumptions. SKM will comment on both stated and implied assumptions; and
- If appropriate, propose an alternative methodology for estimating the DCC used in the MRCP, whilst also explicitly stating all assumptions made in the methodology.

In undertaking this review SKM analysed the assumptions made by Western Power in the estimation of the DCC against the following criteria:

- Accuracy – Extent to which the estimated DCC (as an input to the MRCP) drives the correct level of new capacity investment and supports the correct mix of generation technologies in the market.
- Certainty / Repeatability – Stability and repeatability of the methodology over time.
- Simplicity – Ease of understanding, management burden and cost associated with the calculation.
- Resilience – Extent to which methodology would be impacted by changes in Western Power's Access Arrangement or changes to other Market Rules or procedures.
- Flexibility – Extent to which the methodology can adapt to changes in technology and market conditions.

These criteria were selected as indicators of the extent to which the DCC calculation best meets the Market Objectives, consistent with work previously undertaken by MMA on issues to be addressed when considering Rule Changes. Different weightings were given to each criterion, these are:

Factor	Weighting
Accuracy	50%
Certainty	20%
Simplicity	20%
Resilience	5%
Flexibility	5%

This assessment has concluded that although the existing methodology seeks to accurately forecast the marginal cost of connecting peaking capacity to the network, the methodology introduces complexity associated with:

- identifying the next marginal point of connection.
- defining the minimum required works.
- estimating costs associated with these works.

In order to remain simple and cost effective the existing methodology introduces a range of assumptions and relies heavily on the experience of Western Power staff. These simplifying assumptions introduce significant inaccuracies to the calculation and undermine market certainty in the outcome. To address these shortfalls the report considers 3 alternative calculation methodologies, these being:

- A fixed annual allocation for the DCC based on an average cost of providing capacity on the network.
- A calculation of total connection cost based on a historic per MW connection cost for selected generators with different weightings on different years.
- A process that modelled a 160 MW new entrant generator as the number 1 queue applicant in which Western Power's Application and Queuing Policy and Capital Contribution Policy is accurately and fully applied, as if a real world connection.

In these options there is an inherent tension between accuracy, stability and simplicity. The report recommends a calculation methodology that uses a period-weighted average of historic DCC's to indicate a level of future connection costs which are then used as a proxy for setting an appropriate MRCP. This methodology is simple to implement and this report contends that the year to year movement in the marginal cost of connection will be less than the inaccuracy of the existing calculation methodology.

The recommended methodology produces a single connection cost that is intended to replace the Total Transmission Costs (TC) in the existing methodology.

The preliminary connection cost calculated by the recommended methodology spreadsheet yields a connection cost for the 2011 Reserve Capacity Cycle of 127,953 per MW. This represents a 58 % reduction on the 2011 calculation for TC.

2. Introduction

2.1. Scope of Report

The IMO is currently reviewing the Market Procedure for: Determination of the Maximum Reserve Capacity Price (MRCP). As part of this review, it has been identified that the assumptions and methodology behind the calculation of the Deep Connection Costs (DCC) require further analysis. The intent of this report is to provide an analysis of the existing methodology used to calculate the DCC and recommend a methodology for moving forward. The review and the recommendations focus on the assumptions that underpin the calculation of the DCC and the extent to which these assumptions best support the Wholesale Energy Market (WEM) Market Objectives. The result of the analysis is a specific calculation methodology for Western Power to follow in future DCC reviews.

The calculation methodology is required to take into account:

1. Related legislation such as the Access Code, the Metering Code, the Technical Rules etc and any other relevant regulatory considerations;
2. Possible outcomes and implications of the application of the New Facilities Investment Test (NFIT);
3. Western Power's Capital Contributions Policy;
4. Appropriate tariff charges, such as those in the 2010 Western Power Price List;
5. Application of GST;
6. The appropriateness of applying an escalation for locations outside the metropolitan area;
7. The nature of the current capacity based market and the associated need for unconstrained network access; and
8. Any other considerations the Consultant deems should be taken into account.

2.2. Purpose of this Report

The purpose of this report is to:

- Analyse any assumptions made by Western Power and the IMO in the estimation of the DCC used in the MRCP calculation for the 2010 Reserve Capacity Cycle and recommend adopting or replacing those assumptions; and
- If appropriate, propose an alternative methodology for estimating the DCC used in the MRCP, explicitly stating all assumptions made in the methodology.

2.2.1. Report Deliverable

The main deliverables for this report are:

1. A document which plainly states each parameter that should be used by Western Power in calculating an estimate of DCC under both the Western Power methodology (including details of any amended assumptions and assumptions associated with the Western Australian regulatory regime) and the alternative methodology, the calculation methodology for each parameter, and the assumptions inherent in each calculation. This document will need to be worded such that it can either be incorporated directly into the Market Procedure or be used as a subsidiary document to the Market Procedure. This document will in effect provide a definition of DCC;

2. Details of the costs associated with the DCC that should be included in the MRCP, e.g. the capital contributions estimated by Western Power in the 2010 MRCP review or another cost variable to take into account potential changes to tariffs etc.; and

3. Details of the relevant recommendations and analysis undertaken in determining the information provided in the document referred to above.

2.3. Definitions and Interpretation of Terms

The definition of the terms within this report are as specified in the Market Procedure for the Determination of the Maximum Reserve Capacity Price and in the Western Power Contribution Policy and the regulatory frameworks that support these documents.

In support of the documents detailed above and the analysis in this report the terms Shallow Connection Costs and DCC are defined in section 4.3 of this report.

3. Background

The IMO provided the following background information as part of its Request for Quotation for the services relating to this report:

The Wholesale Electricity Market Rules[1] (Market Rules) and the Market Procedure for the Determination of the Maximum Reserve Capacity Price[2] (the Market Procedure) require the IMO to calculate a Maximum Reserve Capacity Price (MRCP) each year. The MRCP sets the maximum offer that can be made in a Reserve Capacity (RC) Auction and is used as the basis for determining an administered Reserve Capacity Price if no auction is required and capacity refunds.

The Reserve Capacity Mechanism is designed to incentivise the provision of a sufficient amount of reliable capacity within the SWIS. The MRCP is one of the elements of this mechanism which estimates the annualised cost of building a 160 MW OCGT that is entered into the RC Auction.

In particular, the Market Procedure outlines the principles to be applied and the steps to be taken by the IMO in order to develop and propose the MRCP. Section 1.8 details the methodology that Western Power must follow in determining the cost of connecting the Power Station to the SWIS.

Section 1.8.2(i) specifies that "An estimate of DCC must be included". However, the Market Procedure does not include either a detailed methodology for how this should be calculated or a definition of DCC. To date the IMO has defined DCC as the capital costs passed on to the connecting generator that are associated with upgrading/ augmenting the transmission system to allow for the generator to connect to the SWIS.

As part of the 2010 MRCP determination, Western Power provided an analysis in support of their calculation of transmission costs associated with the proposed power station. The estimates provided, and the methodology which supported them was a recurring topic in a number of the submissions the IMO received in response to the draft report. These submissions can be found on the IMO website[3].

In accordance with clause 4.16.9 of the Market Rules, the IMO is currently reviewing the Market Procedure. As part of this review it has been identified that the assumptions and methodology behind the calculation of the DCC require further review.

---

[1] Available on the IMO website: http://www.imowa.com.au/market-rules

[2] Available on the IMO website: http://www.imowa.com.au/f711,482994/482994_Market_Procedure_for_Maximum_Reserve_Capacity_Price.pdf

[3] Available on the IMO website: http://www.imowa.com.au/mrcp

To guide this review this report provides a methodology including the appropriate definition (including the reasons for inclusion and exclusion of each cost), parameters, assumptions and calculation of estimates of deep connection charges associated with connecting a Power Station to the SWIS. This report is consistent with the context of the Western Australian Wholesale Electricity Market and is intended to be followed by Western Power in calculating this estimate of deep connection charges.

The IMO anticipates that the outcomes of this work will feed into its wider five year review of the determination of the MRCP.

4. Connection Costs and the Wholesale Market

A review of the assumptions and methodology behind the calculation of DCC ultimately requires an understanding of the term, including its meaning, purpose and use within the market and regulatory arrangements. While the term conveys a general meaning that is common across many jurisdictions, its precise definition and required interpretation is affected by the manner of its use within the functions and processes of the Market Rules, and given the related procedures, systems and guiding objectives that together give direction and effect to these Market Rules.

This section therefore considers the meaning, purpose and use of the term DCC within the market and regulatory arrangements. It defines the required basis of an assessment framework that will be used to assess the effectiveness of Western Power’s Capital Contributions Policy, insofar that it provides an appropriate input into the operation of the Reserve Capacity Mechanism of the Market Rules.

4.1. A general understanding of the term ‘Connection Cost’

The term connection cost generally covers the costs associated with infrastructure or supporting services that facilitate the connection of an electric facility, such as a generator or load, to a network, in a manner that maintains system reliability and other applicable standards, that is consistent with good practice and that is least cost.

Recognised cost components typically include the design, procurement and installation costs for three classes of investment:

1. Direct costs that provide for the physical connection of a new facility with the existing assets of the network.

   Examples of costs include: Substations; transmission / distribution lines; and communication and control infrastructure.

2. Indirect costs associated with the reinforcement of existing network assets, or service levels, to accommodate the load characteristics, or to support the deliverability of supply, as the case may be, of the connecting electric facility.

   Examples of costs include: Reinforcement or upgrade of existing transmission / distribution line, substations or terminal stations. Installation of new lines, substations or reactive power support at sites removed from the electric facility.

3. Indirect costs associated with upgrading or augmenting the network, or service levels, such that the costs facilitate actual or anticipated load growth, load patterns, or other changes in the network that are not specific to the connecting facility.

   Examples of costs are similar to those in item 2 above.

4.2. Connection Costs in the Physical and Market Systems

The SWIS is the major interconnected electricity network in Western Australia (WA). It supplies the bulk of the South West region, extending to Geraldton in the north, Albany in the south, and Kalgoorlie in the east.

The network assets of the SWIS are owned and managed by Western Power, and facilitate the physical operation of the power system. Electric facilities that connect with the SWIS are subject to Western Power's Capital Contributions Policy that specifies the extent and nature of costs that are payable to facilitate a physical connection to the SWIS. The Capital Contribution Policy is part of Western Power's Access Arrangement which is to meet the requirements of the Electricity Network Access Code 2004 (ENAC).

The Wholesale Electricity Market of Western Australia (WEM) is a feature of the SWIS, providing for the organised dispatch and trade of electricity, and electricity related services, between industry participants that operate in the energy supply sector. The organised markets of the WEM, together with bilateral contract markets for capacity, define the market relations that facilitate transactions in capacity and related services.

Although the connection costs of a new electric facility do not directly feature in the trading arrangements of the WEM, they do indirectly feature as a component of the MRCP, which operates as a calculated cap on offers and on prices in the market for Reserve Capacity.

The market and regulatory arrangements of the WEM can be defined as the market rules, procedures, systems and related regulatory provisions that together give effect to the trading arrangements and operations of the wholesale market, and the behaviour of its participants.

4.3. Deep Connection Costs vs Shallow Connection Costs

The IMO Market Procedure for the calculation of the MRCP includes a requirement for the calculation of a "Transmission Connection Cost Estimate" (item 1.8). In the calculation of this estimate the procedure calls for the cost estimate to consider 9 items, the last of these items is that an "An estimate of Deep Connection Costs shall be included". The other 8 items define the nature of the connection of the generator to the network and the technical assumptions that should be made in calculating the estimate.

The existing Western Power Access Arrangement does not make a distinction between Deep and Shallow Connection Costs. It should also be noted that the definition of Deep vs Shallow Connection Costs do not necessarily with align with Western Power's definition of Connection Assets and Shared Network Assets in all circumstances.

In jurisdictions where the definition is widely used, DCC's typically pertain to the costs described in items 2 and 3 of section 4.1 of this report, however the costs in item 3 are often rolled into the broader tariff base.

The purpose of using an estimate of connection costs in the mechanisms of an organised market for capacity is to provide a price signal that reflects the scarcity of network capacity at a given location. When featured as a input into a pricing mechanism or constraint, this investment signal is considered important in driving economically efficient investment in generation and load development on a network.

Shallow Connection Costs typically represent the costs associated with network assets required to connect the user to the existing or planned network assuming adequate network capacity at the point of connection. In this report, the sum of the Deep and Shallow Connection Costs represent the Transmission Connection Cost Estimate consistent with the Market Procedure.[4]

For the purposes of this report, shallow connection costs will be defined by the 2 km of transmission line and the 330 kV breaker and a half substation specified in items 1.8 a-h of the Market Procedure for the calculation of the MRCP. Deep Connection Costs will be defined as the total connection costs established by the existing methodology applied by Western Power minus the shallow connection costs.

It is noted that using this definition of the calculation of shallow connection costs places technical bounds around the calculation of the broader connection costs that may result in a technical outcome that is removed from the efficient technical solution for a given location. This is particularly the case where connection costs calculations are undertaken for locations that are significantly removed from the existing 330kV network requiring significant extension of the 330kV network in the DCC Calculation (such as at Kalgoorlie). However, by defining the Shallow Connection Costs in this manner the consideration of DCC in effect becomes a study of the determination of Total Connection Costs by Western Power.

[4] Some jurisdictions defined Deep Connection Costs as inclusive of Shallow Connection Costs. For example a pure Deep Connection Cost policy would result in the network user paying all attributable network reinforcement costs (as is the case with the Western Power Capital Contribution Policy). To remain consistent with the MRCP Market Procedure this report defines Deep Connection Costs as separate costs to the Shallow Connection Costs.

As a result, this review of DCC determination methodology effectively becomes a review of the manner in which Western Power is applying its Capital Contribution Policy in response to the bounds provided by the IMO Market Procedure.

4.4. The Regulatory Context

The existing DCC calculation methodology applied by Western Power occurs at the intersection of two major regulatory regimes defining actives in the WEM, the Electricity Network Access Code 2004 (ENAC) and the WEM Market Rules. The following summarises the impact of these market and regulatory arrangements.

4.4.1. Arrangements relevant to the physical networks

4.4.1.1. The Electricity Network Access Code

The ENAC governs the activities of any Covered Network in Western Australia, including that provided by Western Power. The ENAC defines the bounds under which a Network Operator can levy connection costs through the definition of the requirements for a Capital Contribution Policy. In effect, this policy describes the extent to which the cost of infrastructure required to facilitate a connection can be recovered from a user as an upfront charge (connection cost) and the extent to which the cost is rolled into the regulated asset base to be recovered through regulated tariffs. In defining this division, the ENAC states that any Capital Contribution Policy

(a) must not require a user to make a contribution in respect of any part of new facilities investment which meets the new facilities investment test; and

(b) must not require a user to make a contribution in respect of any part of noncapital costs which would not be incurred by a service provider efficiently minimising costs; and

(c) may only require a user to make a contribution in respect of required work;

and

(d) without limiting sections 5.14(a) and 5.14(b), must contain a mechanism designed to ensure that there is no double recovery of new facilities investment or non-capital costs

The above dictates that any DCC charged by Western Power must be on the basis of infrastructure developed in an efficient manner and not include infrastructure to the extent that it meets the requirements of the New Facilities Investment Test.

The ENAC does not require Western Power to differentiate between deep and shallow connection costs.

Also of note is that the ENAC defines that all Access Contracts for capacity services be for a defined capacity and that under normal operation a user will not be restricted below this capacity. This requirement is otherwise referred to as unrestricted access.

4.4.2. Capital Contribution Policy

The Western Power Capital Contribution Policy has been determined by the Economic Regulation Authority of Western Australia (ERA) to be consistent with the requirements of the ENAC. The Capital Contribution Policy defines the capital contribution as the Allocated Forecast Costs minus Network Access Charges plus Other Applicable Costs.

