Independent Market Operator

Maximum Reserve Capacity Price Advisory Group Discussion Paper

February 2008

DOCUMENT DETAILS

IMO Report No.:	26
Report Title:	Maximum Reserve Capacity Price Advisory Group Discussion Paper
Version No.:	3.4.1
Release Status:	Approved for Public Release
Confidentiality Status:	Public

DISCLAIMER

The Independent Market Operator (IMO) has published this document as an information service. While every effort has been made to ensure that the information contained within it is accurate and complete, it does not purport to contain all of the information that may be necessary to enable a person to assess whether to pursue a particular investment. It contains only general information and should not be relied upon as a substitute for independent research and professional advice.

The IMO makes no representations or warranty as to the accuracy, reliability, completeness or suitability for particular purposes of the information in this document.

TABLE OF CONTENTS

1. INTRODUCTION 4
2. THE BASIS AND INTENT OF THE MAXIMUM RESERVE CAPACITY PRICE 5
3. HISTORY OF THE MAXIMUM RESERVE CAPACITY PRICE 6
4. THE MAXIMUM RESERVE CAPACITY PRICE ADVISORY GROUP 7
5. ISSUES REVIEWED BY THE MAXIMUM RESERVE CAPACITY PRICE ADVISORY GROUP 7
6. OCGT COSTS 7
7. PROPOSED SOLUTIONS CONSIDERED BY THE MAXIMUM RESERVE CAPACITY PRICE ADVISORY GROUP 8
8. CALCULATION OF THE WEIGHTED AVERAGE COST OF CAPITAL 13
9. GAS PIPELINE LATERAL 17
10. LAND PURCHASE COSTS 18
11. IMPLEMENTATION OF THE FININGS OF THE MAXIMUM RESERVE CAPACITY PRICE ADVISORY GROUP 19
    - 11.1 Proposal For Change 20
    - 11.2 Underlying Principles Of The Maximum Reserve Capacity Price And The Costing Methodology That Shall Be Applied 21
12. OTHER ISSUES 22
13. CONCLUSION 24

1. INTRODUCTION

This paper discusses the determination of the Maximum Reserve Capacity Price, which is one of the price caps established within the framework of the Wholesale Electricity Market Rules (Market Rules). This document presents the history of the Maximum Reserve Capacity Price and identifies a number of issues that have arisen through the review processes which have been conducted by the IMO each year to determine the Maximum Reserve Capacity Price.

To investigate the range of issues that have been identified, an Advisory Group was established by the IMO in November 2006. This Advisory Group is comprised of a range of industry representatives, including large and small generators, retailers, the Economic Regulation Authority and the IMO.

Throughout the course of the discussions held within the Advisory Group, a number of key issues have been identified:

- Qualification of the purpose and intent of the Maximum Reserve Capacity Price.
- The difficulties involved with determining the Maximum Reserve Capacity Price.
- The issue of variability and risk within the determination process.
- Consistency of the Review process that is conducted each year by the IMO.

Some specific issues have also been identified, along with proposals for their resolution.

- How the Maximum Reserve Capacity Price should be determined each year.
- What should or should not be included within the funding model.

A number of recommendations are presented within this paper for consideration by the Market Advisory Committee and ultimately to be decided by the IMO.

These recommendations are summarised as:

1. Each year, the IMO should engage the services of an engineering consultant to estimate the cost of developing an Open Cycle Gas Turbine (OCGT) power station in accordance with the Market Rules. This work should provide a detailed costing analysis of all components including the expected purchase cost of the capital equipment, plus an estimate of the balance-of-plant costs, which are the costs associated with development of ancillary equipment, infrastructure and serviced required of such a development.

2. The consultant engaged for the OCGT analysis should be contracted for between three to five years to ensure consistency of approach from year to year.

3. Western Power should be requested to provide all transmission costing estimates for use in the determination of the Maximum Reserve Capacity Price.

4. The IMO should conduct a review of the parameters contributing to the Weighted Average Cost of Capital. The first review has been conducted by the IMO, with subsequent reviews to be completed at least once every five years and updated yearly with current equity/cost estimates.

5. A Gas pipeline lateral should not be included in the costing model.

6. The IMO should develop a methodology to consider land purchase costs for inclusion in the overall Maximum Reserve Capacity Price methodology, as these are not specifically considered at present.

Some issues that have been raised are not considered to be within the scope of the Advisory Group. These outstanding issues are raised in this position paper and discussed briefly for completeness.

2. THE BASIS AND INTENT OF THE MAXIMUM RESERVE CAPACITY PRICE

There are two main concepts surrounding the Maximum Reserve Capacity Price. The first concept is that the Maximum Reserve Capacity Price represents the price cap that is used when a Reserve Capacity Auction is held. In years when the Reserve Capacity Auction is cancelled, the Maximum Reserve Capacity Price is used as the basis for setting an administered price for Capacity Credits that are uncontracted when the Market is settled.

The second broad concept is that the Maximum Reserve Capacity Price is based on the capital cost of installing an OCGT peaking power station. There are a number of items that are currently included as part of the Maximum Reserve Capacity Price, which include the construction and development costs as well as the fixed operations and maintenance costs, network connection costs and the costs of installing fuel tanks for liquid fuel operation.

