Submission to the Economic Regulation Authority

MAJOR AUGMENTATION PROPOSAL

330 kV Transmission Line and Associated Works in the Mid-West Region of Western Australia

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safe reliable efficient

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Executive Summary

This *major augmentation proposal*, for the construction of a 330 kV transmission line from Pinjar to Geraldton and associated works, is submitted to the Economic Regulation Authority under section 9.15 of the Electricity Networks Access Code 2004 (the Code) for assessment against the *regulatory test*.

This submission provides a summary of Western Power's evaluation of twelve *alternative options* to increase the power supply capacity to the Mid West region of Western Australia to meet the forecast demand.

The existing transmission network in the Mid-West region is connected to the South West Interconnected Network (SWIN) by 132 kV transmission lines from Pinjar and Muchea. These lines connect Geraldton to Pinjar through Cataby, Eneabba and Three Springs. In 2004 a 132 kV transmission line between Pinjar and Eneabba was commissioned in response to an emerging network constraint. The resultant increase in transmission capacity will be exceeded by 2010 due to forecast increase in demand and the connection of wind farms at Walkaway and Emu Downs. At present there are wind farms and conventional generation proposals that are unable to connect due to a shortfall in transmission capacity. Without the proposed improvement, Western Power will be unable to meet natural load growth, demand from mining and industrial loads and connection of power stations in the Mid-West region. There is a significant risk that some of the development opportunities in the Mid-West region may not proceed if the proposed improvement to the transmission line is not delivered by November 2010.

At present, there are a large number of connection enquiries from proponents of industrial and mining loads, and new generation. This amounts to about 300 MW of load and about 900 MW of generation. Without major transmission reinforcement there is no available network capacity to accommodate any of these new connections.

Western Power has identified 12 major options to address the capacity constraints in the Mid-West region. These options include transmission, generation and demand load management solutions. Western Power appointed independent consultants, Charles River Associates International Pty Ltd (CRA) and Hydro Tasmania Consulting (HTC), to review the economic and technical analysis of the proposed *major augmentation* and the *alternative options*. HTC confirmed that the required additional capacity could not be met with additional generation within the constraints of the *technical rules,* and CRA concluded that a new 330 kV line between Pinjar and Geraldton (Option 1) is the best technical and economic solution to meet the forecast load up to 2030[1].

Western Power has conducted a public consultation process to obtain feedback from proponents of new large load customers and from proponents of new generation including wind-farms on the proposed network augmentation and any alternative options. The public consultation summary is included in Section 5 of this submission.

Western Power submits that the proposed *major augmentation* (being Option 1, a 330 kV transmission line from Pinjar to Geraldton and associated works to be completed by November 2010) maximises the *net benefit after considering alternative options*.

[1] CRA's option evaluation report is available on WP's website (www.westernpower.com.au)

Western Power believes that the proposed 330 kV transmission line and associated works is the best economic solution that will provide transmission capacity required to support natural load growth, connection of new industrial or mining loads, and access connections for wind farms and conventional generation.

Western Power respectfully recommends that the Authority determines that the *regulatory test*, as set out in section 9.20 of the Code, when applied to the proposed major augmentation (330 kV transmission line from Pinjar to Geraldton and associated works to be completed by November 2010), is satisfied.

1 Introduction

This document is a *major augmentation proposal* submitted to the Economic Regulation Authority under Section 9.15 of the Electricity Networks Access Code 2004 (the Code) for assessment against the *regulatory test*.

This submission provides a summary of Western Power's evaluation of twelve reinforcement options to increase the power supply capacity to the Mid West region of Western Australia to meet the forecast demand.

This submission requests the ERA to approve the preferred reinforcement option for the transmission network north of Perth. The major component of the proposed project is a new 330kV transmission line between Pinjar and Geraldton. The reinforcement is required by November 2010 to meet a forecast capacity shortage and to enable connection of new industrial customers (loads and generators) in the region.

The existing 132 kV power supply system in the Mid West region has been the subject of numerous technical studies and several minor augmentations over the past two decades. Recent issues of concern include the need to meet growing natural growth demand and also accommodation of the connection of new prospective industrial customers that include large loads and generation. However, the existing system is operating almost at its limits, and it is restricting new connections requested by the new industrial and mining expansion.

Western Power has appointed independent consultants, Charles River Associates International Pty Ltd (CRA) and Hydro Tasmania Consulting (HTC) to review the economic and technical analysis and the following attachments are included with this submission:

- Western Power's Internal Report – Attachment 1 (confidential)
- CRA's Evaluation Report – Attachment 2
- HTC's Due Diligence Study – Attachment 3
- Public Submissions and Responses – Attachment 4
- Files for Financial Analysis (on CD) – Attachment 5 (confidential)

N.B. Some attachments are confidential since they contain commercially sensitive information.