Where allocated forecast costs include:

- Minimum practical works to provide the connection
- Shared networks costs
- Future applicants
- Current applicants
- Costs brought forward
- Temporary supplies

4.4.3. Arrangements relevant to the Wholesale Market

4.4.3.1. The role of Connection Costs in the design of the WEM

DCC ultimately contribute to the design and implementation of the organised wholesale market via their contribution to the determination of the MRCP that is a feature of the Reserve Capacity Mechanism. Indeed, it is this context that guides the focus of this review.

A review of the WEM Market Rules identifies that the MRCP undertakes the following roles

1. Provides for the mitigation of actual or potential market power (Clause 2.26.3)

2. Provides for the management of commissioning risk specific to a new electric facility that is assigned Certified Reserve Capacity (Clause 4.13). This process underpins the Security of the Reserve Capacity.

3. Defines an upper bound for the Reserve Capacity Price (Clause 4.16)

4. Defines an upper bound for Reserve Capacity Offers in the Reserve Capacity Auction (Clause 4.18)

5. Defines a settlement price for Capacity Credits in the absence of a Reserve Capacity Auction (Clause 4.29.1)

6. Defines the financial implications of failing to satisfy Reserve Capacity Obligations in the absence of a Capacity Auction (Clause 4.26.1)

7. Sets bounds for administrative processes related to Long Term Special Price Agreements (Clause 4.22.2)

The Market Rules are also clear that the MRCP is to act a market signal with a general requirement to be published (Clause 10.5.1.e) and a requirement to be included in the information that forms the Expression of Interest in the Reserve Capacity Auction (Clause 4.3.1).

This review of the Market Rules indicates that the general function of the MRCP is to provide a benchmark or reference price to facilitate the management of risk, market power or other administered market processes. Moreover, it is defined as one unique benchmark or reference price that is applied commonly across the reach of the Market Rules; it therefore does not differentiate in application or calculation with respect to location, time or technology.

The role of the MRCP in the market design is also indicated via the associated Market Procedures, in particular, the *Market Procedure for: Determination of the Maximum Reserve Capacity Price. Version 2*. Specifically:

1. Section 1.5 defines the technical characteristics of a hypothetical Power Station that is to be used in the calculation of the MRCP;

2. Section 1.6 defines the cost factors that are to be used in the calculation of the MRCP; these explicitly include costs associated with the connection of the Power Station to the bulk transmission system (Clause 1.6(d));

3. Section 1.14 defines the formulae to determine the MRCP, for which no precise methodological detail is provided for the determination of connection costs; and

4. Section 1.15 defines requirements for the periodic review of the methodology that is used to determine the MRCP.

A review of the Market Procedure therefore indicates that the calculation of the MRCP is to be based on a hypothetical generation asset using contrived assumptions that are deemed to be reasonable by virtue of the consultative provisions of the Market Rules, and of the periodic reviews that are required by the Market Procedure.

4.4.3.2. The Role of Connection Costs in the Bilateral Market

As a published metric and instrument of the market for Reserve Capacity, the MRCP represents a significant market signal for the installation and procurement of capacity. The direct impact is via the operation of the organised market for Reserve Capacity, including the Reserve Capacity Auction and arrangements for the procurement of Supplementary Reserve Capacity. It has indirect impact on the bilateral contract market for capacity, insofar that the organised market complements the contract market by providing alternative facilities for the procurement of capacity, for trading out of contractual exposures, for the refinement of contracted positions, and as a price reference in the negotiation and operation of bilateral contracts. Moreover, the performance of both the bilateral and organised markets provide price and dispatch signals that feature in decisions to invest in physical capacity, or in associated services.

4.4.3.3. Interaction of the MRCP with the Energy Market

In the broader context of the WEM, the Reserve Capacity Mechanism represents one of two major revenue streams for generators. The second major stream of revenue is the sale of electricity, whether through the bilateral market, the short term energy market (STEM) or as a balancing or ancillary service. The Reserve Capacity Mechanism is intended to cover a portion of the fixed cost associated with installing new capacity. The portion of that cost depends on the generation technology being installed as the fixed and variable cost base of generation technologies vary widely, from diesel generators (with low fixed and high variable costs) to wind and other renewable generation (with high fixed and low variable costs).

As a metric not largely determined by market mechanisms[5] the MRCP has limited ability to respond dynamically to incentivise efficient outcomes within the market. This suggests that the portion of participating generators revenue met by the MRCP through the Reserve Capacity Mechanism should be periodically reviewed via consultative processes that engage industry. However, the WEM market is a day before market and therefore cannot respond dynamically (in real time) to periods of generation shortfall. This is reflected by the low Maximum Energy Price Limits on the WEM compared to those in real time energy markets such as the NEM. The impact of this is that peaking generation technologies, that form and integral part of an efficient energy solution, do not see the high energy price that incentivise their participation in real time energy markets. Thus, the MRCP must be set high enough to incentivise the participation of low fixed cost peaking technologies.

[5] Notwithstanding the scaling made by the Excess Capacity Adjustment that is linked to the relationship between supply and demand for Capacity Credits.

5. Assessment Approach

5.1. An Assessment Framework to support the evaluation task

5.1.1. What is the subject of the assessment?

The subject of the assessment is defined by the IMO in its terms of reference for this review. In particular, the IMO requests the following:

To guide this review the IMO requires a report on the appropriate definition (including the reasons for inclusion and exclusion of each cost), parameters, assumptions and calculation of estimates of deep connection charges associated with connecting a Power Station to the SWIS. This report will need to be in the context of the Western Australian Wholesale Electricity Market and be able to be followed by Western Power in calculating an estimate of deep connection charges.

SKM therefore interprets the subject of the assessment as the substance and application of the calculation methodology for DCC, as prescribed by the Capital Contributions Policy of Western Power.

5.1.2. Benchmark criteria and attributes that should inform the assessment

The IMO requires the assessment to consider what is 'appropriate' with respect to the substance and application of the calculation methodology for DCC.

A consideration of what is appropriate necessarily requires reference to the Market Objectives, insofar that they prescribe what is required for an effective and appropriate set of rules to guide the operation of the WEM in the context of the SWIS.

In determining what is appropriate, however, SKM recognises that the Market Rules, including their Market Objectives, are but one element of a suite of market and regulatory arrangements that ultimately influences the operation of the market. Other elements include related systems, procedures, guidelines, regulatory instruments, institutions, assets and processes of change and reform. Together these shape decisions, implement processes and guide the behaviour of participants in the market. Accordingly, while the Market Objectives can provide some specific guidance of what is appropriate in the context of the WEM, on their own they are not sufficient. For a market design to best achieve the Market Objectives, additional and more general attributes also guide what is 'appropriate'. Examples include the following:

- Resilience to anticipated scenarios of change, reform, investment and innovation.
- Consistent with the realities of operational practices, technological constraints and prevailing contracts.

- Consistent with the broader market and regulatory arrangements that influence market behaviour and outcomes.
- Processes of change are manageable in terms of time, cost and risk.

SKM has therefore broadened the set of criteria and attributes that it considers relevant to the assessment and development of the calculation methodology for DCC.

Appendix A describes how SKM has developed a set of assessment factors to assist the review.

The following summarises the assessment factors that have been used in this review.

5.1.3. Summary of Selected Assessment Criteria

The following summarises the criteria that SKM has utilised to assess Western Power's calculation of DCC:

Criteria 1: Accuracy

For the purpose of this review, we define accuracy as the extent to which the DCC calculation methodology drives the correct level of new capacity investment and supports the correct mix of generation technologies in the market as prescribed by the Market Objectives. The level of new capacity must therefore achieve the Market Objectives, for example, economic efficiency, reliability and fair competition.

As a component in the calculation of the MRCP, the estimate of DCC should represent an upper limit on the connection cost of Reserve Capacity, estimated in marginal cost terms for application across the SWIS. Ultimately the economic intent of the MRCP is to provide a price constraint that is approximately consistent with the system marginal cost of new peaking (liquid fuelled) capacity when the market is in long-run equilibrium. It follows that the DCC estimate should similarly reflect the system marginal connection cost for new peaking capacity in this long-run equilibrium state. With respect to this ideal, the following clarifying observations are made:

- The long-run equilibrium state refers to circumstances when the market is in a long-run equilibrium, meaning that in the context of the Market Rules, the market best achieves the Market Objectives. In part, this requires the market to achieve ideals of economic efficiency, competitiveness and non-discrimination, in circumstances when system assets exactly deliver the requirements of the reserve margin, and associated reliability and system security objectives. When actual capacity varies from the exact requirements of the reserve margin, it is not in a long-run equilibrium. If the market is performing well, this will then cause system marginal prices to incentivise changes to market behaviour towards the achievement of the requirements of the long-run equilibrium. When actual capacity is in excess of the requirements of the Reserve Margin, for example, a competitive market would produce energy and capacity price outcomes that are less than the long-run total cost of new capacity, thereby acting as a disincentive for new investment. Conversely, when actual capacity is short of the requirements of the Reserve Margin, the MRCP combines with higher energy prices to reflect a scarcity of capacity, thereby resulting in prices at or above the marginal cost of new capacity in this long-run equilibrium state, and encouraging increased investment.

- As a system marginal cost, the DCC estimate in the MRCP should reflect the cost of the last increment of new capacity that just achieves the requirements of the Reserve Margin for the SWIS. The appropriate size of this increment is 1 MW, with costs measured on an annual basis. It follows that estimates of DCC should similarly reflect an annualised measure of the additional total cost of connecting the last MW of new capacity that is required to achieve the system's Reserve Margin.

Criteria 2: Simplicity

The calculation methodology represents an overhead burden ultimately borne by customers on the SWIS. Further, more complicated methodologies may introduce uncertainty or modelling difficulty amongst potential investors. For these reasons it is necessary that any methodology be simple to understand, implement, manage and be repeatable. To the extent that it is feasible, participants other than Western Power should be able to independently apply the methodology, therefore supporting their own investment modelling.

Criteria 3: Certainty

The methodology must be stable over time, therefore promoting regulatory certainty, and as a consequence, minimal investment risk.

Because the MRCP is both a default price, and a price cap that affects payments to assets with long-lives, this volatility can be the cause of revenue risk in investment decisions. The consequence is that the market may delay new investment longer than is optimal and/or, the technology of the ultimate capacity investment may be inappropriate given the needs of an economically efficient system and market.

Criteria 4: Resilience

The methodology is expected to continue to deliver the intent of the Market Rules given anticipated scenarios of industry change, development and reform.

Criteria 5: Flexibility

The methodology must accommodate variations in the character of connection costs, and in the scenarios that may be used to establish the benchmark.

5.1.4. Weighting of Criteria

The above criteria are not considered of equal importance within the assessments in this report. Criteria that directly support multiple Market Objectives (as discussed in Appendix A) are given a greater weighting than criteria that support more general attributes. Table 1 provides a weighting out of 100% as a guide to the relative importance of each criteria.

Table 1 Weighting of Assessment Criteria

Factor	Weighting
Accuracy	50%
Certainty	20%
Simplicity	20%
Resilience	5%
Flexibility	5%

5.2. The assessment approach

The assessment will undertake the following steps:

1. Summarise existing methodology.
2. Review existing methodology and assumptions against criteria.
3. Review interactions or complexities with other market and regulatory requirements.
4. Propose a range of options.
5. Consider the proposed methodology options against Criteria.
6. Recommend a methodology

6. Summary of Existing Methodology

6.1. Our approach

This section summarises the existing DCC methodology by considering the following aspects of the DCC:

1) How the DCC is used in the broader MRCP calculation.
2) The context prescribed by the IMO to Western Power for the calculation of the DCC.
3) The methodology and assumptions used by Western Power to apply the Capital Contribution Policy to the context prescribed by the IMO.

The methodology and assumptions summarised in this section form the basis of the analysis in Section 7 of this report.

6.2. Documents Referenced in the Review

The summary outlined in this section references the following documents:

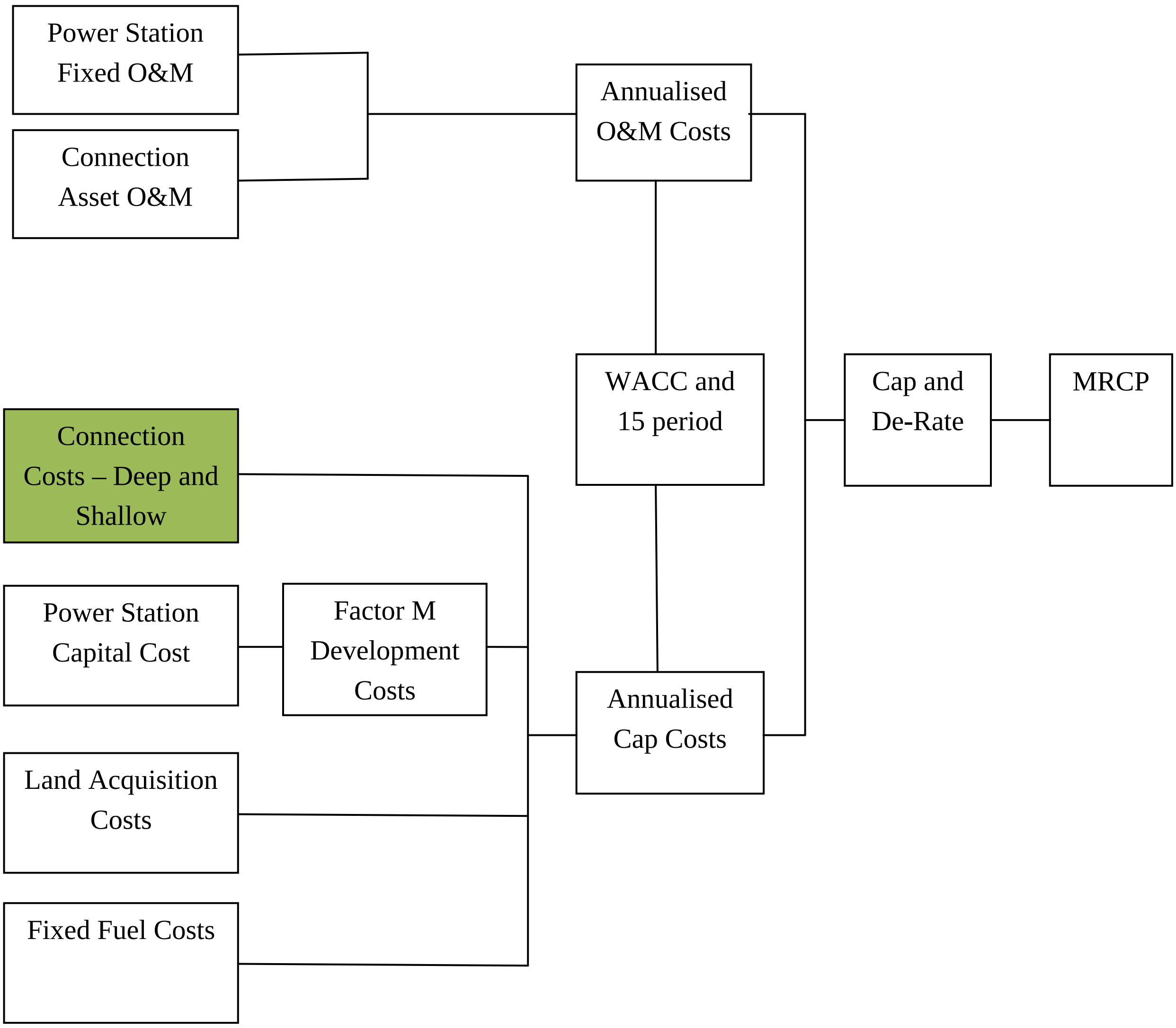
- Interview with Western Power by SKM on 28 October 2010.
- Western Power Capital Contribution Policy Summary[6].
- Appendix 3 of the current Western Power Access Arrangement[7].
- Spreadsheet from the IMO titled "MRCP_CALC_2012_2013 - OPTIMISED V5 -Including easements and updated WACC and updated M and updated transmission costs".
- Spreadsheet provided by Western Power titled "MRCP - Capital Contribution Calculator - Collie Shared Assets Only.xls".
- Wholesale Electricity Market Rules[8] (Market Rules).
- Market Procedure for: Determination of the Maximum Reserve Capacity Price[9].
- Various submissions to the IMO on the DCC calculation methodology[10].