A peaking OCGT power station is used as the basis for determining the Maximum Reserve Capacity Price because it is expected to be the generation facility with the lowest capital cost that could be used to provide both energy and capacity in support of meeting the reliability criteria established under the Reserve Capacity Mechanism. Supporting the entry to the Market of a peaking OCGT would satisfy the reliability criterion (in terms of the provision of both capacity and energy) used to determine the number of Capacity Credits required in the Wholesale Electricity Market. Therefore, a low capacity factor peaking OCGT is seen as an appropriate solution for the Reserve Capacity Mechanism.

In general, the Maximum Reserve Capacity Price is intended to cover the development and construction costs associated with the project, and should allow a proponent to progress a project through the Reserve Capacity Auction. Should such a project be successful in the Reserve Capacity Auction, it is expected that the proponent would take the option of receiving the ten-year Special Price Arrangement.

The following sections will discuss some of the more detailed issues that arise when determining the Maximum Reserve Capacity Price.

3. HISTORY OF THE MAXIMUM RESERVE CAPACITY PRICE

3.1 *Initial Maximum Reserve Capacity Price*

The Market Rules include a Maximum Reserve Capacity Price of $150,000 per MW per year for the period from Energy Market Commencement (21 September 2006) through to 1 October 2008. This price was determined through a consultative Expert Team with the assistance of a number of industry consultants, when both the initial Maximum Reserve Capacity Price and the framework for the Market Rules were established. The framework includes provisions for reviewing, resetting and approving the Maximum Reserve Capacity Price each year.

3.2 *2006 Maximum Reserve Capacity Price*

At the end of 2005, the IMO initiated the first Maximum Reserve Capacity Price review. This review was undertaken to determine the Maximum Reserve Capacity Price for the 2006 Reserve Capacity Cycle, with capacity being available from 1 October 2008 through 1 October 2009. Following the review, the Maximum Reserve Capacity Price was set at $129,900 per MW per year.

Through the public consultation process, it was commented that this decrease did not seem to be well aligned with the expectations of the Market. The main reason for the price reduction was the adoption of the review process outlined within the Market Rules.

3.3 *2007 Maximum Reserve Capacity Price*

The review initiated at the end of 2006 determined the Maximum Reserve Capacity Price to be $142,200 per MW per year. This price was determined for the 2007 Reserve Capacity Cycle for capacity that is to be available from 1 October 2009 to 1 October 2010. This price was determined on the same basis as the 2006 Maximum Reserve Capacity Price and the difference in price largely reflects the increases in project construction and development costs in the present engineering climate.

3.4 *2008 Maximum Reserve Capacity Price*

The review completed for 2008 Reserve Capacity Cycle determined the Maximum Reserve Capacity Price to be $173,400 per MW per year. This price was determined for capacity that is to be available from 1 October 2010 to 1 October 2011. This price

was determined following changes to the Market Rules made in late 2007 to allow a more cost-reflective method to be used.

4. THE MAXIMUM RESERVE CAPACITY PRICE ADVISORY GROUP

The Maximum Reserve Capacity Price Advisory Group is comprised of the following members:

Troy Forward	IMO, Chair of Advisory Group
Ignatius Chin	ERA
Andrew Everett	Verve Energy
Stephen Gould	Landfill Gas and Power
Richard Harris	NewGen Power
Mark Lewis/Andrew Sutherland	Transalta
Stephen MacLean/Paul McCarthy	Synergy Energy
Mark McKinnon	Alinta

5. ISSUES REVIEWED BY THE MAXIMUM RESERVE CAPACITY PRICE ADVISORY GROUP

The Maximum Reserve Capacity Price Advisory Group identified a number of issues that required investigation. These were:

- Appropriateness of the OCGT power station cost determination methodology.
- Calculation of the Weighted Average Cost of Capital (WACC).
- Transmission connection pricing including the appropriateness of including deep connection costs.
- Inclusion or exclusion of the gas pipeline lateral.
- Specific inclusion for the cost of land.

Discussion within the Maximum Reserve Capacity Price Advisory Group also raised the issue of the appropriateness of the funding more generally, and what the guiding principles of the Maximum Reserve Capacity Price should be. It was viewed that such issues were outside the scope of the Maximum Reserve Capacity Price Advisory Group but that they should be raised as part of this position paper for completeness.

6. OCGT COSTS

In November 2006, the IMO retained Sinclair Knight Merz (SKM) to conduct a review of OCGT costing against the method provided for under the Market Rules. SKM

conducted a review of plant costing for a range of OCGT power station options (40-320 MW).

The analysis conducted by SKM utilised information from their internal projects database to construct a normalised project costing for a range of different sized OCGT machines. The normalised project costs were then compared against the prices of OCGTs as determined through application of the process within the Market Rules. The analysis concluded that under all circumstances tested, the expected balance-of-plant costs are not captured appropriately when using the multiplication factor for converting the OCGT cost to a power station cost, as prescribed under the Market Rules.

The conclusion that can be drawn from the SKM analysis is that the current OCGT costing methodology as presented in the Market Rules in general, underestimates actual project development costs, and a new methodology should be devised which does reflect that actual development costs. As a result of this, the Advisory Group developed a set of solutions to better meet the intent of the costing. The options considered are described in the following section.

7. PROPOSED SOLUTIONS CONSIDERED BY THE MAXIMUM RESERVE CAPACITY PRICE ADVISORY GROUP

Three options were proposed for consideration as possible solutions to this issue. The options were:

- Set the Maximum Reserve Capacity Price for a fixed period;
- Conduct full technical analysis of the expected costs of an OCGT each year; and
- Use the existing OCGT determination methodology to determine an initial value and adjust this in accordance with changes in the OCGT base cost.