***Important note**: Both the attached Western Power Internal Report and the CRA Report contain commentary about the the proposed network reinforcement in relation to the Code's New Facilities Investment Test (NFIT). However, this submission to the Authority does **not** request assessment of the proposed augmentation against the NFIT. This will be the subject of a future separate submission.*

1.1 Regulatory Obligations

1.1.1 The Regulatory Test

The *regulatory test* is an assessment under this Chapter 9 of the Code of whether a proposed *major augmentation* to a *covered network* maximises the *net benefit after considering alternative options*. A service provider must not *commit* to a *major augmentation* before the Authority determines, or is deemed to determine, that the test is satisfied.

A *major augmentation proposal* submitted to the Authority under section 9.15 of the Code must meet the requirements of section 9.16 of the Code.

9.16 A *major augmentation proposal*:

(a) must describe in detail each *major augmentation* to which the *major augmentation proposal* relates; and

(b) must state that, in the *service provider's* view, each *proposed major augmentation* maximises the *net benefit after considering alternative options*; and

(c) must demonstrate that the *service provider* has conducted a consultation process in respect of each *proposed major augmentation* which:

(i) included public consultation under Appendix 7; and

(ii) gave all *interested persons* a reasonable opportunity to state their views and to propose *alternative options* to the *proposed major augmentations*, and that the *service provider* had regard to those views and *alternative options*; and

(iii) involved the *service provider* giving reasonable consideration to any information obtained under sections 9.16(c)(i) and 9.16(c)(ii) when forming its view under section 9.16(b); and

(d) must comply with the current requirements *published* under section 9.17.

(e) may include a request that the *Authority* give prior approval under section 6.72 in respect of the *new facilities investment* for one or more *proposed major augmentations*.

This *major augmentation proposal* will demonstrate compliance with all of the requirements under the Code, and in particular with each of the requirements of section 9.16 above.

It should be noted that under section 9.17 of the Code, the Authority is required to publish its requirements for a major augmentation proposal to ensure that the Authority receives sufficient information in a suitable form to enable it to efficiently and effectively apply the Regulatory Test. However, due to the new and developing nature of electricity regulation under the Code the Authority has not yet had the opportunity to do this. Never the less, Western Power has diligently prepared this major augmentation proposal in good faith that it will meet the Authoritys' requirements.

1.1.2 Summary of Relevant Requirements of Technical Rules

Subject to any exemptions granted under the Code, Western Power and users of the South West Interconnected Network (SWIN) must comply with the *technical rules* as approved by the Authority. These *technical rules* impact on the operation of the network and the determination of the transmission line transfer limits required to maintain safe and reliable operation.

The technical requirements that apply to the design and operation of the network include:

- performance standards in respect of service standard parameters, and
- network planning criteria, including contingency criteria, steady-state criteria, stability criteria and quality of supply criteria.

In particular, relevant to this major augmentation proposal are the requirements regarding the following sections of the *technical rules*:

- 2.2.7 - Transient Rotor Angle Stability (Synchronous Stability)
- 2.2.8 – Oscillatory Rotor Angle Stability
- 2.2.9 – Short Term Voltage Stability
- 2.3.7 – Power System Stability and Dynamics, and
- 2.3.8 – Determination of Power Transfer Limits

Western Power is obliged to maintain and operate the network in accordance with the above sections of the *technical rules*, and the proposed *major augmentation* is required to enable Western Power to meet these obligations.

1.2 Background

Western Power's transmission network in the Mid-West region extends 400 km from Pinjar and Muchea to Geraldton. It consists of a number of 132 kV transmission lines as shown in Figure 1 below.

Most of the existing lines were built in the 1970's and were designed to meet needs of a predominantly rural community. The network was designed to supply relatively small loads distributed over a large geographical area. The network is not capable of transferring large amounts of power due to thermal, voltage and synchronous stability limitations[2].

To extend supply capacity in the late 80's and early 90's three local gas turbines were installed at Mungarra power station. There is presently a heavy reliance placed on the use of this generation to maximise supply capacity. However, operation of the gas turbines at Mungarra introduces the risk of synchronous instability for faults on the lines in the Mid-West region or in the South-West Interconnected Network (SWIN). For high levels of power transfer, network disturbances can produce voltage depressions sufficient to cause loss of generator synchronism leading to system collapse.

In 2001, Western Power sought approval to construct a new 330 kV transmission line between Pinjar and Eneabba, operated initially at 132 kV. Western Power was unable to secure sufficient funding for the project and as a result, a 132 kV construction option of a lower initial capital cost was approved. This line was commissioned in 2004. This line increased supply capability to the Mid-West region, particularly in the area between Pinjar and Eneabba.

The power transfer limits are currently constrained by the potential risk of synchronous instability. Operation with power transfers above the stability limits would expose the regional network to a risk of islanding from the SWIN with significant load shedding in the area north of Three Springs. The existing stability limits are required until new transmission reinforcements can be constructed. System studies, reviewed by independent consultant – HTC demonstrate that the addition of gas turbine generation in the Mid-West region would reduce transmission stability limits, resulting in reduced transfer capability and hence no increase in total power supply capacity to the region.