[6] http://www.westernpower.com.au/documents/infoPacks/CapitalContributionPolicy.pdf
[7]http://www.westernpower.com.au/documents/aboutus/accessarrangement/2010/WE_n5012829_v14A_AA2_Appendix_3_-_Contributions_Policy.pdf
[8] http://www.imowa.com.au/market-rules
9http://www.imowa.com.au/f711,482994/482994_Market_Procedure_for_Maximum_Reserve_Capacity_Price.pdf
10 Available on the IMO website: http://www.imowa.com.au/mrcp

6.3. DCC as part of the MRCP

The role of the DCC in the determination of the broader MRCP is detailed in the formulae contained with the Market Procedure for MRCP, this formulae is summarised diagrammatically in Figure 1 below. The DCC component of the MRCP is highlighted in green.

- **Figure 1 Components of the MRCP**



The IMO typically requests the parties that calculate the component parts of the MRCP determination to commence work in July of each year with the results to be with the IMO for compilation by October of the same year.

6.4. The prescribed context for the DCC calculation

The IMO, through the Market Rules and Market Procedures, prescribes the calculation scenario that Western Power is required to use in its estimation of DCC for input into the MRCP calculation. Specifically, the connection scenario considers the connection of the following generator to the SWIS:

a) 160 MW open cycle Gas Turbine.

b) Connected at 330 kV.

c) Costs associated with any staging works will not be considered.

The connection scenario also requires a consideration to the ollowing locations for connection:

- Pinjar
- Kwinana
- Kemerton
- Collie
- Geraldton
- Eneabba
- Kalgoorlie

These locations are consistent with the regions stipulated in section 1.8 of the Market Procedure.

This calculation is requested in current dollars and assumes a 2 year construction period. The steps Western Power currently takes to calculate the DCC within this scope are detailed below.

6.5. Western Power's application of their Capital Contribution Policy

In determining the DCC consistent with the preceding prescribed context, Western Power seeks to address the general requirements of the Western Power Capital Contribution Policy. These are:

- Allocated Forecast Costs, including:
  - Definition of minimal practical works.
  - Level of contribution to the connection costs from current and future third parties.
  - Extent to which the costs are an acceleration of investment that would have met the NFIT.
- Period (up to 15 years) and forecast quantum of the Network Access Charges.

- Other Applicable Costs, including:
  - Non capital costs.
  - Non standard construction.
  - Other costs incurred to ensure Western Power complies with all technical rules.

The current approach to each of these aspects, as determined through discussions with Western Power, is detailed below.

6.5.1. Determining Minimum Practical Works

6.5.1.1. Definition of Minimum Practical Works

In defining the required Minimum Practical Works for the DCC calculations, Western Power depends largely on studies undertaken for previous access applicants and experience and knowledge of what is likely to be the most effective arrangement for new facilities. For some connection points, like Kalgoorlie, the requirement for a 330 kV connection results in works that are significantly disconnected from that which would be considered efficient.

In determining the Minimum Practical Works Western Power does not follow the procedures for processing real new connections, most significantly:

1) Western Power does not undertake any specific steady state or dynamic analysis to determine the Minimum Practical Works for the model generators at each of the locations.
2) No specific options analysis is undertaken beyond the information drawn from previous connection studies.
3) Likely future users are not considered in determining the Minimum Practical Works requirement at each location.

The use of information from previous studies and experience in establishing the Minimum Practical Works for each of the connection points is a reasonable approach in the time frame provided for the study and the expected expenditure. To complete a comprehensive options analysis for each of the locations would require an extended program of work that would need to exist in parallel with Western Power's network planning process and processing of "real world" Access Applications.

6.5.1.2. Estimating the Cost of defined Minimum Practical Works

In determining the cost of the Minimum Practical Works, Western Power uses a cost "building blocks" approach consistent with the first stage of the Western Power estimating framework. This approach involves no application specific design and limited project definition. SKM believe this is consistent with a class 4 estimate under the Association for the Advancement of Cost Engineering international (AACEi) recommended practice of estimate classification (Refer

Appendix B). SKM believes the expected accuracy of this estimate would be in the order of ±30-50%, this is consistent with Western Power's view of this estimating process.

6.5.2. Level of contribution to the connection costs from current and future third parties

In defining the costs contribution by third parties, Western Power assumes that any "spare" capacity produced by the minimum practical works will be utilised by third parties, and therefore allocates a pro –rata cost to the model 160 MW. This pro-rata estimate uses as its basis the portion that the required 160 MW facility takes of the capacity created by the minimum practical works. This approach represents what would be a "best case" for a real connection.

6.5.3. Extent to which costs are an acceleration of investment that would have met the NFIT

Western Power have advised minimum required works developed for the DCC are not considered in the context of the Western Power 10 year plan for the SWIS network. In this way this aspect of the Capital Contribution Policy is not considered.

6.5.4. Calculation period

The calculation period of 15 years is used by Western Power in the calculation of the DCC.

6.5.5. Forecast quantum of the Network Access Charges;

Western Power use the existing Network Access charges with no escalation in real terms in their capital contribution model.

6.5.6. Other applicable costs

Western Power applies the operating and maintenance costs of the minimum practical works on the basis of:

- 3.1% of distribution asset capital cost.
- 2.1% of transmission asset capital cost.

SKM has not identified any other applicable costs applied by Western Power.

6.5.7. Payment Terms

Clause 6 of the Capital Contribution Policy allows provision for payment terms, and prescribes the circumstances when alternative payment terms are available. These payment terms are not applied in the determination of the DCC.

6.5.8. Western Power's application of the applications and Queuing Policy

Western Power does not take into account any impact on the DCC from the Applications and Queuing Policy.

7. Review of Existing Approach and Assumptions against Criteria

This section reviews the methodology and assumptions summarised in section 6 against the criteria detailed in section 5 of this report.

7.1. Review of Existing Approach to Calculating the DCC

This section provides a review of the existing approach of basing the DCC calculation on an estimate of the actual cost of a model connection at various sites against the assessment criteria.

Factor	Impact of Assumption
Accuracy	The approach should produce a cost estimate that is consistent with the system marginal connection cost of the efficient new entrant capacity provider when the market is in a long-run equilibrium, and therefore when it is fully achieving the market objectives (eg. the new capacity exactly achieves the requirements of the reserve margin). The approach does not produce costs that are consistent with this requirement, in part because it considers the current context of the network, and not a context that reflects long-run equilibrium conditions. What this means is that the estimated costs may be volatile, and subject to current system constraints, and the effect of over or under network investment. When feeding through to the MRCP, this may then produce a price/bid cap that contributes to cycles of over or under capacity investment. Due to the constrained nature of the network there may be periods where this approach results in costs significantly higher than those seen by capacity providers using technologies that differ from the model connection size.
Certainty	The approach to a model connection provides certainty to market participants that the DCC should reflect the actual cost of new entrant capacity within the accuracy constraints introduced by the assumptions used discussed further in section 7.2.
Simplicity	The model connection is an approach that is easily understood by market participants. The resulting methodology could be very complicated and requires a range of detailed assumptions. Western Power has adopted a methodology that uses existing data and experience to simplify the approach. This approach represents a practical solution to what could be a significant time and resource intensive process. It does however introduce a range of repeatability concerns.
Resilience	The use of a model scenario for the Calculation of DCC is an approach that can be applied independently of changes in the regulatory context within the WEM. It does however make the calculation methodology subject to changes in both the ENAC and the WEM Market Rules. Therefore, although the approach is resilient the resulting methodology may be impacted by changes to a wide range of market mechanisms.
Flexibility	The current approach has flexibility to respond to the locations within the network that may represent the most cost effective connection site but cannot respond to changes in the nature of the efficient new entrant capacity provider over time.

7.2. Assumptions prescribed by the Market Procedure

This section reviews the following assumptions summarised in section 6.4 of this report against the assessment criteria.

160 MW Capacity Requirements

Factor	Impact of Assumption
Accuracy	The optimal scale for the efficient new entrant capacity provider will change over time. For example, embedded generation may have a lower connection cost but this may be offset by lower capital efficiency in the generation. Alternatively, larger scale generation may deliver a higher economy of scale. Fixing the size of the model new connection means that the DCC cannot adjust to reflect the changes in the nature of the efficient new entrant capacity provider. We note however that a medium-sized OCGT is a benchmark generator that is often used in similar markets around the world to estimate a capacity cost benchmark for the capacity market when in balance with the needs of the reserve margin.
Certainty	Fixing the model size to 160 MW should result in a relatively stable outcome for the DCC over time within a large network. However physical constrains in the SWIS may result in step change in costs as network connection opportunities at this size are consumed. This is discussed further in location assumptions.
Simplicity	The model 160 MW connection is an approach that is easily understood by market participants and simplifies the calculation methodology.
Resilience	The 160 MW connection assumption is resilient to changes in the market.
Flexibility	The efficient new entrant capacity provider will change over time. Fixing the size of the model new connection means that the DCC cannot adjust to reflect the changes in the nature of the efficient new entrant capacity provider.

330kV Connection Voltage

Factor	Impact of Assumption
Accuracy	Setting the voltage of the connection avoids the efficiencies that may be introduced by other approaches to connection. The most pressing example of this is the model connection in Kalgoorlie that results in the minimum practical works being a circa 400 km 330 kV transmission line. It is unlikely this is the most cost effective connection solution. This connection voltage assumption will likely drive the DCC calculation to overstate the cost of connection.
Certainty	Fixing the model voltage of connection to 330 kV should result in a relative stabile outcome for the DCC over time within a large network.
Simplicity	The model 330 kV connection is an approach that is easily understood by market participants and simplifies the DCC calculation methodology. It removes many of the options Western Power may have otherwise needed to consider from the calculation of the DCC.
Resilience	The 330 kV connection assumption is resilient to changes in the market.
Flexibility	Fixing the voltage of the model new connection means that the DCC cannot adjust to reflect the changes in the nature of the efficient new entrant capacity provider.

7 Connection Sites

Factor	Impact of Assumption
Accuracy	The seven sites selected represent a reasonable cross section of the likely connection sites on the SWIS and would likely therefore capture a site selected by an efficient new entrant capacity provider at the scales considered.
Certainty	In the 2009 MRCP calculation the Western Power calculations for MRCP varied between \$35 million and \$350 million across the 7 sites considered with an average of \$129 million. This is a very wide range in costs that could have a significant impact on the stability of the DCC calculation.
Simplicity	Attempting to calculate the actual connection costs for 7 sites introduces a significant complexity. The DCC calculation for the 7 sites makes the management of the DCC calculation troublesome. Not only must the calculations be undertaken for each site, a consistent approach to the calculation must be maintained for each site. Western Power's use of previous studies and experience makes this difficult to achieve. Further the interaction between the DCC and other components of the MRCP must be considered in the selection of the model lowest cost new entrant.
Resilience	The seven sites are selected independent of market arrangements.
Flexibility	The seven sites would likely effectively respond appropriately to changes in the network configuration over time.

7.3. Assumptions determined by WP to guide the application of the DCC calculation

This section reviews the following assumptions summarised in section 6.5 of this report against the assessment criteria.

Assumptions in the Definition of Minimum Practical Works

Factor	Impact of Assumption
Accuracy	In not using a dedicated options analysis or other planning activities, the existing approach introduces the possibility that the minimum practical works have not been identified. A sub optimal technical solution could significantly increase the cost associated with a particular connection site. To produce a cost estimate that corresponds to a long-run equilibrium state, then some form of network reference scenario would be desirable, to hypothesise the network state when it is in a long-run equilibrium, and therefore not subject to inefficient pockets of congestion or constraint that may otherwise introduce a transmission scarcity cost component to the DCC estimate that is used in the MRCP.
Certainty	The dependence on experience may undermine market certainty on the outcome of the DCC .
Simplicity	The existing approach is a simplification of the activities undertaken in a full access application process. However, it relies heavily on previous real access applications and the experience of Western Power's staff. This represents a risk to the ongoing repeatability of the existing methodology.
Resilience	Is directly linked to the Western Power capital contribution policy and would be directly impacted by changes in this policy.
Flexibility	Can respond to changes in the market and changes in the physical network. However, this response is based on historic access applications and the experience of Western Power staff.

Assumptions in Cost Estimation

Factor	Impact of Assumption
Accuracy	Estimate will likely be ±50% of the actual cost to build the connection assets.
Certainty	The accuracy of the estimating methodology has a direct impact on the market's certainty and confidence of the DCC.
Simplicity	This approach represents the simplest approach to cost estimating as detailed in Appendix B and utilises existing Western Power processes and does not therefore represent a significant management burden.
Resilience	The cost estimation process is based on Western Power's wider cost estimation process and would be impacted by changes in this process.
Flexibility	The estimating approach can respond to any defined Minimum Practical Works.

Assumed Contribution from Third Parties

Factor	Impact of Assumption
Accuracy	Represents the best case for an access applicant. Thus an actual applicant may see a cost above that determined under this approach by up to the pro rata amount.
Certainty	Represents a consistent approach to a complicated variable in the calculation of real access charges.
Simplicity	Is a simplifying assumption to a complicated variable.
Resilience	Could be heavily impacted by changes in management of Western Power's regulated network.
Flexibility	N/A

Lack of Integration with Western Power 10 Year Strategic Planning

Factor	Impact of Assumption
Accuracy	Introduces the possibility of significantly overstating the actual DCC.
Certainty	N/A
Simplicity	Is a simplifying assumption.
Resilience	Is in conflict with Western Power's existing Capital Contribution Policy and therefore the impact of any changes would be uncertain.
Flexibility	N/A

7.4. Summary Key of Issues / Gaps

From the analysis detailed above the following issues / gaps have been summarised:

7.4.1. Accuracy

The review of the DCC methodology, as it is applied to the context of determining the MRCP, has found that in some circumstances, the DCC calculation methodology will not correctly measure the system marginal connection cost of new capacity in an assumed state of long-run equilibrium, thereby possibly distorting efficient investment behaviour. The following details the basis of these concerns.

- The existing approach to calculating the DCC applies to real investments in the physical system. It then determines and allocates connection costs that are relevant for the time and place of that real investment. When applied to the context of the MRCP calculation, a contrived investment scenario is used, defining the technology and guiding the location of a hypothetical investment. This assumed investment scenario does not however require Western Power to estimate a connection cost in a circumstance when the system is assumed to be in long-run equilibrium. This means that the estimated connection cost will be reflective of short-run conditions in the system. In practice, this means that if transmission investment has been insufficient in the past, which in many jurisdictions is the case, then the DCC calculation methodology may over-estimate the connection and system augmentation costs for the hypothetical 160 MW generation investment. This means that the system marginal connection cost may capture costs that are required to recover from insufficient investment in the past (reflected as a cost of transmission scarcity), thereby over-measuring the estimate of MRCP. Such a circumstance would typically be coincident with higher energy prices, caused by higher marginal costs of system constraints and system losses, which when combined with a higher MRCP, may cause the combined market revenues to be inefficiently high, and potentially encouraging a cycle of over-investment in generation plant.