Each of these options will be discussed in more detail below. The primary considerations for each method were:

- Accuracy of the method;
- Consistency of the method;
- Sources of error;
- Volatility and price certainty;
- Expected magnitude of rule changes; and
- Level of systems risk and cost;

Presented below are the details of this analysis as considered by the Advisory Group in an internal working paper.

7.1 *Option 1 – Set Maximum Reserve Capacity Price For A Fixed Period*

Under this option the Maximum Reserve Capacity Price would be calculated in one year and applied, with escalations, for a fixed term, for example five years. In the year of determination, the IMO could engage a suitably qualified consultant to complete the technical analysis. The analysis would include the determination of expected OCGT prices for the year in question, together with analysis and forecasting of adjustment (indexation) rates that could be applied for each of the following four years.

7.1.1 *Accuracy of the Method*

This method is likely to be reasonably accurate in the short term (one to two years), but may suffer with changes in commodity prices and rates (eg. land prices, labour costs, shipping costs) in the longer term particularly if they are volatile.

7.1.2 *Consistency of the Method*

This method would be reasonably consistent within the period, but selection of an appropriate consultant could have a significant effect on the Maximum Reserve Capacity Price outcome. The application of this method will be biased by the specific experience of the consultant and access to their in-house data sets and pricing methodologies. This will be amplified with a change in the consultant. The fact that this price will be determined infrequently will assist in the consistency of approach, but accuracy may be traded off.

7.1.3 *Sources of Error*

Sources of error will be dominated by the access to real OCGT, transmission asset and balance-of-plant pricing information. The consultant may be based in another state and may not have a detailed understanding of the construction and development environment in Western Australia. This may introduce errors in the pricing assumptions.

7.1.4 *Volatility and Price Certainty*

Volatility would be considered to be low in this case as the five-year timeframe will reduce price forecasting uncertainty in the Maximum Reserve Capacity Price completely over the period. The five year horizon will be transparent to investors and other stakeholders.

7.1.5 *Expected Magnitude of Rule changes*

Possibly no rule changes would be required if this were presented to the ERA as the IMO determination of the appropriateness of each of the input parameters used in Appendix 3 of the Market Rules. However, adopting such a strategy would be best supported by proposing Market Rule changes to Appendix 3 to capture the new process. This would require substantial changes to the Market Rules as it represents a significant process change. Specific rule changes would need further consideration.

7.1.6 *Level of Systems Risk and Cost*

IT systems changes are not expected to be significant. Manual input of the Maximum Reserve Capacity Price each year can be initiated in the Wholesale Electricity Market Systems (WEMS) to achieve this result. However, the existing functionality within the WEMS is unlikely to be compliant with the Market Rules if such changes are progressed. This may need to be considered further.

7.2 *Option 2 – Full Analysis Each Year*

For this option, the IMO would engage a consultant to conduct a review of the OCGT and transmission costs each year in determining the Maximum Reserve Capacity Price. This work would extend the current methodology used by the IMO to compute transmission connection capital costs and Operations and Maintenance (O&M) costs each year.

7.2.1 *Accuracy of the Method*

This method is likely to be the most accurate of the three methods proposed. The analysis conducted by the consultant would capture fluctuations and trends in commodity and construction costs on a year by year basis. The accuracy would be limited by access to appropriate data.

7.2.2 *Consistency of the Method*

Similar to Option 1, the consistency of this method could be compromised by the selection of consultant and their access to data and pricing information. An appropriate consultant could be engaged for a fixed term (possibly three years) so as to ensure that the method is applied consistently from year to year.

7.2.3 *Sources of Error*

Sources of error include the consultant's access to real pricing data each year. This method would mitigate forecasting error that could be present in the other two methods.

7.2.4 *Volatility and Price Certainty*

This option would be expected to lead to a higher level of volatility than the other two options because the Maximum Reserve Capacity Price is only determined for one year. This option may also involve a higher investment-based risk than the current Maximum Reserve Capacity Price determination methodology as there would be no forward visibility of the OCGT price.

7.2.5 *Expected Magnitude of Rule changes*

It may be possible to implement this option under the current Market Rules using the existing review strategy. However, for completeness, it is advisable that Market Rule changes be contemplated that completely allow for the application of this method.

7.2.6 *Level of Systems Risk and Cost*

This option would not appear to present significant WEMS issues as the existing price determination functionality could be used.

7.3 *Option 3 - Adjustment Factor To Existing Ocgt Price Determination*

In this option an appropriate consultant would use their project pricing experience to determine an adjustment factor for the OCGT power station costs. Present analysis indicates that a disparity may exist between the multiplication factor currently used in the Market Rules to convert the base price of an OCGT into a power station cost (Currently set at 2.0) and actual prices. The difference largely appears to be in the cost of the balance-of-plant components. The consultant would determine new adjustment factors to convert the Gas Turbine World (GTW) prices into power station development costs.

For a defined period of time (for example three years), the Maximum Reserve Capacity Price would be calculated from GTW pricing, as is currently the case under the Market Rules, multiplied by the adjustment factor that has been determined. This differs from Option 2 where the OCGT cost would be completely recalculated each year. The method could be extended to include a forecast of the adjustment factor for each year in the horizon and for each of a range of capacities that may be considered in any one year.

The IMO would determine costs associated with other components within the Maximum Reserve Capacity Price methodology in the same way that it has done previously.