[2] See Appendix for definition of terms.

Figure 1: Overview of transmission network in the Mid-West region

Western Power has assessed the adequacy of the existing 132 kV transmission network supplying the Mid-West region and has identified an emerging shortfall in capacity.

1.3 Existing supply capacity and constraints

The existing supply capacity in the region north of Muchea and Eneabba is approximately 155 MW. This consists of:

- transmission capacity of 65 MW in summer conditions;
- local generation capacity of 85 MW – based on Mungarra power station only; and
- wind generation with firm contribution of 5 MW in summer conditions.

An independent consultant, Hydro Tasmania (HTC), has evaluated Western Power's technical studies and concluded that a 46 MW transfer limit, "may be more appropriate than 65 MW" for transmission capacity. The 65 MW transfer limit was initially determined by

Western Power in 2003 on the basis of the pole slip criteria. This is a higher limit than that recommended by HTC, thereby allowing a potential reinforcement to be delivered by the latest deadline of November 2010, with some additional reliability risk to customers. Using the recommended 46 MW transfer limit would require continuous operation of at least one Mungarra gas turbine at considerable expense.

The constraints in the Mid-West region are:

South to north power transfer:

The import capability into the Mid-West region depends on a number of factors including local generation, availability of local reactive support, regional load (north of Eneabba and Muchea) and the thermal ratings of the transmission lines.

The thermal ratings of the lines are dependent on ambient weather conditions. System simulation studies show that the power transfer limit can be as low as 43 MW without the Mungarra generators in operation. With one gas turbine operating at Mungarra and without the Walkaway wind farm the transfer limit can increase up to about 90 MW in winter conditions based on the pole slip criteria. However, with three gas turbines operating at Mungarra and without the Walkaway wind farm, the power transfer limit is about 72 MW in summer conditions.

An independent assessment by HTC concluded that the appropriate transmission transfer limit is only 46 MW for operation with three gas turbines at Mungarra. In 2003 Western Power adopted the highest reasonable summer power transfer limit of 65 MW *(includes safety margin of 10% from 72 MW)* to maximise capacity to Mid West and also allow the reinforcement to be delivered by the latest possible deadline of November 2010.

High utilisation of the transmission system results in voltage, thermal and transient stability limits being imposed on the network. Forecast load demand will create a risk of voltage and synchronous instability following a single line trip after summer 2009/10.

This instability could result in widespread load shedding and power supply disruptions particularly following a single line trip during periods of peak summer demand. In addition, system study results, that have been validated by HTC, show that further gas turbine generation will reduce synchronous stability limits, with no gain in total power supply capacity to the region.

North to south power transfer:

The Mid-West region's network is significantly constrained by existing 132 kV line thermal ratings and synchronous stability. Construction of the 132 kV line between Pinjar and Eneabba in 2004 has temporarily eased some of these constraints. However, the recent connection of the Emu Downs wind farms has exhausted transmission capacity available to connect new generation between Pinjar and Eneabba. New generation in the Geraldton area cannot be accommodated due to existing thermal limits on the 132 kV network. If the existing lines are run above their thermal limits following a single line trip, conductor sagging could reduce clearances creating a public safety risk.

Constraints in the northern part of the Mid-West region are the principal reason that the system requires reinforcement.

1.4 Load forecast

A low, central and high load forecasts are used in the evaluations. To be consistent the following terminology is used:

Low forecast - based on historical load trend growth (called also 'natural' load growth) plus firm already approved small block loads.

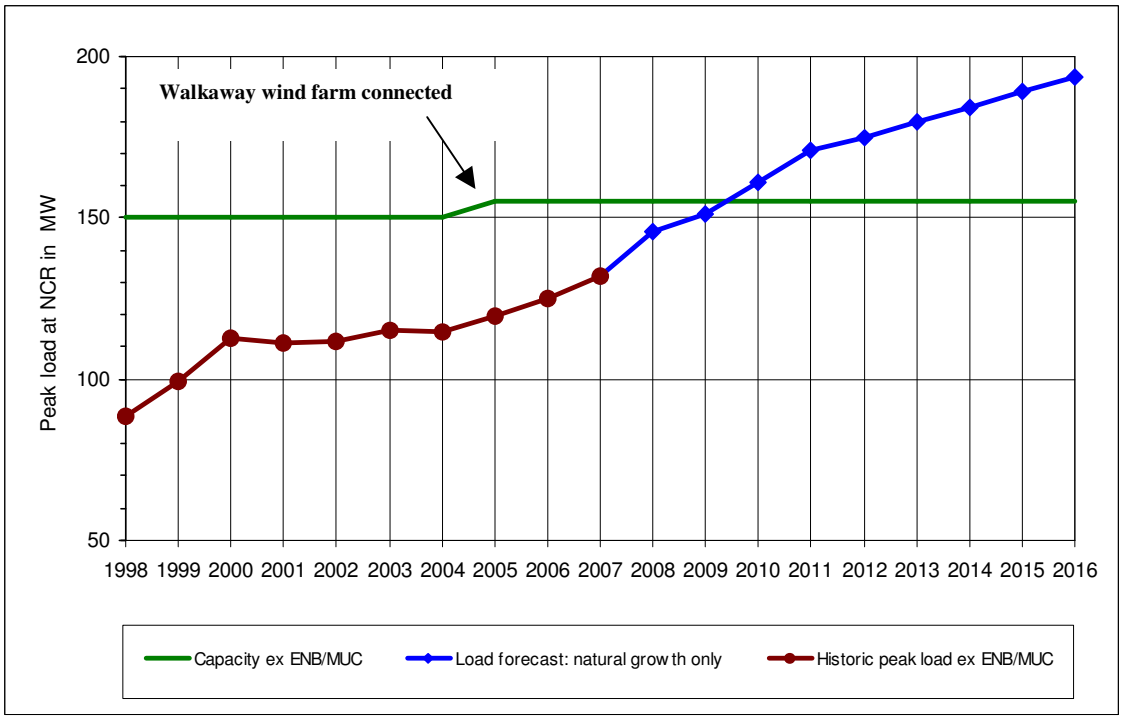
Central forecast - including diversified 'prospective loads' with a probability weighting.