- The existing methodology represents an opportunity for significant inaccuracy in the order of ± 30-50% of the actual completed cost of the connection asset.
- The lack of integration with Western Power's 10 Year Planning introduces significant inaccuracies and further disconnects the DCC estimate from a long run equilibrium position.
- The lack of dedicated options analysis has the opportunity to introduce significant inaccuracies and disconnects the determination of the MRCP from a long run equilibrium position.
- Whether the hypothetical 160 MW and a 330 kV connection continues to be the correct scale for a least cost capacity provider given the cost impact of increasing DCC.

7.4.2. Simplicity

- The existing methodology is a simplification of the process that is undertaken for a real applicant that relies heavily on the experience of Western Power's technical staff and on historic analysis. This reliance means that the process cannot be completed by non Western Power staff and undermines the repeatability of the process.
- Modelling the Actual Connection Costs for 7 sites represents a significant management burden.

7.4.3. Certainty

- The DCC is becoming an increasing portion of the MRCP over time and under the current assumptions may change dramatically year to year due to increasing network constraints.
- In the 2009 MRCP calculation the Western Power calculations for MRCP varied between $35 million and $350 million across the 7 sites considered with an average of $129 million. The $35 million DCC represents 17% of the total capital cost whereas the average $129 million would represent 41%. As the more cost effective sites continue to be utilised and restrictions on medium and large scale generation in central areas continue to increase over time the DCC will likely trend toward the average. This trend will be supported by the increasing restrictions on medium and large scale generation in developed areas. This is reflective of a methodology that is disconnected from a long run equilibrium cost.

- Indeed this a key concern raised in responses to the 2010 MRCP determination. This has the effect of producing a DCC estimate that can be very different between Reserve Capacity Cycles, ultimately causing volatility in the measure of MRCP.

7.4.4. Resilience

- The current approach to calculating the DCC requires an implementation of Western Power's Capital Contribution Policy. Thus any methodology and associated assumptions must be framed with reference to this policy. This policy is reconsidered at each review of Western Power Access Arrangement (approximately every three years). Any methodology framed under the existing approach will be impacted by this review or by many other changes under the ENAC.

7.4.5. Flexibility

- Fixing the connection size and voltage undermines the ability of the methodology to respond to changes in the position of the technical nature of the efficient new entrant generator within the market.

8. Options Considered

8.1. Key Observations

Critical to our assessment of Accuracy, is the differential treatment of connection costs within the network regulatory and market arrangements, as they apply to either the trading arrangements of the WEM, or to physical investments that occur in the SWIS.

Currently, Western Power's Capital Contribution Policy is used to allocate the actual connection costs of real assets and services to industry participants, and is also used by the IMO to guide its estimate of DCC that feature as a component in the determination of the MRCP.

The critical distinction lies in between these two applications of the Capital Contribution Policy:

- The policy must calculate and allocate the costs of actual investments in real assets and services to industry participants.
- The policy is also used to calculate the expected costs of hypothetical assets to support a contrived MRCP mechanism using proxy data that is intended to provide an economic signal or reference benchmark to support administered purposes.

When considering the role of the MRCP, it becomes obvious that the logical requirements of a connection cost calculation methodology may at times depart from what is required to allocate the costs of real investments. Some of these departures may imply a need for contradictory outcomes.

In terms of real investments in physical assets, and the calculation and allocation of related connection costs, methodological requirements that define the calculation of connection costs accurately reflect the efficient cost of the connection. Indeed, this cost determination features a prudency assessment that links with formal planning processes, including the scenario modelling and options assessment that is included therein.

As a mechanism for setting the DCC, the Capital Contributions must seek to provide a pricing constraint or default price related to actual and potential investments in reserve capacity. For it to promote the achievement of economic efficiency, it must be set with reference to the investment signals that are needed to promote an equilibrium level of generation investment in the long-run, as discussed in section 5.1.3 of this report. This consideration of appropriate investment signals results in a calculation that necessarily varies from that required for the allocation of costs related to actual investments in real assets and services.

The use of a single estimate of a MRCP for a single region and multi-period market means that the calculation of connection costs will ultimately be static, approximate and representative based on what is deemed reasonable. Given that the MRCP is used primarily as a market constraint and default price in particular circumstances, the need for accuracy becomes less critical.

It follows therefore that the methodological requirements for the calculation of DCC may, under some options to be considered, become largely divorced from the methodology defined under the Capital Contributions Policy.

8.2. Options

To address the issues discussed in section 7.4 this section considers a range of options against the assessment criteria.

To determine the range of options to be considered, reference is made to the discussion section 8.1 of this report. From these discussions it is clear that the options, insofar that they produce a cost estimate for inclusion in the MRCP, must seek to produce appropriate investment signals that have the effect of promoting the achievement of the Market Objectives. In doing this the approach does not necessarily need to result in an application of the Capital Contribution Policy.

The Options proposed below are best considered on a continuum of increasing complexity.

Option 1

Calculate an "average cost" based on the cost of providing network capacity and the quantity of network capacity provided as the basis of the DCC and adjust this annually to capture market changes. This option is a reflection of the long run average (not marginal) cost of capacity on the network.

Option 2

Use historic connection cost data to forecast likely future DCC. This approach may place bounds around the historic connection cost data to only include connection costs for technologies consistent with an efficient new entrant capacity provider. The approach to forecasting may take into account trends over time or other market data. The extent to which historical data is used in the forecasting process should provide a balance of historic long run marginal costs and short run marginal costs.

Option 3

Continue with the existing methodology and revisit and adjust the main assumptions to attempt to address some issues.**Option 4**

Continue with the existing approach of the modelling of the connection of a model generator and reinforce the methodology to undertake analysis more consistent with that undertaken for an access applicant. This would include options analysis, integration with Western Power long term planning and perhaps consideration of the impact of the Applications and Queuing Policy.

This approach would most accurately reflect the short run marginal cost of connection.

8.3. Options Comparison

The pros of each option are compared with the existing approach (Option 3) in terms of the assessment criteria in section 5.1.3 of this report . This information is provided symbolically in Table 3 with a tick representing an improvement compared to Option 3 for that criteria and a cross representing a worse outcome against that criteria.

- **Table 2 Comparison of alternative DCC calculation methodology (Options 1,2 and 4) approaches against the existing methodology (Option 3) - Detailed**

Criteria	Average Cost (Option 1)	Forecast DCC based on Historic Connection Costs Data (Option 2)	Reinforced Existing Approach (Option 4)
Accuracy	This approach would not reflect short run or long run marginal costs and, as such, may disconnect from an appropriate outcome over time.	This approach would likely result in a more accurate outcome than the status quo as it does not include the opportunities for inaccuracies introduced by assumptions. It would also pick up changes in the optimal technology for the efficient new entrant over time.	On the basis that the appropriate investment was made to implement this approach, this approach should yield DCC that closely reflect that experienced by the efficient new entrant capacity provider using the modelled technology.
Certainty	This approach would provide significant certainty in the market of the likely outcome of the DCC calculation.	This approach would in effect “smooth” changes in the cost of connecting over time. The extent of the smoothing would be impacted by the forecasting mechanism used. This mechanism may impact market certainty.	This approach would respond appropriately to any network constraints that may impact the model generator size. The need for a sophisticated model and confidential data may make it difficult to anticipate results.
Simplicity	Will require limited management and could likely be undertaken independent of Western Power.	Will require Western Power to undertake calculations (as confidential data will be used) but the methodology can be automated with new data added in each year’s review. This approach is significantly simpler than the existing approach.	This would be more complex than any that is used for any calculation currently undertaken by the IMO. It would likely require 1-2 technical staff full time to fully implement.
Resilience	Will disconnect the DCC from the major market mechanisms making the approach more resilient.	Will reflect changes in market mechanism albeit after a delay. The methodology will not be directly affected by changes in market and regulatory mechanisms.	This will result in an increased linking of the DCC calculation to the Access Queuing Policy and the Capital Contribution Policy increasing the impact of any change.
Flexibility	This approach would not effectively reflect changes in the market.	This approach could reflect changing trends in the market. Step changes in the market would be reflected on a year behind basis.	This approach could reflect changes in the market before they were experienced by market participants making the DCC a lead indicator for the market.

- **Table 3 Comparison of DCC Calculation Methodology Approaches against Option - Symbolic**

Criteria	Average Cost	Forecast DCC based on Historic Connection Costs Data	Reinforced Existing Approach
Accuracy	✗	✓	✓
Certainty	✓	✓	✗
Simplicity	✓	✗	✗
Resilience	✗	✓	✗
Flexibility	✓	✓	✓

From the summary provided in Table 2 and Table 3, Option 2 “Forecast DCC based on Historic Connection Costs Data” is the preferred option, the discussion below expands on this preference.

SKM are of the view that reinforcing the existing model connection approach (Option 4) will increase the accuracy of the DCC calculation against the short run “real world” connection costs. With a range of assumptions on the long term “stable” nature of the network taken from Western Power’s long term system planning information this approach may produce the most accurate investment signals. However, SKM are of the opinion that the increased complexity, management cost and certainty issues outweigh any benefit in accuracy that could be achieved through this approach. Moreover, the ultimate need for accuracy is via the pricing mechanism of the organised market for Reserve Capacity, making this issue a second-order concern from the perspective of the DCC calculation. Indeed, other jurisdictions that share a similar market design take this approach, allowing a more simplistic and approximate methodology for the determination of DCC estimates. Ideally, this issue should be picked up in the broader review of the RC mechanism.

The Average Cost (Option 1) approach significantly simplifies the existing approach. It is not however a reflection of marginal cost and cannot therefore be considered an accurate determinate of an efficient investment signal.

The option to forecast DCC based on historic connection costs (Option 2) will produce a more accurate outcome than the existing approach as it avoids many of the assumptions and simplifications the existing approach adopts. The method by which historic data is used in the forecasting process can be used to assist the DCC to better approximate appropriate investment signals by weighting recent and historic data. That is, a heavier weighting on more recent data would result in an increased focus on current investment conditions relative to historic conditions. This approach is also significantly simpler than the existing approach. For these reasons, Option 2 is the preferred approach.

8.3.1. Issues to be addressed with the preferred approach

SKM has identified the following issues with Option 2 that must be addressed in the methodology to effectively implement the approach:

1) Ability to Respond to Rapid Changes in Actual Connection Costs

   Western Power has indicated that they believe increasing constraints on the SWIS will result in a rapid increase in connection costs and have raised concerns that that using historic data may not be able to capture this. SKM is less concerned with this issue for reasons:

a) The requirement for applicants for Capacity Credits to have an Access Offer means that data will be available for the actual access offer costs for the year the capacity credits are required.

b) The requirement for the DCC to reflect the long run marginal cost of connection to best achieve market objectives means it need not respond to short term under investment in the network at a given location.

In developing the methodology it is intended that the Access Offer data for the year the capacity credits are required will be included in the calculation at an appropriate weighting.

2) Reflecting appropriate long run and short run conditions

Ultimately the MRCP should provide an appropriate investment signal for generation, such that the system tends towards the achievement of the reserve margin, with the installed capacity of generation reflecting an efficient mix of generation technologies. The achievement of appropriate investment signals is therefore more a challenge for the greater pricing mechanism of the market for Reserve Capacity, and less so for the DCC estimate that is merely a cost input. Given such, an appropriate setting for the DCC estimate is a stable estimate of transmission connection costs that are relevant when the installed capacity of generation just meets the level of the reserve margin; this may reflect a point when transmission capacity is either long or short. Obviously historic costs may be different from those in an equilibrium state. However, when noting that a forward looking method that embraces options analysis in a planning framwork is overly onerous, a method that uses historical data with weights to give greater emphasis to current conditions may be an adequate compromise, and may reveal emerging conditions.

3) Reflecting Connection Cost of Efficient Capacity Provider

As discussed in section 5.1.2, the DCC should be set to reflect the long run marginal cost of new peaking (liquid fuelled) capacity. The location of liquid fuelled peaking capacity is less dependent on the location of energy sources (coal, gas pipes, solar, and wind resources) than other generation technologies and as such these technologies are less constrained in their ability to avoid areas of network constraint. For this reason the methodology will only use historic capital contribution cost data for generators that are capable of liquid fuel operation.

4) Confidentiality of actual Connection Cost data

The historic access cost data held by Western Power is considered confidential information and cannot be released to external parties except in aggregate form. This represents a challenge in developing the details of the methodology that SKM and Western Power are working through.

- Selection of financial escalators

Given that the proposed methodology uses financial data across years, an appropriate discount rate will be required to provide an appropriate result in today's dollars. SKM believe that the WACC used within the MRCP calculation would be the most appropriate for this purpose.

- Consistent definition of "Total Connection Costs"

  The definition of the Total Connection Cost must include all network assets from the terminals of the generator step up transformer into the network

- Establishing a conservative forecasting error margin in the calculation

  The general practice by organised markets, when estimating or forecasting values for benchmark or reference prices, is to apply some conservatism in managing estimation or forecasting risks. This conservatism is often generous to market participants when these prices are used as a bid or price cap. This is particularly the case in the WEM where:

  a) The use of the Excess Capacity Adjustment to adjust the settlement cost of capacity credits in the case of oversupply partially mitigates the risk of conservatism in the calculation of the MRCP.

  b) A MRCP set too low in the event of a Capacity Auction could result in an undersupply of capacity in the market.

Given the above SKM will consider a margin in calculating the DCC in the context of other risk margins introduced elsewhere within the MRCP calculation.

9. Recommended Methodology

9.1. Preferred Option

SKM's preferred approach is Option 2, summarised in section 8.3. This approach calculates a weighted average of actual connection costs for liquid-fuel plant, with weights defined so that greater emphasis is given to more recent data.

9.2. Overview

The recommended methodology is implemented by a spreadsheet that takes in the cost of connection for a defined set of generation projects over time, using real costs for historic projects and access offers for projects that are yet to occur. An average annual connection cost per MW Certified Capacity is calculated for each year and this nominal figure is converted to a real figure for the calculation year of the Reserve Capacity Cycle. These real figures are then entered in to a weighted average with the most recent projects weighted more heavily than older projects. The weighted average figure is then scaled by a forecasting error to provide a forecast connection cost. The following discussion pertains to aspects of this calculation that are intended to address many of the issues raised in section 8.3.1 of this report.

9.3. Generators to be included

The calculation methodology only seeks to include generators that have a liquid fuelled capability. This position is to exclude the increased connection costs associated with generators that must be located next to remote fuel / energy sources such as wind, solar and coal. It is not considered that these increased connection costs should be captured in the MRCP calculation as it seeks to estimate the costs of an efficient new entrant capacity provider or peaking plant.

9.4. Scope of Connection Costs

The spreadsheet includes specific instructions pertaining to the scope to be covered by the connection costs included for each project. This scope includes all transmission costs from the terminals of the generator step up transformer into the network (including costs of procuring land easements etc.). If Western Power's connection cost data does not include all of the costs within this scope these costs should be estimated using Western Power's estimating methodology.

9.5. Pro-rating Capacity Costs

As the generation projects under consideration are of various sizes, the total connection costs for each project must be brought back to a common base. The base selected in the recommended calculation methodology is the certified capacity for each project. It is noted that this certified capacity can change marginally from year to year, for simplicity the most recent quantum of certified capacity for each connection has been used.

9.6. Escalation of Capital Costs

Converting the nominal cost data that represents the average for each year to real dollars for the calculation year requires an accurate escalation factor. This factor should reflect temporal movements in the cost of construction network assets. The sources of such an escalation factor could include:

1. Average change in the estimates for the scope of Clause 1.8 a-h of the Market Procedure for: Determination of the Maximum Reserve Capacity Price over the 5 year period considered
2. Escalation factors proposed by Western Power for their network assets and accepted by the Economic Regulatory Authority.
3. Published escalation factors .