7.3.1 *Accuracy of the Method*

This method would allow a reasonably accurate determination of price by allowing for time-varying (forecast) adjustments to be applied. The method is likely to be more accurate than Option 1 as a range of adjustment factors can be considered. The Maximum Reserve Capacity Price can then be determined in any one year based on the IMO's expectations of capacity requirements.

7.3.2 *Consistency of the Method*

This method is likely to provide a similar level certainty to that of Option 1 because the adjustment factor would be set for a number of years, but may ensure more flexibility in the outcome, providing a better overall result. Option 1 will lock the OCGT pricing in for a definite time period, but may produce inconsistent results if the plant capacity parameter changes within the planning horizon. This Option 3 would allow for such changes to be made on a year-by-year basis. Similar consistency issues are present with regard to selection of an appropriate consultant and the reliance on the quality of their data.

7.3.3 *Sources of Error*

Sources of error include the determination of the adjustment factor and the forecasting of this method over the planning horizon. For this reason, it is proposed that use of the adjustment factors be restricted to two years and that a full recalculation be undertaken every third year.

7.3.4 *Volatility and Price Certainty*

This option provides a higher level of volatility than Option 1, but a lower level than Option 2. Potential investors and stakeholders could undertake their own forecasting of expected OCGT costs and conduct a sensitivity analysis as to the effect of the adjustment factor in any one year. This transparency reduces the price risk over Option 2

7.3.5 *Expected Magnitude of Rule changes*

This option could be completed under the existing framework of the Market Rules. It would, however, be more appropriate to implement rule changes to Appendix 3.

7.3.6 *Level of Systems Risk and Cost*

This option could be operated under the WEMS as it now exists and would maintain compliance of the WEMS with the Market Rules (unchanged). The cost of engaging the consultant once every three years would add to the cost budget.

7.4 *Outcome*

The Maximum Reserve Capacity Price Advisory Group agreed that the best way forward was to adopt a subset of Option 2, to conduct a Full Analysis Each Year.

The selected subset of Option 2 is to complete a full analysis each year with the generation component and development costs estimated by a suitably qualified consultant and the transmission costing to be preferably estimated by Western Power.

This option was selected as a reasonable way forward as it preserves the general intent of the Maximum Reserve Capacity Price determination methodology, while providing a realistic outcome on a year by year basis. This option was accepted based on the general understanding that:

- The IMO should retain a consultant for a period of three to five years (probably three in the first instance). This will help provide continuity to the process and reduce perceived regulatory risk of procedural-induced price changes.

- In the first year, the IMO will have the successful consultant provide a full list of the equipment to be included in the project costing. This will provide a high level of visibility to what is being included or excluded from the project costing.

- Following the public consultation process conducted the first year, the IMO would finalise and publish the complete listing of equipment. It would be preferable to include all costs used, but this would be subject to resolving confidentiality issues with the consultant. This equipment list would be used for the determination conducted in the remaining two years of the process to support procedural certainty.

- The consultant will use the most up-to-date prices for plant components, and apply industry-based indexation factors where real costing information is not available.

-

- Transmission costing, including shallow and deep connection costing to be preferably completed by Western power. This would provide an acceptable technical solution plus an appropriate costing analysis specific to the SWIS. Transmission costing considerations are discussed in a subsequent section of this report.

The proposed method retains a cost-reflective approach in determining the OCGT power station costs each year. Some concern was raised that the estimated OCGT power station price would still vary from year to year, primarily as a result of exogeneous influences.

Much of the discussion within the group centred on the appropriateness and impact of setting the Maximum Reserve Capacity Price for longer periods of time (in the order of three to five years), as would have been the case for Options 1 and 3.

The issue of price volatility is more about market design than about obtaining effective outcomes within the existing rules framework. Therefore, it was concluded that such questions about the volatility of the Maximum Reserve Capacity Price, and the effect of price stabilisation on facility investment are structural issues concerning the framework of the Market and require detailed and extensive analysis. This is something that is likely to be considered as part of any longer-term analysis of the performance and effectiveness of the Market and would not be considered by the Advisory Group unless specifically requested by the MAC.

8. CALCULATION OF THE WEIGHTED AVERAGE COST OF CAPITAL

The Weighted Average Cost of Capital (WACC) was identified by the Maximum Reserve Capacity Price Advisory Group as an issue requiring consideration. The WACC is used to calculate the cost of financing the Maximum Reserve Capacity Price and is also used in the determination of the Factor K, which is used to account for the time-value of the Maximum Reserve Capacity Price as a payment stream for new generation projects.

The IMO has engaged a consultant, The Allen Consulting Group, to review the methodology by which the WACC should be calculated and the values of the associated input parameters to the WACC computation.

A number of recommendations have been made by The Allen Consulting Group in their final report. The IMO intends to publish a position paper on these recommendations which will be presented as part of the Market Rule changes. The recommendations and the IMO position paper will therefore be part of the public consultation process when developing and assessing the relevant Market Rules and associated Market Procedures.

The work package also included a review of the determination methodology for the Factor K, which was published in arithmetic form as part of the 2006 Maximum Reserve Capacity Price review undertaken by the IMO. The new method for calculating the Factor K was implemented for the Maximum Reserve Capacity Price determined for the 2008 Reserve Capacity Cycle.