High forecast - includes 100% of all 'prospective' loads.

1.4.1 Low forecast

Western Power has reviewed the load forecast and adequacy of the existing 132 kV transmission network that supplies the area north of Eneabba and Muchea. Figure 2 below shows a low demand forecast based on 'natural' load growth plus already approved small block loads. Presently, spare firm supply capacity to the area north of Eneabba and Muchea is just above 20 MW. Forecast load is expected to exceed supply capacity by summer 2009/10 which is from December 2009 to March 2010.

Figure 2: Supply and demand based on natural load growth from 1997/98 to 2015/16



The increase of 5 MW in the firm capacity shown in the above graph is due to the contribution from the Walkway wind-farm near Geraldton commissioned in 2005. Although, this wind-farm has an installed capacity of 90 MW, its contribution to the summer peak capacity is significantly lower than its installed nominal capacity. The wind farm power output is a function of prevailing winds, and is not reliable during times of the system peak demand.

1.4.2 Central and high forecasts

Presently there are a number of prospective industrial customers, comprising of mining and industrial load, wind, gas and coal generation, who wish to connect to the network. Potential new demand for connection of new customers in excess of the low forecast is:

- 300 MW of new block loads *(twice the load of the existing Mid West network),* and
- 900 MW of new generation:
    - ~ 600 MW of conventional generation (gas, coal), and
    - ~ 300 MW of wind farms.

However, there is no spare capacity for connection of any new large industrial and mining loads. Full utilisation of the existing transmission capacity and synchronous stability constraints means connection of additional generators[3] to the existing network in the Mid West will not increase overall capacity to the region until a major transmission reinforcement is constructed.