The current draft of the report uses option 1 above as the basis for an escalation factor. The resulting escalation factor is calculated at 7.4% and is calculated based on the delta between the 2006 dedicated connection assets and the 2011 dedicated connection assets.

9.7. Weighting of Yearly Cost to the Calculated Cost

As discussed in section 9.1 of this report, the contribution each yearly average makes to the final forecast is weighted with the most recent years having a higher weighting. This weighting has been developed based on a consideration of the signalling role of marginal connection costs in the context of the MRCP calculation. The scaling used in the recommended solution is detailed in Table 4.

Table 4 Weighting of Annual Average Connection Costs

Year	Weighting
MRCP Calculation Year	7
MRCP Calculation Year - 1	5
MRCP Calculation Year - 2	3
MRCP Calculation Year - 3	1
MRCP Calculation Year – 4	1

9.8. Forecasting Margin

As discussed in section 8.3.1 jurisdictions around the world typically include a level of conservatism in the calculation of market caps. In the context of the DCC calculation, Western Power have indicated that they expect connection costs to continue to rise as the available capacity on the transmission network is consumed. To ensure significant increases in the cost of connection do not undermine the ability of the methodology to reflect the short term imperatives of the MRCP calculation as a price cap, a forecasting margin has been introduced. At this time this margin has been set at 15% to reflect the discount used in 4.29.1b of the Market Rules. However, this may be revisited if the year to year movement in actual connection costs proves to be higher than this.

9.9. Treatment of Years with no relevant connections

In some years no liquid fuel capable generation is connected to the SWIS. In the current 5 year window there is 1 year that does not have the connection of a liquid fuelled generator. For these years a proxy for the cost of connection is required. Two options were considered in establishing this proxy, using an average of surrounding years or using the cost calculated for Dedicated Connection Assets under Clause 1.8 a-h of the Market Procedure for: Determination of the Maximum Reserve Capacity Price. In the recommended methodology the Dedicated Connection Asset cost per MW Capacity Credit has been used on the basis that this cost is available and includes information on temporal movements in the cost of connection that may be lost using the averaging approach.

9.10. Integration into the Market Procedure

As the scope of the recommended calculation methodology includes all connection assets associated with connecting a generator the calculated metric would replace the Total Transmission Costs [TC] in the existing MRCP calculation. The change to Market Procedure could be as simple as altering the Market procedure as follows:

Clause 1.8.1 replaced with:

"Western Power will forecast the Total Connection Costs based on historic connection costs and relevant access offers for generators that are capable of being liquid fuelled. The forecasting methodology will be as approved by the ERA. For years that no suitable historic data is available a connection cost will be calculated on the basis defined in step 1.8.2.

Delete 1.8.2h

SKM will work with the IMO to establish the preferred text to implement the recommended solution in the Market Procedure.

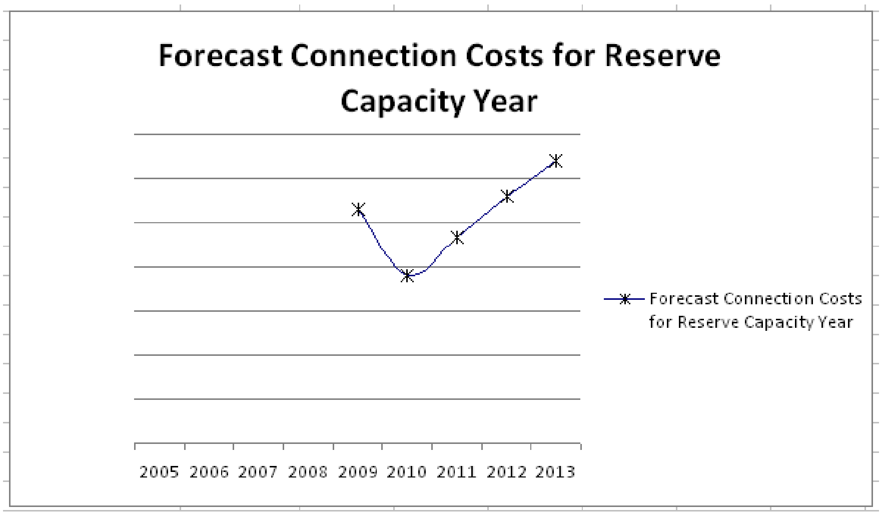
10. Impact of Methodology on Deep Connection Cost Calculation

Western Power have used the proposed methodology to calculate the TC based on preliminary data. Western Power note that there remains a requirement for outstanding data verification and that the result will change from that presented in this report.

As the recommended methodology produces an outcome that replaces Total Transmission Costs (TC) in the existing MRCP calculation the impact of the recommended methodology on the MRCP can be determined through a direct comparison between the historic TC and the TC calculated through the recommended methodology. In the 2011 Reserve Capacity Cycle the estimate for TC was $A48.798[11]Million or $304,875 per MW Capacity Credit. This compares to a figured calculated through the recommended methodology of $127,953 per MW.

The forecast Connection Cost for each Reserve Capacity Year has been back calculated for previous years and is provided in Figure 2 below. The information in Figure 2 is presented in such a way as not to undermine Western Power's confidentiality obligations for the underpinning access cost information. For example, the average annual connection costs data has been excluded and the graph has no scale. It is recommended that the information in Figure 2 be presented to the market to increase the level of certainty generated by the calculation process.

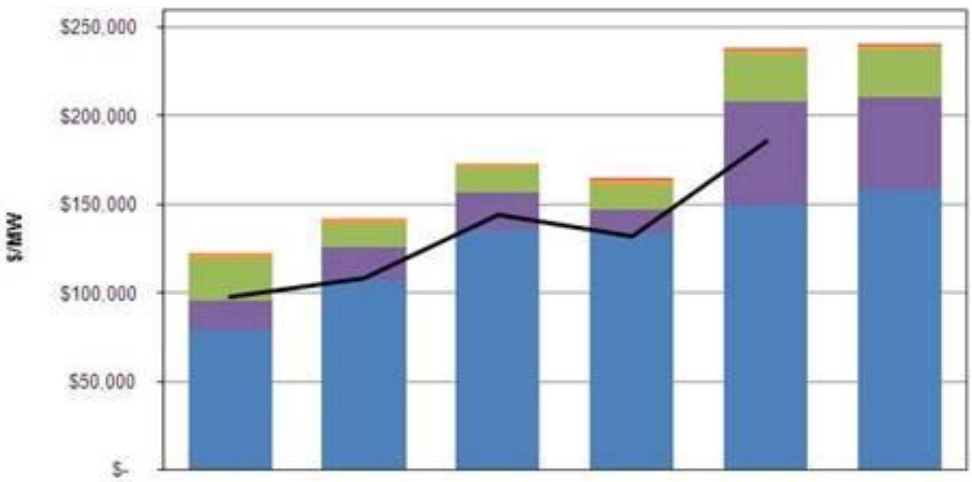
- **Figure 2 : Historic Figures for TC Calculated Using the Recommended Methodology**



[11]http://www.imowa.com.au/f175,877711/IMO_Final_Report_Max_Reserve_Capacity_Price_2013_14_final.pdf

The calculated figure for TC represents a 58 % reduction in the value for TC, a significant reduction. This does however bring the calculation more into line with the pre 2009 MRCP calculations as demonstrated in Figure 3. (Note that the figures in Figure 3 are the annualised contribution to the MRCP not the capital cost data discussed in the previous paragraph)

Figure 3 Historic Movements in Components of the MRCP[12]



Capacity Year	08/09	09/10	10/11	11/12	12/13	13/14
Power Station Cost	$ 79,110	$ 107,404	$ 135,701	$ 134,091	$ 149,306	$ 158,710
Transmission Costs	$ 16,558	$ 18,017	$ 20,672	$ 13,151	$ 58,493	$ 51,621
Fixed O& M	$ 23,900	$ 13,363	$ 14,392	$ 13,431	$ 27,335	$ 26,649
Fuel Costs	$ 2,907	$ 3,456	$ 2,631	$ 3,151	$ 2,615	$ 2,825
Land Costs	$ -	$ -	$ -	$ 293	$ 769	$ 818
MRCP (nearest $100)	$ 122,500	$ 142,200	$ 173,400	$ 164,100	$ 238,500	$ 240,600
Excess Capacity	6.43%	11.44%	2.19%	5.83%	8.99%	NA
Reserve Capacity Price (per yr)	$ 97,837	$ 108,459	$ 144,235	$ 131,805	$ 186,001	NA

---

[12] Source: http://www.imowa.com.au/mrcp

11. Conclusion

This paper has assessed the existing Deep Connection Cost calculation against the criteria of accuracy, certainty, simplicity, resilience and flexibility; these criteria have been determined and defined with reference to the Market Objectives. This assessment has concluded that although the existing methodology seeks to accurately forecast the marginal cost of connecting peaking capacity to the network, the methodology introduces complexity associated with:

- identifying the next marginal point of connection
- defining the minimum required works
- estimating costs associated with these works

In order to remain simple and cost effective the existing methodology introduces a range of assumptions and relies heavily on the experience of Western Power staff. These simplifying assumptions introduce significant inaccuracies to the calculation and undermine market certainty in the outcome.

The paper has considered a range of approaches to improve the DCC calculation methodology. The ideal methodology would forecast the long run marginal cost of the connection of peaking capacity to the network in a transparent and simple manner. Given the range of variables that impact connection costs, accurate forecasting requires either significant resources to determine the variables or the use of simplifying assumptions. This necessitates a trade-off between simplicity / cost and accuracy.

Given this trade off, an alternative methodology of using historic connection costs to indicate future connection costs has been recommended. This methodology is simple to implement and this report contends that the year to year movement in the long run marginal cost of connection will be less than the inaccuracy of the existing calculation methodology. This position is supported by the existing Reserve Capacity process that will allow the connection cost offers for the year the Reserve Capacity is required to be included in the calculation.

An excel spreadsheet has been developed to implement this methodology. Five years of connection cost history is used (including the offers for the current year) and the most recent years are weighted more heavily than historic years.

The output of the methodology is a single cost for connection per MW of Capacity Credit and a Chart demonstrating the trend of connection costs over time. If it is possible to publish this chart with the MRCP calculation, within the bounds of Western Power confidentiality requirements, the market certainty associated with this calculation would be reinforced.

The preliminary connection cost calculated by the recommended methodology spreadsheet yields a connection cost for the 2011 Reserve Capacity Cycle of $127,953 per MW. This represents and 58 % reduction on the 2011 calculation for TC.

Appendix A Assessment Criteria

The following summarises the benchmark criteria and attributes that have been used to guide the assessment:

General Criteria and Attributes:

Criterion or Attribute	How we consider it as part of this assessment
Resilience to anticipated scenarios of change	We will consider the appropriateness of the methodology in terms of the current context of the market, and with respect to our view of how the market and industry may evolve given anticipated scenarios of change, reform, investment and innovation. A consideration of resilience to potential scenarios of change is of particular relevance to the planning process, especially with respect to the planning assumptions and options that contribute to the assessment of shared connection costs and system augmentation or reinforcement costs. **Criteria: Resilience**
Consistent with the realities of operational practices, technological constraints and prevailing contracts	Given that the starting point of our assessment is to review the existing DCC calculation methodology of Western Power, we will assume that it achieves this attribute unless we identify participant concerns indicating the contrary in industry submissions to the IMO's 2010 MRCP determination. Where we identify weaknesses in the existing calculation methodology, we will explicitly consider this attribute in our recommendation of improvements to the calculation method.
Consistent with the broader market and regulatory arrangements that influence market behaviour and outcomes	Given that the starting point of our assessment is to review the existing DCC calculation methodology of Western Power, we will assume that it achieves this attribute unless we identify participant concerns indicating the contrary in industry submissions to the IMO's 2010 MRCP determination. Where we identify weaknesses in the existing calculation methodology, we will explicitly consider this attribute in our recommendation of improvements to the calculation method.
Processes of change are manageable in terms of time, cost and risk	Given that the starting point of our assessment is to review the existing DCC calculation methodology of Western Power, we will assume that it achieves this attribute unless we identify participant concerns indicating the contrary in industry submissions to the IMO's 2010 MRCP determination. Where we identify weaknesses in the existing calculation methodology, we will explicitly consider this attribute in our recommendation of improvements to the calculation method.

Specific Criteria and Attributes:

Criterion or Attribute	How we consider it as part of this assessment
Market Objective # 1 *To promote the economically efficient, safe and reliable production and supply of electricity and electricity related services in the South West interconnected system.*	Economic Efficiency: Economic efficiency in the context of the power market is associated with the production of electricity and electricity related services at minimum cost, and in a manner that fully reflects the preferences of market participants and end-users. The calculation methodology used for determining DCC contributes to an assessment of economic efficiency in the power market via its effect on investment, and its contribution to the pricing and investment signals intrinsic to the MRCP determination. Connection, augmentation and reinforcement assets that are determined to be economically efficient will typically be unique to a particular location, technology and time-frame, they will have a particular usage profile, and they will be determined to be optimal given a particular expectation of current and future market operation. The IMO's consideration of what is 'appropriate' with respect to the substance and application of the calculation methodology for DCC, in the context of the MRCP determination, must therefore consider not just the quality of the calculation parameters and processes, but also the planning basis and choice of options and assumptions that together influence the locational, technology, temporal and usage aspects of related assets. As a cost component to the calculation of the MRCP, the methodology for calculating DCC can be a significant influence on reserve capacity prices. This influence acts directly through the definition of the settlement price in the Reserve Capacity Mechanism and indirectly as a market signal impacting bilateral trade negotiations. Thus, to support the economic efficiency of the market the DCC Calculation must establish a cost that supports the correct level of investment in generation over the long term. Safety and Reliability: In the context of this review, safety can be interpreted in a financial sense, given effect by the Maximum Reserve Capacity Price (MRCP) that in part protects the industry from excessive price outcomes that may raise market risk, and potentially weaken the solvency of some participants. Reliability can be interpreted in terms of the adequacy and availability of capacity, particularly via the reserve and availability margin that is achieved in the wholesale market. . ▪ Connection costs that are too high, may raise the MRCP, and therefore subject participants to potentially higher prices for reserve capacity; this can reduce solvency, raise financial risk, and diminish the achievement of the safety aspect of this Market Objective. ▪ Connection costs that are too low may weaken investment and market participation signals, thereby potentially reducing the reserve and availability margin over time, and also diminish the achievement of this aspect of the

	Market Objective. We consider that the following criteria can assist the achievement of this objective: ▪ **Accurately reflect the cost borne by the efficient new entrant capacity provider** - Costs that are too low may dampen investment and market participation signals by reducing the extent that prices will recover generation costs. This will discourage competition and distort market outcomes. Further, in the event that costs are too high, investment signals may be excessive, causing over-investment which in the future may pose solvency issues for investors, and/or cause prices to be lower than may be efficient.
Market Objective # 2 *To encourage competition among generators and retailers in the South West interconnected system, including by facilitating efficient entry of new competitors.*	The extent of competition in a market is in part determined by industry structure, which is beyond the scope of this review. However, the extent to which the market and regulatory signals encourage and provide for market participation and investment has a direct impact on the number of participants in the market and therefore the level of competition. In terms of this latter point, and given the constraints of this review, we therefore consider that the following criteria assist the achievement of this objective: ▪ **Accurately reflect the cost borne by the cheapest new entrant capacity provider** - As above **Certainty for Investors -** As a significant market signal the stability of the DCC over time drives investment confidence increasing the spectrum of investors prepared to participate in the market.
Market Objective # 3 *To including sustainable energy options and technologies such as those that make use of renewable resources or that reduce overall greenhouse gas emissions.*	The MRCP works alongside the energy based markets within the WEM as a package to incentivise appropriate generation development and dispatch. Given the low maximum energy prices and the day before nature of STEM the MRCP plays a major role in incentivising low fixed cost peaking plants that only sell energy during periods of constrained supply and/or high demand. Thus the DCC must be adequate to facilitate investment in this generation technology. However, if the DCC is set too high it is likely the MRCP will over encourage the installation of cheap fixed cost plant to the detriment of generation technologies that fulfil other roles within the market. This will result in a suboptimal economic outcome. We consider that the following criteria assist the achievement of this objective: **Accurately reflect the cost borne by the cheapest new entrant capacity provider**. As above **Be flexible enough to capture changes in the location and technology of the cheapest new entrant capacity provider over time** The most efficient manner of delivering new peaking capacity to the WEM is likely to vary in location and technology over time. Ideally the DCC calculation methodology would be flexible enough to capture this change in location and

	technology as it varies over time to ensure that new, more competitive, peaking generation arrangements are not incentivised beyond their efficient contribution to the generation mix. That is, efficient peaking generation does not displace renewable generation beyond that which is efficient in the generation mix.
Market Objective # 4 *To minimise the long-term cost of electricity supplied to customers from the South West interconnected system.*	Ultimately the long-term cost of electricity is minimised when investments in industry assets and infrastructure occur in a manner that is timely, and with a location and technology that is economically optimal, and that combines with a market structure that is competitive. In terms of the constraints of this review, we note that timely investments occur when investment risk is minimised, implying a need for accurate market signals, a competitive market context, and the minimisation of regulatory and market risk over time. We therefore interpret this market objective in terms of the following criteria: ▪ **Accuracy of the cost calculation methodology** –As above ▪ **Simplicity of calculation** – The calculation of the DCC represents a direct overhead burden on the long term cost of generation in the market. More simple methodologies cost less to undertake and administer reducing the impact of market overheads on the cost of electricity.
Market Objective # 5 *To encourage the taking of measures to manage the amount of electricity used and when it is used.*	Given that the review is constrained to the context of power generators connecting to the SWIS, and the costs thereof, we do not consider this Market Objective as part of our assessment.