While it was appropriate to include the Factor K in the determination of the Maximum Reserve Capacity Price for the 2008 Reserve Capacity Cycle, the inclusion of this term was also evaluated. Where a Market Participant progresses a new project through the Reserve Capacity Auction and is awarded a Long Term Special Price Arrangement (LTSPA), the Factor K is used to account for adjustment of the floor price applied in clause 4.22.3 of the Market Rules. Here, the floor price for Capacity Credits with an LTSPA is indexed at a rate of CPI minus 1%. The Factor K adjusts the Maximum Reserve Capacity Price upwards to remove the effect of the "minus 1%" term in net present value terms.

While the arrangements pertaining to the use of the Factor K are appropriate for Capacity Credits receiving an LTSPA, it is also applied to the Maximum Reserve Capacity Price which also affects all uncontracted Capacity Credits not receiving an LTSPA. This will have the effect of always and unnecessarily inflating the Maximum Reserve Capacity Price in the case where the Reserve Capacity Requirement is met through those intending to bilaterally trade their Capacity Credits.

One solution proposed to the Maximum Reserve Capacity Price Advisory Group to remove the bias that occurs is to remove the Factor K completely from the Maximum Reserve Capacity Price methodology while also removing the "minus 1%" term from the Market Rules. This approach has the advantage of maintaining the same arrangements for Capacity Credits subject to an LTSPA, while removing the bias that occurs for the remainder of Capacity Credits not covered by an LTSPA.

8.1 *Outcome*

The IMO engaged The Allen Consulting Group to assess appropriate methodologies and values used to calculate and appropriate WACC.

The IMO will publish The Allen Consulting Group's final report along with a position paper on the recommendations made by The Allen Consulting Group when it progresses changes to the Market Rules.

It is further proposed to remove the Factor K and the "minus 1%" adjustment term in clause 4.22.3 of the Market Rules.

8.2 *TRANSMISSION CONNECTION AND DEEP CONNECTION COSTS*

The cost component TC within Appendix 4 of the Market Rules states that:

> "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…"

Under Clause 4.16.4, the IMO is also required to make an assessment of the appropriateness of the values of TC each year when conducting the Maximum Reserve Capacity Price review.

The issue of transmission costs, and particularly the cost of augmenting the shared network, is highly contentious. The actual costs vary greatly depending on the location of the connection and the status of the network at the time of project development. When the network is highly constrained, significant shared network costs may be incurred. These high costs are representative of the significant upgrades that may be required under these conditions. On the other hand, it is possible that the costs of augmenting the shared network may be low if the connection option is optimised and there is spare capacity available on the transmission network.

Western Power have previously provided confidential estimates of a number of transmission network connection scenarios. These costs have varied by an order of magnitude depending on the specific scenario. The issue for the Maximum Reserve Capacity Price review is which part of the cost spectrum should be applied each year.

There are a number of arguments for and against using either the low or high cost case. These are discussed briefly below.

8.3 *The High Cost Scenario*

It may be argued that the high cost scenario is appropriate to use for the determination of the Maximum Reserve Capacity Price because:

- The Maximum Reserve Capacity Price theoretically represents the cap in the Reserve Capacity Auction and should be high enough to fund a range of credible development scenarios within the SWIS.

- The Transmission network, in general, is becoming highly constrained, and as a result, a large proportion of the projects under consideration are exposed to high augmentation costs.

On the other hand, the argument against using the high cost scenario would be based on:

- Many of the projects exposed to high network augmentation costs are under development in constrained locations within the SWIS. These projects are typically located close to industrial processes and loads and are developed under commercial arrangements between the generator and load or customer. It would be argued that this type of plant does not represent the marginal OCGT on the SWIS, as is intended in the development of the Maximum Reserve Capacity Price.

- The high cost scenario does not send appropriate locational signals to the market. That is, the marginal OCGT on the SWIS should be situated in a location that is not exposed to high transmission costs because the project developer would be interested in minimising the overall project costs. Therefore, the developer should pick a location on the SWIS that has lower transmission connection costs. This signal also supports the efficient development of generation capacity within the SWIS insofar as siting facilities where they may be most needed in the network (in some instances).

- High transmission costs flow through to all users in the SWIS, as the Capacity Credit price is set for all Capacity Credit holders. Therefore a high transmission cost may be applied over the entire capacity base, not only over the marginal, or last, unit onto the SWIS. This may represent an inefficient outcome of the Market.

8.4 *The Low Cost Scenario*

For the Low Cost Scenario, it would be argued that:

- Minimum, but appropriate, costs should be applied to the Maximum Reserve Capacity Price in order to encourage efficiency in the development of capacity within the SWIS.

- Minimum costs will help incentivise generation solutions to locate in areas that do not require significant levels of network reinforcement.

- High transmission costs for lower order generation facilities (intermediate and base load plant for example) should be borne by the generators. These costs will be recovered through bilateral contract coverage.

- Minimum costs would then be applied over all capacity within the SWIS rather than the marginal unit.

Arguments against the Low Cost Scenario would include:

- Investment should not be limited by reducing the Maximum Reserve Capacity Price.

8.5 *Sensitivity Of Costing*

A simple sensitivity analysis of the cost of augmenting the shared transmission network shows that Maximum Reserve Capacity Price may change by up to $40,000 per MW per year. For a 160 MW OCGT, this equates to $6.4M per year. Across a base of 4,322MW, this may equate to a difference in Reserve Capacity Costs in the order of $173M.

8.6 *Outcome*

It has been mentioned in previous sections that the proposed solution to costing of the transmission system connection should be conducted by Western Power. This was proposed on the basis that:

- Western Power is best suited to providing connection solutions that are technically feasible for use in the SWIS.
- Western Power has access to current pricing information in respect of other connection solutions proposed for the SWIS.