Figure 3: Prospective new load and generation connections in the Mid West Region

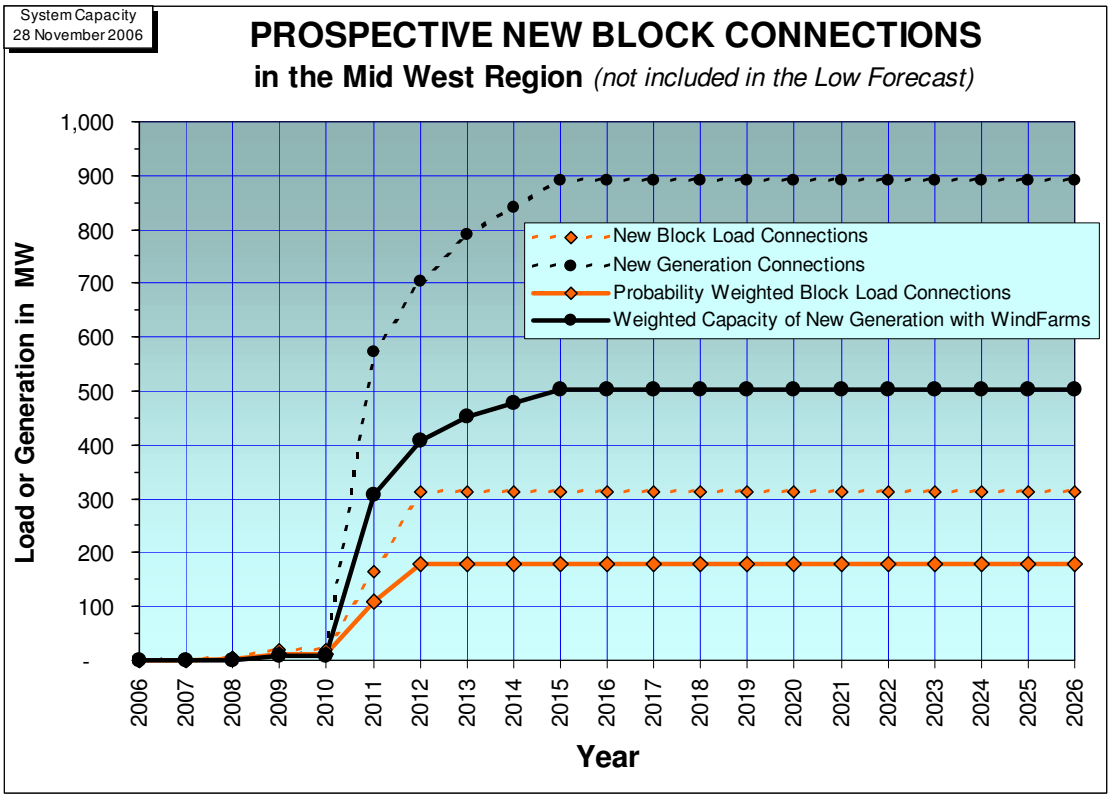


Figure 3 shows the potential connections based on a probability weighted analysis and 100% of all connections.

[3] Except for replacement of the existing Mungarra and Geraldton generators

Figure 4: Peak Load Forecast for the Area North of Eneabba and Muchea including prospective new block load connections.

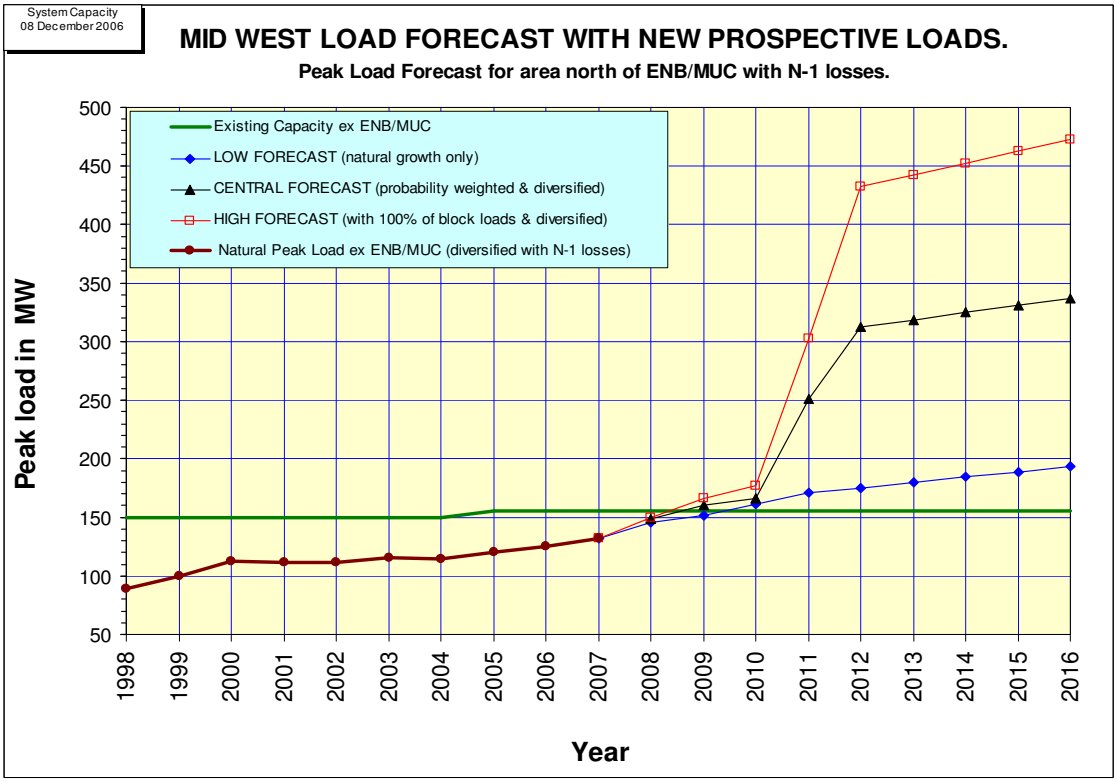


Figure 4 above shows low, central and high load forecasts for area north of Eneabba and Muchea. The graph shows that all load forecasts will exceed the existing supply capacity by summer 2010. Western Power needs to reinforce the network to accommodate these connections and economic development in the region.

1.5 Drivers for Reinforcement

There are multiple reasons for a new transmission line in the Mid- West Region. In the next few years, it is anticipated that a number of significant factors will impact on the development, including:

- Shortfall in capacity to meet forecasted low or central load growth forecast;
- Prospective connection of large industrial block loads;
- Prospective development of energy resources south of Geraldton;
- Uncertainty in availability of existing local generation (from Mungarra PS and Geraldton GT) after October 2010;
- Prospective connection of large-scale wind generating plants within the area; and
- Need for transmission infrastructure to connect future base-load and mid merit power stations north of Perth.

For more details please refer to the internal Western Power report in Attachment 1, Section 3.