Appendix B AACEi Cost Estimating Classes

The AACEi (Association for the Advancement of Cost Engineering) international recommended practice of estimate classification is outlined in the table below.

- **Table 5 Generic Cost Estimate Classification Matrix (Summary)**

	Class 4 Order of Magnitude/Concept	Class 3 Pre-Feasibility Study (PFS)	Class 2 Feasibility Study (FS)	Class 1 Definitive Estimate
Basis Of Capital Cost Estimate – Purpose & Criteria				
Purpose	Preliminary economic and technical Investigation. Project screening. Comparison of alternatives, configurations and options	Economic Feasibility of one or more chosen options.	Project Approval and basis of securing financing. "Bankable " study	Detailed Control. Target measurement. Change/Variation. Monitor and control of implementation phase.
Expected Estimate Contingency Range	25% to 40%	15% to 20%	10% to 15%	5% to 10%
Accuracy - Indicative Range	-30% to +100%	-20% to +25%	-10% to +15%	-5% to +10%
Level of Project Definition	0% to 5%	10% to 30%	30% to 70%	70% to 100%
Level of Engineering (% of total Eng.)	0% to 2%	2% to 5%	1. 15% to 30%	2. 30% to 100%

Agenda Item 5: Weighted Average Cost of Capital – Debt Risk Premium

1. BACKGROUND

The IMO appointed Pricewaterhouse Coopers (PwC) to undertake a review of the methodology for determining the Weighted Average Cost of Capital (WACC). PwC's updated draft report was presented at the 17 February 2011 meeting and was accepted by the MRCPWG, subject to the following:

- the gearing ratio would be retained at 40% as there was insufficient argument for change; and
- the IMO would discuss the debt risk premium with the Economic Regulation Authority (the Authority) following the publication of its methodology for determining this parameter.

2. DEBT RISK PREMIUM METHODOLOGY PUBLISHED BY THE ERA

As was discussed at the 20 January 2011 meeting, the Authority released a discussion paper[1] on 1 December 2010 that sought feedback on its proposed future method for determining the debt risk premium in its regulatory roles. Following consideration of public submissions, the Authority published its methodology in the *Final decision on WA Gas Networks Pty Ltd proposed revised access arrangement for the Mid-West and South-West Gas Distribution Systems*[2] on 28 February 2011.

In considering the debt risk premium, the Authority noted the reduction in available estimates of bond yield data from the two sources previously used by regulatory authorities. CBASpectrum ceased publishing its estimates of fair yield curves for Australian corporate bonds in September 2010 and Bloomberg has progressively shortened its estimates of fair yields across all credit ratings.

To address these limitations and in response to developments in the Australian regulatory environment, the Authority has discontinued the previous practice of determining the debt risk premium by estimating a 10-year corporate bond through extrapolation of Bloomberg data. The Authority has instead based the debt risk premium on the yields of a sample of bond of varying terms to maturity, determined through direct observations from the Australian financial market.

The IMO proposes that the MRCPWG discuss the following options for determination of the debt risk premium:

---

[1] *Discussion Paper, Measuring the Debt Risk Premium: A Bond-Yield* Approach, available from http://www.erawa.com.au/cproot/9104/2/20101201%20D57440%20Discussion%20Paper%20-%20Measuring%20the%20Debt%20Risk%20Premium%20-%20A%20Bond-Yield%20Approach.PDF

[2] Available from http://www.erawa.com.au/cproot/9382/2/20110228%20Final%20decision%20on%20WA%20Gas%20Networks%20Pty%20Ltd%20proposed%20revised%20access%20arrangement%20for%20the%20MW%20and%20SW%20GDS.pdf

- extrapolation of Bloomberg BBB yield curves to 10 years, using 5-year and 7-year fair value curves, as performed by Allen Consulting Group in its *Update of WACC Minor Parameters*[3] for the 2011 MRCP determination;
- extrapolation of the Bloomberg 7-year BBB fair value curve to 10 years, using the most recent available 7-year and 10-year AAA fair value curves (last published on 22 June 2010) as recommended by PwC in its report for the MRCPWG[4]; and
- the bond-yield approach employed by the Authority.

3. RECOMMENDATIONS

The IMO recommends that the MRCPWG:

- **Discuss** the options for determination of the debt risk premium.

[3] Available from http://www.imowa.com.au/f175,877645/ACG_Report_to_IMO_291010.pdf

[4] Available from http://www.imowa.com.au/f2179,1029803/PwC_MRCP_WACC_-_Final_Report_28_February_2011.pdf

Agenda Item 6: Submissions from 2011 Maximum Reserve Capacity Price Determination

1. BACKGROUND

The IMO published the *Final Report: Maximum Reserve Capacity Price Review for the 2013/14 Reserve Capacity Year*[1] on 28 January 2011. In responding to the issues raised in submissions, the IMO committed to present various issues to the MRCPWG for consideration. In addition, in responding to the PwC draft report, Alinta has separately questioned the validity of the 15-year period over which the capital cost of the power station is annualised in determining the MRCP.

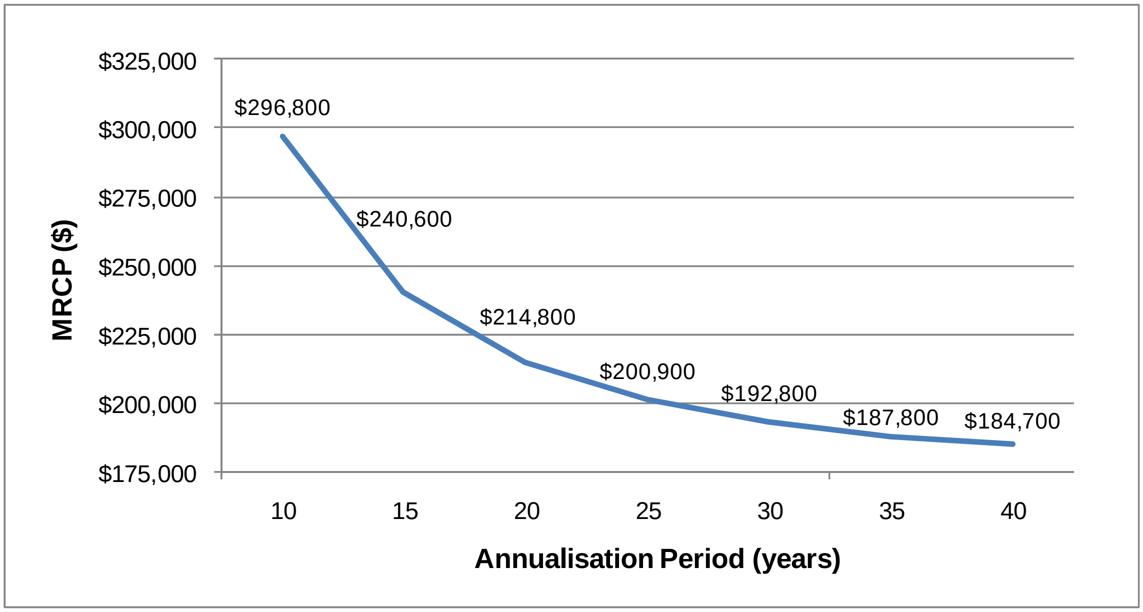
These specific issues were extracted and presented at the 17 February 2011 meeting, and are presented again in Appendix A. In considering the issues raised in submissions, the MRCPWG agreed that:

- discussion of the size of land parcels and the inclusion of insurance in the Fixed O&M costs be deferred to the 24 March 2011 meeting due to the high number of apologies for the 17 February meeting;
- the IMO would provide a summary of the impact on the MRCP of variation to the term for recovery of capital costs, which is presented below;
- the IMO would engage an engineering consultant to provide an independent view on escalation factors that could be considered in combination with the methodology proposed by SKM. The IMO expects that this advice will be available for consideration by the MRCPWG at the 5 May 2011 meeting; and
- further discussion regarding volatility in the MRCP would take place at a later date.

2. ANNUALISATION PERIOD

The MRCPWG requested that the IMO provide a summary of the impact on the MRCP of variation to the term for recovery of capital costs. The IMO has completed this analysis, which is presented in the graph below. For the purpose of this exercise, the IMO has varied the annualisation period within the calculation of the 2011 MRCP that will apply for the 2013/14 Capacity Year.

[1] Available at http://www.imowa.com.au/mrcp



The graph indicates that changing the annualisation period to 30 or 40 years would reduce the MRCP value by 20% and 23% respectively.

3. RECOMMENDATIONS

The IMO recommends that the MRCPWG:

- **Discuss** the term for recovery of capital costs, including the analysis of the impact of variation of this term on the MRCP;
- **Discuss** the treatment of insurance costs as either fixed or variable O&M costs; and
- **Discuss** the consideration of available lot sizes in the land cost determination.

Agenda Item 6 Appendix A: Issues Raised in Submissions for Further Consideration by the MRCPWG

Submissions from the 2011 MRCP Determination

Submitter	Component/Issue	Comment/Change Requested	IMO's response
Infratil Energy Australia	Escalation Factors	The determination of escalation factors through simple extrapolation of previous year's indices is a weak methodology. Observable forward prices for these commodities could provide a better estimate.	The IMO notes Infratil's comment. The IMO will investigate options for the use of observable forward prices for the purpose of cost escalation and will present these to the Maximum Reserve Capacity Price Working Group (MRCPWG).
Infratil Energy Australia	Fixed O&M	Infratil notes that the cost of insurance has been omitted and estimates this cost to be in the order of $1m per annum.	Step 1.12.1(c) of the Market Procedure for: Determination of the Maximum Reserve Capacity Price, specifies that the Insurance cost must be accounted for in the calculation of the WACC, however there is no aspect of the prescribed WACC formula in the Market Procedure where this is included. Additionally, operational insurance is seen as a variable O&M cost as it will depend upon how the plant is run and as such is considered to be a Short Run Marginal Cost. Therefore the insurance cost is not included in the calculation of the MRCP. The IMO will present Infratil's comment to the MRCPWG for its consideration.

Submitter	Component/Issue	Comment/Change Requested	IMO's response
Infratil Energy Australia	Volatility of RCP	The RCP is the only visible price for capacity available to investors and financiers. Year on year volatility in this price can undermine confidence in the allocation of capital to new capacity in the SWIS, Infratil recommends that the IMO give thought to methods for smoothing the annual price (without blunting price signals). These might include a rolling 3 year price or limiting the move (down) in price by, say, 5% from one year to the next.	The IMO notes Infratil's comments and suggestions. Concern around price volatility has been noted by the MRCPWG. Infratil's suggestion will be presented to the MRCPWG when it considers this issue in 2011.
Tesla Corporation	Land	It is noted in the MRCP Landgate report that the minimum lot size within the Kemerton Industrial Park is 5 hectares. The land cost is based upon a lot size of 3 hectares. This is inconsistent with the estimate of transmission line distance. The lot size should be calculated on the basis of 5 hectares if Kemerton is to be used as the reference site as it is not possible (due to planning restrictions) to obtain a site smaller than 5 hectares within a 2km distance of any substation in the Kemerton region. Alternatively the 2km distance should be increased to a meaningful distance that allows a 3 hectare site to be utilised. The costs should reflect a model plant that is possible to build. It is not possible to build this model plant as planning rules (acknowledged by Landgate) prevent this from occurring.	The Market Procedure stipulates that the land size must be 3 hectares (where no buffer zone is required) and the transmission line must be 2km in length. Consequently, revision of these costs can not be considered for the 2013/14 MRCP. However, the IMO notes Tesla's comment and will refer this to the MRCPWG for its consideration.

Submitter	Component/Issue	Comment/Change Requested	IMO's response
Perth Energy	Fixed O&M	Perth Energy notes that there remains no allowance for insurance costs in the MRCP. Insurance costs for a 160MW OCGT would be in the order of $1m per annum, or just over $6,000 per MW. Insurance is a necessary component for any prudent power station operator and Perth Energy suggests that such costs be explicitly provided for in any future MRCP reviews.	Step 1.12.1(c) of the Market Procedure specifies that the Insurance cost must be accounted for in the calculation of the WACC, however there is no aspect of the prescribed WACC formula in the Market Procedure where this is included. Additionally, operational insurance is seen as a variable O&M cost as it will depend upon how the plant is run and as such is considered to be a Short Run Marginal Cost. Therefore the insurance cost is not included in the calculation of the MRCP. The IMO will present Perth Energy's comment to the MRCPWG for its consideration.
Perth Energy	Escalation Factors	Perth Energy notes that some indices to be applied to escalate certain cost parameters have been based on the actual movement in base metals prices between 2009 and 2010. This resulted in a decrease in these cost parameters. The MRCP is forward looking and is meant to reflect the cost of providing generation capacity in future years. Perth Energy would therefore suggest that historical price movements in base metal prices are not relevant for cost escalation purposes and suggests the IMO investigate the potential use of forward estimates for base metal prices for the next MRCP review.	The IMO notes Perth Energy's comment. The IMO will investigate options for the use of observable forward prices for the purpose of cost escalation and will present these to the MRCPWG.

Submission in relation to PwC Draft Report

Submitter	Component/Issue	Comment/Change Requested	IMO's response
Alinta	MRCP Calculation	It is also noted that the MRCP calculation is based on recovering the capital costs over a 15-year period, which may relate to the period over which tax depreciation is permitted. However, Alinta understands that the likely economic life a generation facility will be in the vicinity of 30 – 40 years. Given that there is already a misalignment between the period of the special price arrangement (10 years) and the analysis period for the MRCP (15 years), it is unclear why the period over which the MRCP is calculated should not more accurately reflect the economic life of the assets. The methodology would simply need to recognise that some costs (e.g. depreciation) would be recovered over a shorter period than other costs.	The IMO notes Alinta's comment. The period over which the capital cost is annualised is beyond the scope of PwC's review of the WACC. The IMO proposes that this be discussed by the MRCPWG in conjunction with Agenda Item 6 (Submissions from 2011 MRCP Determination).