The IMO met with representatives from Western Power and has received a positive response to a request for assistance.

9. GAS PIPELINE LATERAL

This section briefly discusses the issue of the inclusion or exclusion of a gas pipeline lateral as part of the Maximum Reserve Capacity Price.

Historically the IMO has not included the cost of a gas pipeline lateral in the Maximum Reserve Capacity Price on the basis that the unit being funded is a peaking station, which may only run for a limited number of hours each year. OCGT plant can be dual fired, usually to run on both liquid fuels (normally distillate) and natural gas. However, the lowest cost option for this role is expected to be an OCGT operating solely on liquid fuel. The Maximum Reserve Capacity Price model provides for the cost of liquid fuel tanks.

The argument for excluding the gas pipeline lateral is that the developer of a pure peaking OCGT would not expose themselves to the high costs associated with the development of a gas pipeline lateral, along with the relatively high ongoing costs associated with a gas supply and delivery contract. It would be difficult to justify such expenses on an OCGT that is situated very high in the merit order. For plant positioned lower in the merit order, the costs of a gas lateral would be underwritten by sales of electricity. Remembering that the Maximum Reserve Capacity Price should cover a peaking OCGT that is not covered by a bilateral contract, the IMO has taken the position that the current costing methodology is appropriate.

One of the questions raised in regard to this issue is in respect of Environmental Protection Authority requirements for new OCGT generating plant. The EPA has published a guidance paper entitled: Guidance Statement for Emissions of Oxides of Nitrogen from Gas Turbines.

The paper discusses the use of industry best practices in ensuring low oxides of nitrogen (NOx) emissions for new natural gas fired OCGT plant. The guidance supports the use of low NOx emissions strategies. It should be noted that the report does not consider liquid-fuelled OCGT plant. However it would be the IMO's view that best practices should also be followed for liquid-fuelled OCGT plant. This is realised through the inclusion of a separate cost component for low NOx burner technology.

It would appear that there is not sufficient evidence to suggest that a gas pipeline lateral should be funded on the basis of EPA concerns or initiatives in support of natural gas as a fuel type over distillate.

9.1 *Outcome*

With the exception of Alinta, all members of the Maximum Reserve Capacity Price Advisory Group support the position that the gas pipeline lateral should not be funded as part of the determination of the Maximum Reserve Capacity Price.

10. LAND PURCHASE COSTS

Land purchase costs have not been specifically considered in the determination of the Maximum Reserve Capacity Price to date. Depending on the development scenario, land purchase costs may be a significant component of the Maximum Reserve Capacity Price. While the cost of purchasing land has not been considered specifically, allowances are included to cover costs associated with legal, approval, financing and contingencies.

The IMO has met with representatives from Landgate to determine if it is possible to obtain generic land valuations for a number of areas where power station development may be proposed (North Country Region, Kwinana, Collie Region, Goldfields). It is proposed that the IMO develop a schedule of valuations which will be used as the basis for including a land cost component in the Maximum Reserve Capacity Price determination methodology. The proposed methodology is to:

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 are:

- Collie Region
- Kemerton Industrial Park Region
- Pinjar Region
- Kwinana Region
- North Country Region
- Kalgoorlie Region

These areas represent the regions within the SWIS where generation projects are most likely to be proposed and should provide a broad cross-section of options.

Each year, the IMO will contract 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 be required to provide an indication as to the size of land required, which should be limited to the following options:

- One parcel of land in an industrial area which does not require a significant buffer zone due to its classification. Eg. 3 ha

- The summation of multiple smaller parcels of land as appropriate to meet the requirements above.

- One larger parcel of land which includes the requirement of a buffer zone. Eg. 30 ha.

Accuracy expectations are that the valuations would normally be between 85% and 100% of the market value of the land. It will be possible to include either the high, medium or low estimate in this evaluation.

10.1 *Review*

The IMO should use the same parcels of land each year if possible, or if this is not possible, use similar representative parcels of land each year. From time to time, and in a period not exceeding five years, the IMO should review the primary land regions and the sizes of land included for the purposes of the valuations. These should be subject to a transparent review process including public consultation.

10.2 *Outcome*

It is proposed that the cost of land each year be based on the least-expensive land purchase cost as determined in the analysis conducted by Landgate.

11. IMPLEMENTATION OF THE FININGS OF THE MAXIMUM RESERVE CAPACITY PRICE ADVISORY GROUP

The Maximum Reserve Capacity Price Advisory Group assessed a range of issues in relation to the calculation of the Maximum Reserve Capacity Price and made a number of proposals in regard to the way the Maximum Reserve Capacity Price should be calculated. The preferred solution is to develop a mechanism which incorporates:

- Selection of Option 2 for calculating the price of the OCGT power station and associated balance of plant costs. Option 2 is based on determination of these OCGT and other costs by a suitably qualified consultant each year.

- Exert advice for the estimation of the WACC for the Maximum Reserve Capacity Price.

- Development of transmission connection costs by Western Power.

- Inclusion of the cost of land.

To implement the preferred process, the Maximum Reserve Capacity Price Advisory Group discussed a number of possible options, with the view to removing the detailed

provisions and prescriptive mechanisms that are present within the Market Rules. This is because the environment is subject to continual change, but the IMO is unable to reflect those changes in a timely or efficient manner. The proposed options to extricate the detail from the Market Rules were to adopt an approach:

1. Similar to the current provisions in the Market Rules which includes the detailed methodology in the Market Rules and associated Appendices. This was a “no-change option”.