2 Overview of Options

Western Power has identified a total of 12 major reinforcement options to address the emerging shortfall of power supply capacity in the Mid-West region. These are:

Transmission solutions:

1. Establish a double circuit 330 kV line (with one side initially energised at 132 kV) between Perth and Geraldton by November 2010.
2. Establish 132 kV lines from Eneabba to Three Springs, and Mungarra to Rangeway Substation located in the Geraldton CBD with the 330 kV line (as in Option 1) deferred until Nov 2014.
3. Establish 132 kV lines from Eneabba to Three Springs, and Mungarra to Rangeway with the 330 kV line (as in Option 1) deferred until Nov 2014.
4. Reinforce existing network using lines of 132 kV construction only.
5. Establish a single 220 kV line between Perth and Geraldton by November 2010.
6. Build reinforcement with line towers designed for 500 kV initially insulated and operated at 330 kV.
7. Build a Direct Current Perth to Geraldton line.
8. Do nothing.

Generation solutions:

9. Add more generation at Mungarra Power Station.
10. Additional generation at Dongara.
11. Permanently island the Mid-West region from the SWIS at Three Springs.

Other solutions:

12. Rely solely on a demand management program to reduce peak demand.

2.1 Discussion

Generation options (9-11) were discounted on the basis of non-compliance with the technical requirements. Connection of additional generation will not increase capacity to the region due to transmission limits. This conclusion has been validated in HTC's review.

Due to synchronous instability constraints, connection of additional generation in the region will result in reduction of the transmission transfer limits. The connection of additional generation in the Mid-West will not increase overall capacity to the region until major transmission reinforcement is commissioned. For more detail see HTC report.

Load reductions that can be achieved through demand management (Option 12) are unlikely to be sufficient to defer network expansion even under low demand scenarios. Therefore, this option is not considered viable.

System studies have shown that single circuit 132 kV transmission expansion options, or the option of doing nothing, will not meet planning criteria and are therefore not viable. Without network expansion, it will not be possible to meet natural load growth or to accommodate new customers beyond 2010, without compromising system security, reliability and quality of supply.

Transmission options (2-7) are of higher net present costs than Option 1 and are therefore less economically attractive.

The above options were reviewed by CRA in January 2007[4]. CRA concluded that construction of the new 330 kV line between Pinjar and Geraldton by November 2010 (as per Option 1) is preferable to the other options considered, including doing nothing and load demand management. The generation options considered are not feasible as new transmission capacity would be needed to connect new generation. Option 1 will facilitate the load forecast and connection of new generation in the Mid-West region up to 2030.

NOTE: For more details please refer to the internal Western Power report in Attachment 1 or to CRA's evaluation report in Attachment 2.

[4] For more details see Section 6 'Conclusion' of CRA's report located on WP's or ERA's website.