Agenda Item 7: Draft Market Procedure

1. BACKGROUND

The MRCPWG has arrived at a number of agreed outcomes during its work to date. These outcomes include the following:

- Power Station type: the appropriate power station type is an Open Cycle Gas Turbine with low NOx burners and inlet cooling, operating on distillate with 2% capacity factor;
- Power Station type: the appropriate quantity of capacity is 160 MW, provided as a single facility with a nominal nameplate capacity of 160 MW;
- Summer De-rating Factor (SDF): the SDF should be specified by the Consultant who develops the Power Station costs, according to available turbine and inlet cooling technology, and taking into account humidity conditions, replacing the value of 1.18 currently indicated in the Market Procedure;
- Power Station cost: the Consultant who develops the Power Station costs should specify uplift factors for construction costs in the current list of geographical locations;
- Transmission Connection Cost: Western Power is the appropriate party to determine shallow connection costs;
- Fixed Fuel Cost: the Fixed Fuel Cost should include an allowance to maintain sufficient fuel levels for 14 hours of operation at all times, not 12 hours as currently indicated in the Market Procedure;
- Fixed Operation and Maintenance (O&M): the current methodology for determining Fixed Operation and Maintenance Costs is appropriate;
- Land Cost: Landgate is the appropriate party to determine land costs;
- Land Cost: the current list of land locations is appropriate, although there should be greater flexibility to add to the list where appropriate;
- Land Cost: a Market Participant may not be required to purchase any required buffer zone if the facility was located in an industrial precinct, so the land size should be standardised with the stipulation that the buffer zone must exist where required;
- Weighted Average Cost of Capital (WACC): the IMO should continue to determine the WACC with the ERA reviewing this in its approval of the MRCP in accordance with clause 2.26.1 of the Market Rules;
- WACC: the majority of recommendations by Pricewaterhouse Coopers will be accepted, excluding the gearing ratio and debt risk premium;
- WACC: the IMO will continue to determine the WACC on a real pre-tax basis
- WACC: debt issuance costs will be included in the WACC calculation and no longer included in the the margin M;
- WACC: the gearing ratio will be kept at 40%; and

- Cost optimisation: Land, Transmission and Construction Costs should be optimised to determine the cheapest location.

2. DRAFT MARKET PROCEDURE

The IMO has updated the *Market Procedure: Maximum Reserve Capacity Price* to reflect the IMO's new format arising from its Market Procedure project and to incorporate the agreed changes listed above. The IMO notes that the MRCPWG has yet to finalise some remaining elements of the MRCP, and has highlighted these sections of the Market Procedure in yellow.

The draft Market Procedure is provided to the MRCPWG for its evaluation and consideration.

3. RECOMMENDATIONS

The IMO recommends that the MRCPWG:

- **Discuss** the amendments made to the *Market Procedure: Maximum Reserve Capacity Price*; and
- **Note** that the IMO will further amend the Market Procedure and present these amendments to the MRCPWG as the remaining elements MRCPWG's review are completed.

MARKET PROCEDURE: Maximum Reserve Capacity Price

VERSION 5

Deleted: 4

fsdfsdfMarket

ELECTRICITY INDUSTRY ACT 2004

ELECTRICITY INDUSTRY
(WHOLESALE ELECTRICITY MARKET)
REGULATIONS 2004

WHOLESALE ELECTRICITY MARKET RULES

COMMENCEMENT:

This Market Procedure took effect from 8:00am (WST) on the same date as the Wholesale Electricity Market Rules.

VERSION HISTORY

VERSION	EFFECTIVE DATE	NOTES
1	13 October 2008	Market Procedure for Determination of the Maximum Reserve Capacity Price resulting from PC_2008_06
2	4 December 2008	Amended Market Procedure for Determination of the Maximum Reserve Capacity Price resulting from PC_2008_14
3	1 April 2010	Amendments to the Procedure resulting from Procedure Change Proposal PC_2009_12
4	11 October 2010	Amendments to the Procedure resulting from Procedure Change Proposal PC_2010_04
5	XXXX	Amendments to the Procedure resulting from XXXX

CONTENTS

Deleted: 1
Deleted: 1
Deleted: 1
Deleted: 1
Deleted: 2
Deleted: 2
Deleted: 2
Deleted: 3
Deleted: 4
Deleted: 6
Deleted: 1
Deleted: 6
Deleted: 1
Deleted: 7
Deleted: 2
Deleted: 8
Deleted: 3
Deleted: 8
Deleted: 3
Deleted: 12
Deleted: 6
Deleted: 14
Deleted: 8

1 PROCEDURE FOR DETERMINING THE MAXIMUM RESERVE CAPACITY PRICE

This procedure for determining the Maximum Reserve Capacity Price sets out the principles to be applied and steps to be taken by the Independent Market Operator (IMO) in order to develop and propose the Maximum Reserve Capacity Price as required under the Market Rules. Under the Market Rules, the Maximum Reserve Capacity Price is used as the price cap for the Reserve Capacity Auction in the event that one is held. It is also used as the basis of determining the price of uncontracted Capacity Credits in the case where the Reserve Capacity Auction is cancelled.

1.1 Interpretation

1.1.1 In this procedure, unless the contrary intention is expressed:

(a) terms used in this procedure have the same meaning as those given in the Wholesale Electricity *Market Amending Rules* (made pursuant to Electricity Industry (Wholesale Electricity Market) Regulations 2004);

(b) to the extent that this procedure is contrary or inconsistent with the Market Rules, the Market Rules shall prevail to the extent of the inconsistency;

(c) a reference to the Market Rules or Market Procedures includes any associated forms required or contemplated by the Market Rules or Market Procedures; and

(d) words expressed in the singular include the plural or vice versa.

1.2 Purpose

The purpose of this procedure is to describe the steps that the IMO must undertake in determining the Maximum Reserve Capacity Price in each Reserve Capacity Cycle.

This procedure is made in accordance with clause 4.16.3 of the Market Rules.

1.3 Application

1.3.1 This procedure applies to:

(a) The IMO in determining the Maximum Reserve Capacity Price; and

(b) Western Power in developing estimates of the costs associated with connecting a notional Power Station to the 330 kV transmission system.

1.4 Overview of the Maximum Reserve Capacity Price

The Maximum Reserve Capacity Price sets the maximum offer price that can be submitted in a Reserve Capacity Auction and is used as the basis to determine an administered Reserve Capacity Price if no auction is required. Each year the IMO is required to conduct a review of the appropriateness of a number of the components that are used to determine the Maximum Reserve Capacity Price.

1.5 Definition of Power Station

1.5.1 The Power Station upon which the Maximum Reserve Capacity Price shall be based will:

(a) be representative of an industry standard liquid-fuelled Open Cycle Gas Turbine (OCGT) power station.

(b) have a nominal nameplate capacity of 160 MW.

(c) operate on distillate as its fuel source.

(d) have a capacity factor of 2%.

(e) include low Nitrous Oxide (NOx) burners or associated technologies as would be required to demonstrate good practice in power station development.

(f) include an inlet air cooling system.

1.6 Scope of the Factors to Maximum Reserve Capacity Price

1.6.1 The Maximum Reserve Capacity Price is to include all reasonable costs expected to be incurred in the development of the Power Station, which will include estimation and determination of:

(a) Power Station balance of plant costs, which are those other ancillary and infrastructure costs that would normally be experienced when developing a project of this nature;

(b) land costs;

(c) costs associated with the development of liquid fuel storage and handling facilities;

(d) costs associated with the connection of the Power Station to the bulk transmission system;

(e) allowances for legal costs, insurance costs, financing costs and environmental approval costs;

(f) reasonable allowance for a contingency margin; and

(g) estimates of fixed operating and maintenance costs for the Power Station, fuel handling facilities and the transmission connection components.

1.7 Development of Costs for the Power Station

1.7.1 The IMO shall engage a consultant to provide advice, including an estimate of the costs associated with designing, purchasing and constructing the Power Station. The Power Station costs shall be determined with specific reference to the use of actual project-related data and shall take into account the specific development conditions under which the Power Station will be developed. This may include direct reference to:

(a) Existing power stations, or power station projects under development, in Australia and more particularly Western Australia.

(b) Worldwide demand for gas turbine engines for power stations.

(c) The engineering, design and construction, environment and cost factors in Western Australia.

(d) The level of economic activity at the state, national and international level.

1.7.2 Development of the Power Station costs shall include components for the gas turbine engines, and all Balance of Plant costs that would normally be applicable to such a Power Station. This must include, but will not be limited to the following items:

(a) Civil Works.

(b) Mechanical Works.

(c) Electrical Works.

(d) Buildings and Structures.

(e) Engineering and Plant Setup.

(f) Miscellaneous and other costs.

(g) Communications and Control equipment.

(h) Commissioning Costs.

1.7.3 Power Station Costs must be determined, for all locations listed in step 1.11.1, as at June in Year 1 of the Reserve Capacity Cycle. Where Power Station Costs have been determined at a different date, those costs must be escalated using a power station capital cost escalation factor.

Formatted: Font: (Default) Calibri, 12 pt

The methodology for determining the power station capital cost escalation factor shall be determined by the IMO.

Formatted: Highlight

1.7.4 The Consultant employed under 1.7.1 shall determine a Summer De-rating Factor for the Power Station which shall take into account available turbine and inlet cooling technology, recent humidity conditions and any other relevant factors.

Formatted: Font: (Default) Calibri, 12 pt

1.8 Transmission Connection Works

1.8.1 Western Power shall provide Transmission Connection Cost Estimates on the basis defined in step 1.8.2.

Formatted: Highlight

Deleted: S

Formatted: Highlight

Deleted: 0

1.8.2 The Transmission Connection Cost Estimate shall be developed on the following basis:

(a) The capital cost (procurement, installation and commissioning, excluding land cost) of a generic, industry standard 330kV substation that facilitates the connection of the Power Station will be estimated.

(b) The estimate will include all the components and costs associated with a standard substation.

(c) The estimated cost will be based on a generic three breaker mesh substation configured in a breaker and a half arrangement.

(d) The substation will be located adjacent to an existing transmission line and include an allowance for 2km of 330kV overhead single circuit line to the power station that will have one road crossing.

(e) It shall be assumed that the transmission connection to the Power Station will be located on 50% flat - 50% undulating land, 50% rural - 50% urban location and there will be no unforeseen environmental or civil costs associated with the development.

(f) The connection of the substation into the existing transmission line will be turn-in, turn-out and will be based on the most economical (i.e. least cost) solution. It is assumed that the existing transmission line will not require modification to allow the connection with the exception of one new tower located at the substation to allow a point of connection.

(g) Costs associated with any staging works will not be considered.

(h) Shallow connection easement costs will be considered.

(i) An estimate of deep connection costs shall be included.

1.9 Fixed Fuel Cost

Deleted: <#>Section Break (Next Page) Liquid Fuel Storage and Handling Facilities

1.9.1 The IMO must determine appropriate and reasonable costs for the Liquid Fuel storage and handling facilities. Costs associated with the following items should be developed:

(a) A fuel tank of 1,000 t (nominal) capacity including foundations and spillage bund.

(b) Facilities to receive fuel from road tankers.

(c) All associated pipework, pumping and control equipment.

1.9.2 The estimate should be based on the following assumptions:

(a) Land is available for use and all appropriate permits and approvals for both the power station and the use of liquid fuel have been received.

(b) The capacity of the storage tank should be sufficient to allow for 24 hours of continuous operation at maximum capacity for a 160 MW open cycle gas turbine power station.

(c) Any costing components that may be time-varying in nature must be disclosed as part of the modelling. Such components might be the cost of the liquid fuel, which will vary over time and as a function of exchange rates etc.

1.9.3 The costing should only reflect fixed costs associated with the Fixed Fuel Cost (FFC) component and should include an allowance for keeping enough fuel in storage to allow for the Power Station to operate for 14 hours at maximum capacity.

Deleted: the tank half-full at all times

1.9.4 The IMO may engage a consultant to assist the IMO in reviewing and estimating the costs associated with liquid fuel storage and handling facilities.

1.9.5 Fixed Fuel Costs (FFC) must be determined as at June in Year 1 of the Reserve Capacity Cycle. Where Fixed Fuel Costs have been determined at a different date, those costs must be escalated using annual CPI as published by the Australian Bureua of Statistics (ABS), on a June to June basis, as a cost escalation factor.

1.10 Fixed Operating and Maintenance Costs

1.10.1 The IMO must determine Fixed Operating and Maintenance (O&M) costs for the Power Station and the associated transmission connection works.

1.10.2 The Fixed O&M costs may be separated into those costs associated with the Power Station, those costs associated with the transmission connection infrastructure and any other major components that are considered likely to be of sufficient magnitude so as to require separate determination.

1.10.3 Fixed O&M costs shall also include fixed network access and/or ongoing charges, which are to be provided by Western Power.

1.10.4 To assist in the computation of annualised Fixed O&M costs, the costs associated with each major component shall be presented in 5 year periods covering 1 to 5 years; 6 to 10 years; 11 to 15 years; 16 to 20 years; 21 to 25 years; 26 to 30 years; 31 to 35 years; 36 to 40 years; 41 to 50 years; 51 to 55 years; and 56 to 60 years as required respectively.

1.10.5 The Fixed O&M costs associated with each major component shall be converted into an annualised Fixed O&M cost as required in the determination methodology section (1.14).

1.10.6 The IMO may engage a consultant to assist the IMO in reviewing and estimating the Fixed O&M costs.

1.10.7 Fixed O&M costs must be determined as at June in Year 1 of the Reserve Capacity Cycle. Where Fixed O&M costs have been determined at a different date, those costs must be escalated using:

(a) a Generation O&M Cost escalation factor for Generation O&M costs

(b) a Labour cost escalation factor for transmission and switchyard O&M costs

(c) cpi as published by the Australian Bureau of Statistics for fixed network access and/or ongoing charges

1.10.8 The methodology for determining the Fixed O&M Costs escalation factor shall be determined by the IMO.

1.11 Land Costs

Deleted: .
Formatted: English (U.K.)
Formatted: List Paragraph, No bullets or numbering
Formatted: Font color: Custom Color(RGB(0,54,79)), English (U.K.)
Formatted: List Paragraph, No bullets or numbering
Formatted: Main Sub Heading, Numbered + Level: 1 + Numbering Style: a, b, c, … + Start at: 1 + Alignment: Left + Aligned at: 1.27 cm + Indent at: 2.22 cm
Formatted: Font: (Default) Calibri, 12 pt
Formatted: Font: (Default) Calibri, 12 pt
Formatted: Main Sub Heading, Indent: Left: 2.22 cm, No bullets or numbering
Formatted: Main Sub Heading, Numbered + Level: 1 + Numbering Style: a, b, c, … + Start at: 1 + Alignment: Left + Aligned at: 1.27 cm + Indent at: 2.22 cm
Formatted: Font: (Default) Calibri, 12 pt
Formatted: Main Sub Heading, No bullets or numbering
Formatted: Main Sub Heading, Indent: Left: 0.95 cm, Hanging: 1.27 cm, No bullets or numbering
Formatted: Font: (Default) Calibri, 12 pt
Formatted: Font: (Default) Calibri, 12 pt
Formatted: Font: (Default) Eurostile LT Std Bold, 13 pt, English (U.K.)
Formatted: Main Sub Heading, Indent: Left: 2.22 cm, No bullets or numbering
Formatted: List Paragraph, No bullets or numbering

1.11.1 The IMO shall retain Landgate under a consultancy agreement each year to provide valuations on parcels of industrial land. The regions in which the analysis would be conducted will include:

(a) Collie Region

(b) Kemerton Industrial Park Region

(c) Pinjar Region

(d) Kwinana Region

(e) North Country Region

(f) Kalgoorlie Region

These areas represent the regions within the South West interconnected system (SWIS) where generation projects are most likely to be proposed and should provide a broad cross-section of options. Where appropriate, the IMO may include additional locations.