2. Where the Market Rules reflect the general calculation principles of the Maximum Reserve Capacity Price and review processes, with the detail being incorporated in a Market Procedure. This would include a structural review every five years.

3. Where the Market Rules reflect the general calculation principles of the Maximum Reserve Capacity Price and review processes, with the detail being incorporated into subsidiary process documentation. This would also include a structural review every five years.

Proposal two was largely supported by the Maximum Reserve Capacity Price Advisory Group because it presents a more flexible option which will still be subject to the consultation and approval processes that already exist in the Market Rules. Section 11.1 further expands on this proposal and section 11.2 outlines the underlying principles on which the Maximum Reserve Capacity Price will be based.

11.1 Proposal For Change

The Maximum Reserve Capacity Price Advisory Group recommends that Rule Changes and Procedures be developed to implement the changes that have been presented under Option 2 above. The proposal shall include removal of the detailed methodology for calculating the Maximum Reserve Capacity Price from Appendix 4 of the Market Rules and implementing amendments to various clauses under Chapter 4 of the Market Rules. These amendments should:

- Establish a broad mechanism for determination and review of the Maximum Reserve Capacity Price, with annual determination followed by structural review of the concepts at least every five years.

- Include the development of a Market Procedure for the determination of the Maximum Reserve Capacity Price. The Market Procedure shall outline the underlying principles, assumptions and detailed mechanisms and processes by which the IMO will calculate the various components of the Maximum Reserve Capacity Price.

The changes to be developed will be based on the principles presented in this document. These principles are summarised in the following section. The new provisions should also incorporate a structural review of the methodology every five years. Following this structural review, necessary changes to the Market Procedure will be developed for subsequent use.

Proposed Market Rule Changes and an associated Market Procedure have been developed and are submitted as part of the Maximum Reserve Capacity Price Advisory Group outcomes. They capture the above intent and allow for the implementation of the various outcomes that have been discussed.

11.2 Underlying Principles Of The Maximum Reserve Capacity Price And The Costing Methodology That Shall Be Applied

As mentioned previously, the Maximum Reserve Capacity Price is based on the cost of developing and constructing a liquid fuelled OCGT, the cost of which could be recovered by a Market Participant offering its Certified Reserve Capacity through the Reserve Capacity Auction. The principles of costing the general OCGT scenario for determining the Maximum Reserve Capacity Price are based on the following factors:

- The OCGT power station will be of 160MW in size (nameplate)
- For the purposes of the Reserve Capacity Mechanism and the Maximum Reserve Capacity Price, the OCGT power station is expected to be powered only by distillate fuel.
- Costing should be completed on a least-cost basis and should include an allowance for the following items.
    - The OCGT and balance of plant items, including and allowance for low emissions technology.
    - The cost of acquiring land.
    - The cost of connecting to the bulk transmission system (given the status of the Transmission network at the time)
    - The fixed costs associated with operations and maintenance of the OCGT power station and transmission connection.
    - Ongoing costs associated with use of the transmission network.
    - Normal project development and approval costs.
    - Costs associated with the design and construction of liquid fuel storage and handling facilities.
    - Costs associated with financing.
- After calculating the least-cost OCGT, a contingency margin of 15% shall be applied to the total annualised capital cost.

12. OTHER ISSUES

Through the course of discussions within the Maximum Reserve Capacity Price Advisory Group, a number of issues were raised which have not been resolved, or were seen to be beyond the scope of the Advisory Group's mandate. These issues generally have larger implications for the Wholesale Electricity Market. The main issues, raised and discussed here for completeness, are:

- The place of volatility in the Maximum Reserve Capacity Price.
- The treatment of the scaling factor applied to the Maximum Reserve Capacity Price.
- Proposals of the use of the Reserve Capacity Auction to determine Reserve Capacity Price.
- Alternative methodology to determine the Maximum Reserve Capacity Price.

Solutions have not been sought for theses issues because they were considered to be outside the brief of the Advisory Group.

12.1 *Volatility In The Maximum Reserve Capacity Price*

Substantial discussion within the Maximum Reserve Capacity Price Advisory Group focussed on the issue of volatility in the Maximum Reserve Capacity Price. Price volatility was determined to be comprised of:

- Structural volatility. This is volatility that is present as a result of the nature of the Maximum Reserve Capacity Price determination methodology (ie the Market Rules); and
- Procedural volatility. This is volatility that is present as a result of the application of the process of applying the Market Rules.

The solutions proposed in this paper have attempted to address procedural volatility by creating a more flexible but open and transparent process, which can be applied consistently from year to year to provide certainty.

Structural volatility occurs largely as a trade-off between medium-term price certainty and price accuracy. The argument presented in support of more price certainty, or less structural volatility, is that investors are likely to view price certainty as a positive part of the market structure. Price certainty over the medium term (eg 3-5 years) could help in the financing process for projects. A number of solutions were discussed which included the use of various averaging and price-setting techniques that could be applied to the Maximum Reserve Capacity Price.

The downside of any averaging technique is that as time goes on, the deviation between the forecast price and the actual price increases at the expense of price

efficiency and effectiveness. The use of longer averaging periods does not allow real price fluctuations to be reflected in the Maximum Reserve Capacity Price. Examples of this would be increasing labour costs which have contributed to higher construction prices but have not been appropriately reflected under an averaging framework, or a fall in commodity prices that may have influenced real costs, but may not have been picked up if an averaging process is used.