3 Proposed 330 kV transmission line to Geraldton

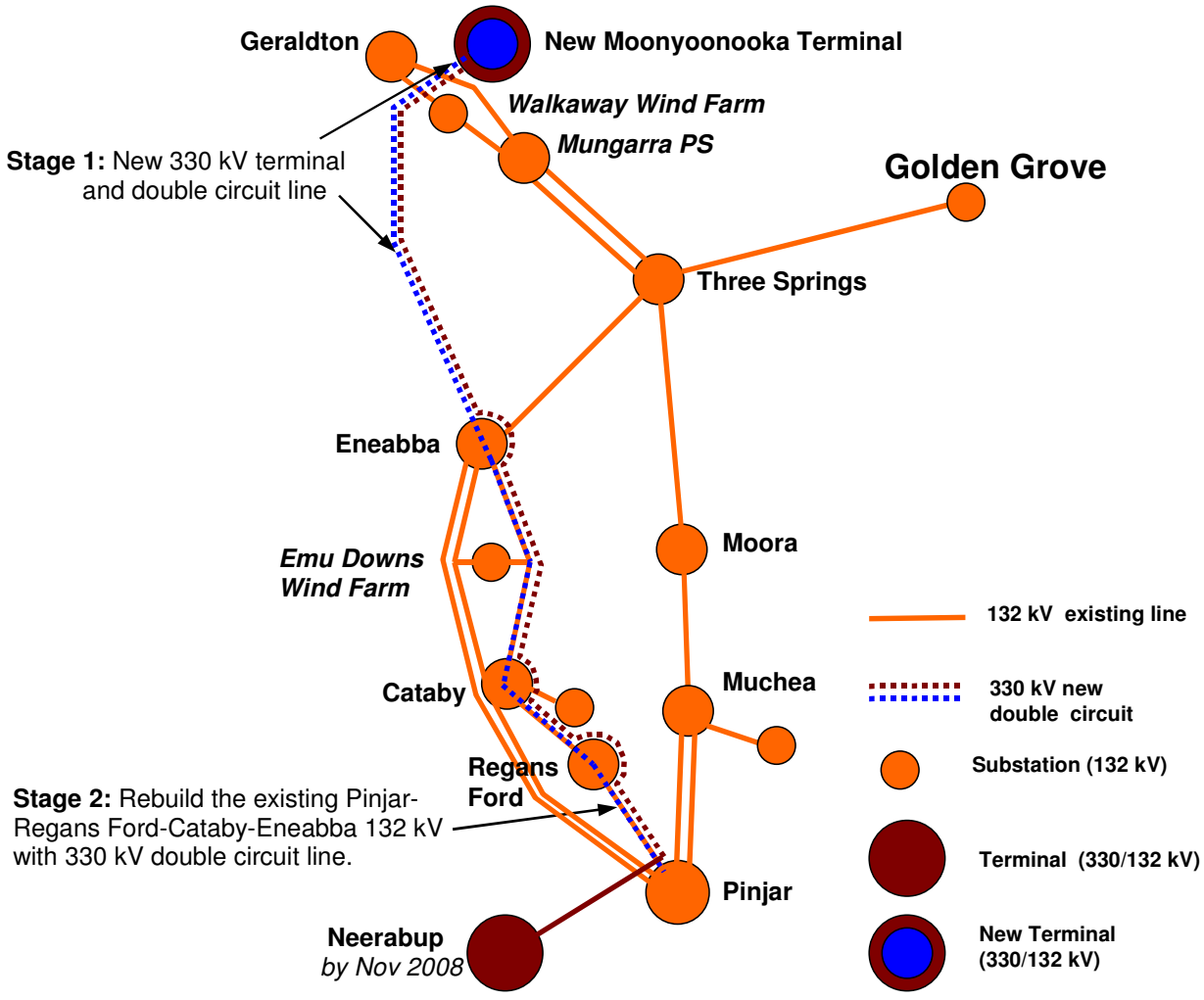
3.1 The project

To meet the load forecast and alleviate system constraints, Western Power's preferred option is to construct a new 330 kV double-circuit transmission line between Pinjar and Geraldton (with one side initially energised at 132 kV to allow for construction of 132 kV resupply to the Regans substation). The scope of the project also includes:

- Establishment of new 330/132 kV terminal station at Moonyoonooka (MNT).
- Establishment of new 330 kV line circuit at Neerabup (NBT).
- Construction of a new 132 kV line circuit at Pinjar (PJR).

For detailed scope of work, please refer to attachment 1.

Figure 5: Proposed 330 kV transmission line.



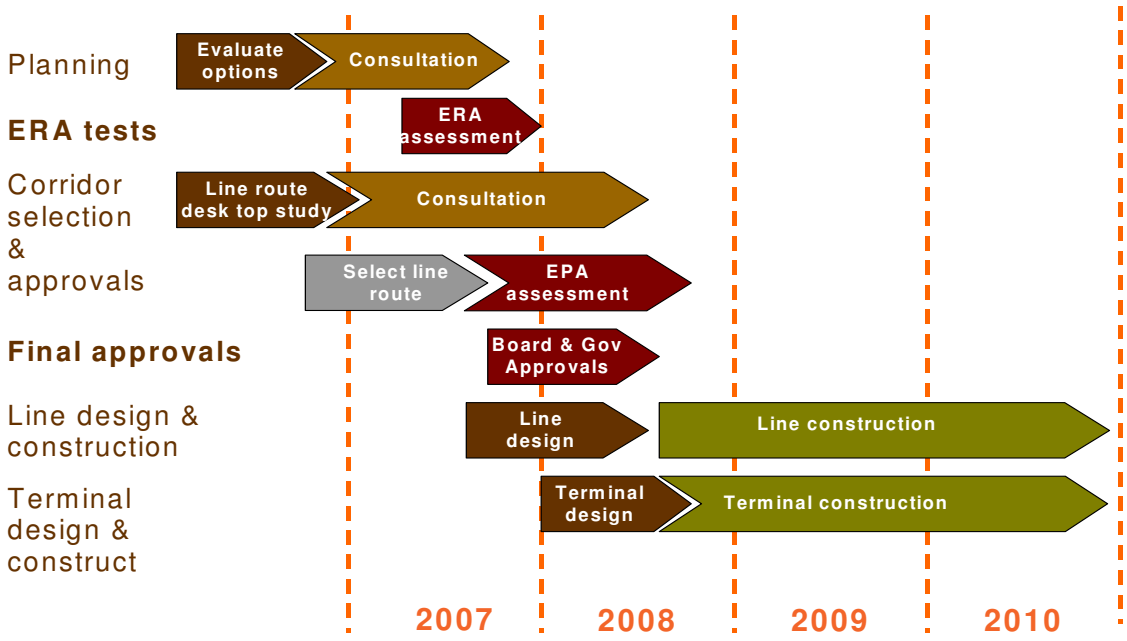
3.2 Cost of the proposed option

The cost for the proposed 330 kV reinforcement, as per Option 1, has been estimated at approximately $300M.

Detailed costing and sensitivity results are included in the confidential Appendix A and Appendix B.