1.11.2 The IMO will contract with Landgate to conduct the valuations on the same land parcel size, so as to provide a consistent method of valuing the cost of purchase of the land. The IMO will provide an indication as to the size of land required, which should be limited to the following options:

(a) One parcel of land in an industrial area of a standard size with consideration given to any requirements for a buffer zone in that specific location. For example. 3 ha.

(b) The summation of multiple smaller parcels of land as appropriate to meet the requirements above.

c)

1.12 Legal, Financing, Insurance, Approvals and Other Costs (margin M)

1.12.1 The IMO shall determine the value of margin M, which shall constitute the following costs associated with the development of the Power Station project:

(a) legal costs associated with the design and construction of the power station.

(b) financing costs such as debt and equity raising costs not directly covered in the debt issuance costs within the Weighted Average Cost of Capital.

Deleted: are

Deleted: which does not require a significant buffer zone due to its classification.

Formatted: Highlight

Deleted: One larger parcel of land which includes the requirement of a buffer zone. For example. 30 ha.

Deleted: an estimate for

Deleted: application of the cost of finance the Maximum Reserve Capacity Price

(c) insurance costs required to insure the replacement of capital equipment and infrastructure;

(d) approval costs including environmental consultancies and approvals, and local, state and federal licensing, planning and approval costs;

(e) other fixed costs associated with operating and maintaining the Power Station; and

(f) contingency costs, where this shall be equal to a factor of 0.15.

1.12.2 The IMO may engage a consultant or consultants to directly estimate costs associated with the provision of Legal Costs, Financing, Insurance and Environmental approval costs.

1.13 Weighted Average Cost of Capital (WACC)

1.13.1 The IMO must determine the cost of capital to be applied to various costing components of the Maximum Reserve Capacity Price. This cost of capital shall be an appropriate WACC for the generic Power Station project considered, where that project is assumed to receive Capacity Credits through the Reserve Capacity Auction and be eligible to receive a Long-Term Special Price Arrangement through the Reserve Capacity Mechanism.

1.13.2 The WACC will be applied directly:

(a) in the annualisation process used to convert the Power Station project capital cost into an annualised capital cost; and

(b) to account for the cost of capital in the time period between when the Reserve Capacity Auction is held (i.e. when capital is raised), and when the payment stream is expected to be realised. To maintain computational simplicity, the nominal time for this period is one year. It is assumed that the total investment cost of the generic power station will be incurred in even incremental amounts over the 12 month period immediately preceding the first Reserve Capacity Year. As a result the effective compensation period for the total investment cost for the generic power station will be six months as detailed in the CAPCOST[t] formula in step 1.14.1.

1.13.3 The methodology adopted by the IMO to determine the WACC will involve a number of components that require review. These components are classed as those which require review annually (called Minor components) and those structural components of the WACC which require review less frequently (called Major components) as detailed in step 1.13.8.

1.13.4 In determining the WACC, the IMO:

Deleted: . This component shall be computed as part of the determination of the Weighted Average Cost of Capital (WACC).

Deleted: two years

Formatted: Highlight

Deleted: may

Deleted: will normally be

Deleted: .

Deleted: <#>The IMO must determine the WACC for the purposes of calculating the Maximum Reserve Capacity Price. ¶

(a) must annually review the Minor components; and.

(b) may review the Major components if, in the IMO's opinion, a significant economic event has occurred since undertaking the last 5 yearly review of the Maximum Reserve Capacity Price in accordance with clause 4.16.9 of the Market Rules.

1.13.5 The IMO may engage a consultant to assist the IMO in reviewing the Major and Minor components of the WACC.

1.13.6 The IMO shall compute the WACC on the following basis:

(a) The WACC shall use the Capital Asset Pricing Model (CAPM) as the basis for calculating the return to equity.

(b) The WACC shall be computed on a Pre-Tax basis.

(c) The WACC shall use the standard Officer WACC method as the basis of calculation.

1.13.7 The pre-tax real Officer WACC shall be calculated using the following formulae

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

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

Where:

(a) R_e is the nominal return on equity (determined using the Capital Asset Pricing Model) and is calculated as:

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

Where:

R_f is the nominal risk free rate for the Capacity Year;

β_e is the equity beta; and

MRP is the market risk premium.

(b) R_d is the nominal return on debt and is calculated as:

$$R_d = R_f + DM$$

Where:

R_f is the nominal risk free rate for the Capacity Year;

DM is the debt margin, which is calculated as the sum of the debt risk premium (DRP) and debt issuance cost (d).

(c) *t* is the benchmark rate of corporate income taxation, established at either an estimated effective rate or a value of the statutory taxation rate;

(d) γ is the value of franking credits;

(e) *E/V* is the market value of equity as a proportion of the market value of total assets;

(f) *D/V* is the market value of debt as a proportion of the market value of total assets; and

(g) The nominal risk free rate, R_f, for a Capacity Year is the rate determined for that Capacity Year by the IMO on a moving average basis from the annualised yield on Commonwealth Government bonds with a maturity of 10 years:

– using the indicative mid rates published by the Reserve Bank of Australia;

and

– averaged over a 20-trading day period.

(h) The debt risk premium, *DRP*, for a Capacity Year is the premium determined for that Capacity Year by the IMO as the margin between the observed annualised Australian benchmark corporate bond rate for corporate bonds which have a BBB (or equivalent) credit rating from Standard and Poors and a maturity of 10 years and the nominal risk free rate:

– using the predicted yields for corporate bonds published by Bloomberg for 10 year BBB rated bonds;

– using the nominal risk free rate calculated as directed above; and;– the nominal risk free rate and Bloomberg yields averaged over the same 20-trading day period.

(i) If there are no Commonwealth Government bonds with a maturity of 10 years on any day in the period referred to in step 1.1.1(g), the IMO must determine the nominal risk free rate by interpolating on a straight line basis from the two bonds closest to the 10 year term and which also straddle the 10 year expiry date.

(j) If the methods used in steps 1.13.8(h) and 1.13.8(i) cannot be applied due to suitable bond terms being unavailable, the IMO may determine the nominal risk free rate and the DRP by means of an appropriate approximation.

(k) *i* is the forecast average rate of inflation for the 10 year period from the date of determination of the WACC. In establishing a forecast of inflation, the IMO

Deleted: *DRP*

Formatted: Indent: Left: 5 cm, First line: 0 cm

Deleted: risk premium for the Capacity Year

Deleted: ;¶

Formatted: Highlight

Deleted: +

Deleted: and the nominal risk free rate calculated as directed above; and

Deleted: ¶

Deleted: S

Deleted: s

Deleted: and 1.1.1(h)

Deleted: and the *DRP*

Deleted: methodology

Deleted: S

is to have regard to the forecasts of the Reserve Bank of Australia and, beyond the period of any such forecasts, the mid-point of the Reserve Bank's target range of inflation.

1.13.8 The CAPM shall use the following parameters as variables each year.

CAPM Parameter	Notation/Determination	Component	Value
Nominal risk free rate of return (%)	R_f	Minor	TBD
Expected inflation (%)	*i*	Minor	TBD
Real risk free rate of return (%)	R_{fr}	Minor	TBD
Market risk premium (%)	*MRP*	Major	6.00
Asset beta	β_a	Major	0.5
Equity beta	B_e	Major	0.83
Debt risk premium (%)	*DRP*	Minor	TBD
Debt issuance costs (%)	d	Major	0.125
Corporate tax rate (%)	*t*	Major	30
Franking credit value	γ	Major	0.5
Debt to total assets ratio (%)	*D/V*	Major	40
Equity to total assets ratio (%)	*E/V*	Major	60

Deleted: <#>*i* is the forecast rate of inflation. In establishing a forecast of inflation, the IMO is to have regard to the forecasts of the Reserve Bank of Australia, the Western Australian Department of Treasury and Finance, and financial market participants.¶

Deleted: π_e

Formatted: Font: Italic

Deleted: margin

Deleted: *DM*

Deleted: Minor

Deleted: TBD

1.14 Determination of the Maximum Reserve Capacity Price

1.14.1 The IMO shall use the following formulae to determine the Maximum Reserve Capacity Price:

A value for PRICECAP[t] shall be determined for each of the locations as listed under step 1.11.1. The lowest determined value for PRICECAP[t] shall be used as the Maximum Reserve Capacity Price.

Formatted: Indent: Left: 1.25 cm, No bullets or numbering

PRICECAP[t] = (ANNUALISED_FIXED_O&M[t] + ANNUALISED_CAPCOST[t] / (CAP / SDF))

Deleted: The Maximum Reserve Capacity Price to apply for a Reserve Capacity Auction held in calendar year t is PRICECAP[t] where this is to be calculated as:¶

Where:

PRICECAP[t] is the Maximum Reserve Capacity Price to apply in a Reserve Capacity Auction held in calendar year t;

ANNUALISED_CAPCOST[t] is the CAPCOST[t], expressed in Australian dollars in year t, annualised over a 15 year period, using a Weighted Average Cost of Capital (WACC) as determined as part of the Maximum Reserve Capacity Price Market Procedure and updated as required;

CAP is the capacity of an open cycle gas turbine, expressed in MW, and equals 160MW;

SDF is the summer derating factor of a new open cycle gas turbine, and shall be determined, in conjunction with Power Station costs in step 1.7.3;CAPCOST[t] is the total capital cost, expressed in million Australian dollars in year t, estimated for an open cycle gas turbine power station of capacity CAP; and

ANNUALISED_FIXED_O&M[t] is the annualised fixed operating and maintenance costs for a typical open cycle gas turbine power station and any associated electricity transmission facilities, expressed in Australian dollars in year t, per MW per year.

The value of CAPCOST[t] for each location is to be calculated as:

CAPCOST[t] = (PC[t] x (1 + M) x CAP + TC[t] + FFC[t] + LC[t]) x (1+ WACC)^1/2

Where:

PC[t] is the capital cost of an open cycle gas turbine power station in year t, expressed in Australian dollars in year t per MW as determined in step 1.7 for that location;

M is a margin to cover legal, approval, financing and other contingency costs as detailed in step 1.12;

TC[t] is the Transmission Connection Cost Estimate as determined in step 1.8 for that location.;

FFC[t] is the Fixed Fuel Cost as determined in step 1.9;LC[t] is the Land Cost as determined in step 1.11 for that location; and

WACC is the Weighted Average Cost of Capital as determined in step 1.13.

1.14.2 Once the IMO has determined a revised value for the Maximum Reserve Capacity Price, the IMO must publish a draft report describing how it has arrived at the proposed revised value **[MR4.16.6]**. In preparing the draft report, the IMO must include details of how it has arrived at any proposed revised values for the Major and Minor components used in calculating the WACC.

1.14.3 The IMO must publish the draft report on the Market Web-site and advertise the report in newspapers widely distributed in Western Australia and request submissions from all sectors of the Western Australian energy industry, including end users.

1.14.4 After considering any submissions on the draft report the IMO must propose a final value for the Maximum Reserve Capacity Price and submit the report to the Economic Regulation Authority (ERA) of Western Australia for approval.

Deleted: equals 1.18

Deleted: ;¶

Deleted: ¶

Formatted: Indent: Left: 0 cm

Deleted: 2

Formatted: Superscript

Deleted: and financing

Deleted: costs and

Deleted: ies

Deleted: is the cost of electricity transmission assets required to connect an open cycle gas turbine power station to the SWIS, plus an estimate of the costs of augmenting the shared network to facilitate the connection of the open cycle gas turbine power station, expressed in Australian million dollars in year t

Deleted: is the fixed fuel costs and must represent the fixed costs associated with an on-site liquid storage tank with sufficient capacity for 24 hours of Liquid Fuel including the cost of keeping this tank half full at all times expressed in Australian million dollars in year t; ¶

Deleted: is the cost of land purchased in year [t]

Formatted: Indent: Left: 2.54 cm, Hanging: 1.27 cm

Deleted: ¶

Formatted: Outline numbered + Level: 3 + Numbering Style: 1, 2, 3, … + Start at: 1 + Alignment: Left + Aligned at: 0 cm + Tab after: 1.27 cm + Indent at: 1.27 cm

1.14.5 Once the final value for the Maximum Reserve Capacity Price, with any updates, has been approved by the ERA, the IMO shall post a final report on the IMO website advising of the revised Maximum Reserve Capacity Price.

1.14.6 The IMO shall publish the Maximum Reserve Capacity Price in the Request for Expressions of Interest document which must be published before 31 January of Year 1 of the relevant Reserve Capacity Cycle.

Formatted: List Paragraph, No bullets or numbering

Formatted: Outline numbered + Level: 3 + Numbering Style: 1, 2, 3, … + Start at: 1 + Alignment: Left + Aligned at: 0 cm + Tab after: 1.27 cm + Indent at: 1.27 cm

Formatted: List Paragraph, No bullets or numbering

Formatted: Outline numbered + Level: 3 + Numbering Style: 1, 2, 3, … + Start at: 1 + Alignment: Left + Aligned at: 0 cm + Tab after: 1.27 cm + Indent at: 1.27 cm

1.15 Major Review

1.15.1 In accordance with clause 4.16.9, the IMO must conduct a review of the methodology used to determine the Maximum Reserve Capacity Price at least once every five years ("Major Review"). This process will review the basis for determining the Maximum Reserve Capacity Price, the structural methodology by which the Maximum Reserve Capacity Price is computed each year and the method the IMO uses to estimate each of the constituent components of the Maximum Reserve Capacity Price.

1.15.2 For annual reviews carried out between Major Reviews the IMO must use the same methodology as it used in the most recent Major Review. However, where the IMO considers that any of the comparator companies used in the most recent Major Review are no longer available or that its characteristics have significantly changed, the IMO may select a different set of comparator companies, applying the following criteria:

(a) the company must be a power generator, energy transmitter or distributor;

(b) market capitalisation must be more than $200m AUD; and

(c) the company must be listed on Bloomberg.

Maximum Reserve Capacity Price Basis

1.15.3 The basis of determining the Maximum Reserve Capacity Price shall be reviewed by the IMO with particular reference to the following factors:

(a) The type of power station

(b) The size of the power station

(c) The expected load factor of the power station

(d) Primary and secondary fuel types of the power station.

1.15.4 The above review must give consideration to the Wholesale Electricity Market Objectives.

Power Station

1.15.5 In accordance with Market Rule 4.16.9, the IMO must conduct a review of the definition of the Power Station and its associated components. The IMO is required to take into consideration the following factors:

(a) The method used to determine the Power Station price

(b) The summer derating factor applied to the Power Station

(c) The capacity factor of the Power Station.

Transmission Connection

1.15.6 In accordance with Market Rule 4.16.9, the IMO must conduct a review of the type of connection used to connect the Power Station to the bulk transmission network. The IMO is required to take into consideration the following factors:

(a) Which part of the bulk transmission system the Power Station will be connected to (eg 330kV / 220 kV/ 132 kV).

(b) Land use type assumptions (rural/urban options).

(c) The switchyard configuration.

(d) The number of road crossings.

Fixed Fuel Costs

1.15.7 In accordance with Market Rule 4.16.9 the IMO must conduct a review of the fixed fuel costs with direct reference to the outcome of the review of the Maximum Reserve Capacity Price in step 1.15.1 above.

Deleted: S

Deleted: 0