Countering the proposal for less structural volatility is the argument that the Maximum Reserve Capacity Price should be reflective of the actual development costs of the OCGT considered in the Maximum Reserve Capacity Price methodology. Assuming that procedural volatility is largely reduced, the Maximum Reserve Capacity Price should fluctuate in response to input cost movements.

However, Maximum Reserve Capacity Price fluctuations have wider ramifications than only for the least-cost new OCGT that could be procured through a Reserve Capacity Auction. It seems that Reserve Capacity prices, reflected by Maximum Reserve Capacity Prices may be having impacts on the terms and conditions of many bilateral contracts, and therefore have much wider implications for the whole market than might have been thought previously.

12.2 *The Scaling Factor Applied To The MRCP*

Under the current Market Rules, if the Reserve Capacity Target is met through capacity procured through the Bilateral Trade Declaration process, the Reserve Capacity price is based on a scaling parameter which first scales the Maximum Reserve Capacity price by 85% and then further scales the Reserve Capacity price in relation to the number of excess Capacity Credits assigned (if any).

A number of members of the Maximum Reserve Capacity Price Advisory Group raised concerns about both the appropriateness of the 85% scaling factor and the effect that the surplus scaling factor has on existing capacity. It is argued that the 'market' price of capacity for Market Participants with existing Facilities (and existing bilateral contracts) is influenced by the introduction of excess capacity. This is seen as havng a negative effect on a Market Participant holding a net generation position, but may be seen as having a positive effect on a Market Participant with a net consumer position.

12.3 *Deferral To The Reserve Capacity Auction*

A number of proposals have been made through other market consultation processes to change the Reserve Capacity Mechanism so that the Reserve Capacity price is set by the Reserve Capacity Auction each year. This issue was raised again within the Maximum Reserve Capacity Price Advisory Group and is noted here for completeness.

12.4 *Alternative Maximum Reserve Capacity Price Methodology*

An alternative methodology exists whereby the IMO would base the Maximum Reserve Capacity Price on the development costs of a specific project. The costs of

developing an OCGT would be estimated as per the previous suggestions, but the project would be costed for a limited number of specific sites.

Using this method, the IMO would identify, for example, two locations at which it would estimate the OCGT power station development costs, transmission connection costs and land costs. The Maximum Reserve Capacity Price would then be based on the lower overall costs under the assumption that this represents a realistic estimate of the lowest entry price to the Wholesale Electricity Market for a liquid fuelled OCGT peaking power station.

This method would appear to support the intention of the Reserve Capacity Mechanism and the Wholesale Electricity Market Objectives more broadly. By basing the pricing of the OCGT on development costs at specific locations, the Maximum Reserve Capacity Price would appropriately reflect changes in the varying costs as a result of the status of the network and changes in the costs of land purchase. These are the two factors that appear to be most topical, and subject to variation. This alternative methodology would be subject to periodic review in terms of the locations that are evaluated.

The disadvantage of this method is that there may be a number of influencing factors that may make a specific solution proposed by the IMO untenable even if a project proponent were to develop the same project. This is because the cost of developing key elements of a generation facility, and the ability of the project to be developed will depend on which other projects are being developed in parallel. This is particularly true of transmission access where applications are handled according to queuing principles set out in the Access Code.

13. CONCLUSION

The Maximum Reserve Capacity Price Advisory Group has reviewed a range of issues associated with the calculation of the Maximum Reserve Capacity Price. The Advisory Group focused on reducing the procedural uncertainty in computing the Maximum Reserve Capacity Price each year, while developing a mechanism which will appropriately reflect the costs of developing a liquid fuelled peaking OCGT power station in the SWIS.

The mechanism developed by the Advisory Group to determine the Maximum Reserve Capacity Price each year, will include

The Maximum Reserve Capacity Price will be based on costings developed for a liquid fuelled OCGT power station, inclusive of all reasonable costs associated with the power station, including:

- The cost of developing an OCGT power station and associated equipment, Fixed O&M costs, engineering, legal, approvals and financing costs, to be completed by a consultant each year;

- Land acquisition costs, to be estimated by Landgate each year;

- Costs of connecting to the transmission system, preferably completed by Western Power each year;

- The Weighted Average Cost of Capital for the OCGT power station project are to be estimated by a suitable consultant.

The preferred position of the Maximum Reserve Capacity Price Advisory Group is to implement necessary changes for a framework that combines general provisions in the Market Rules for determination and review of the Maximum Reserve Capacity Price supported by a detailed Market Procedure that outlines the specific assumptions to be used when determining the Maximum Reserve Capacity Price each year and when conducting the review process.

Market Rule changes will be required to implement the preferred mechanism developed by the Advisory Group. These changes will include:

- Removal of the detailed methodology for determining the Maximum Reserve Capacity Price in Appendix 4 of the Market Rules.

- Amendment of the section 4.16 of the Market Rules to incorporate:

    - General provisions for calculating the Maximum Reserve Capacity Price;

    - Development of a Market Procedure containing the specific and detailed methodology to be used each year;

    - Review clauses based on a structural review of the methodology at least every five years, where changes to the Market Procedure will reflect any necessary modifications to the process.

    - Removal of the Factor K that currently exists as part of the Maximum Reserve Capacity Price and removal of the “minus 1%” term for the indexation component applied to LTSPAs.