3.3 Timeline

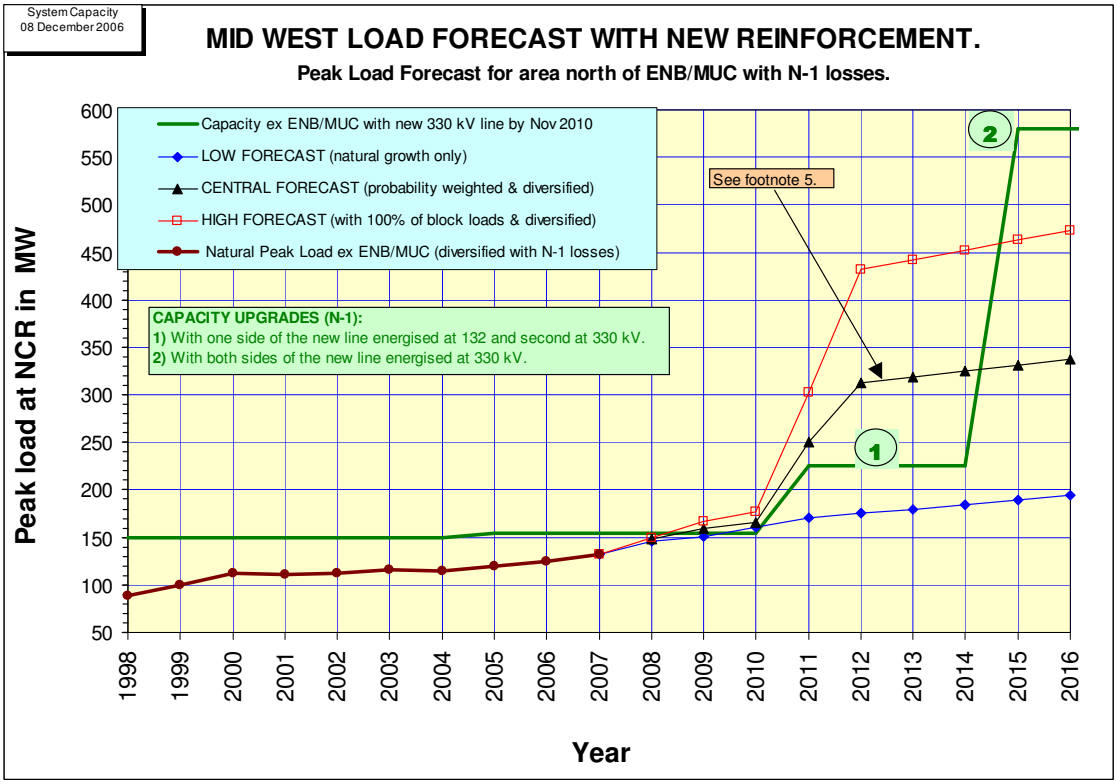
Mid 2004	**Identified need for major reinforcement**
December 2004	Board approved advancement of funds for line corridor selection
January 2005 – late 2008	Line route selection and approvals
November 2006 – April 2007	Community consultation on the line route
October 2006 – January 2007	Evaluation of options by consultants
February 2007 – April 2007	**Public consultation**
By May – September 2007	Economic Regulation Authority submission
By September – December 2007	Economic Regulation Authority approval (expected)
By March 2008	Board and Government approvals (including funding)
By May 2008	Line tender for Pinjar - Eneabba line section
By May 2008	Possible tender for terminal works
July 2008 – September 2010	Pinjar-Eneabba line construction
By February 2009	Line tender for Eneabba - Geraldton line section
March 2009 – November 2010	Eneabba – Geraldton line construction
July 2008 – October 2010	Terminal construction
November 2010	**Project target completion date**



3.4 Expected benefits

The proposed reinforcement will increase supply capacity[5] to the Mid West region as shown below.

Figure 6: Load Forecast for Mid West Region with Reinforcement of Option 1.



The expected benefits of the proposed reinforcement to the transmission network are:

- ability to accommodate natural load growth in the region;
- increase in transmission capacity to support forecast load growth in the region;
- increase in transmission capacity to enable connection of customers (new loads and generation);
- improvements in reliability of power supply to all customers in the region;
- ability to connect new wind farms;
- ability to connect new base generation located north of Perth;
- facilitation of entry of lower cost generation in the region;
- opportunity to retire old and inefficient gas turbines at Geraldton and Mungarra; and
- reduction in transmission losses.

[5] Between 2010 and 2014 a radial line may supply mining load and therefore Western Power does not expect to meet N-1 requirement.

3.5 Consequences of Late delivery

The consequences of not adhering to the project deadline are:

- risk of up to 15 MW load shedding in the North Country over summer 2010/11 and more than 20 MW by summer 2011/12. This may create dissatisfaction of the existing customers due to deterioration in reliability of supply.
- inability to connect new large loads or local generation.
- dissatisfaction with Western Power's inability to connect customers.

3.6 Critical items

The critical items impacting on the project's deadline are:

- Regulatory & Ministerial approvals.
- Funds from Department of Treasury and Finance.
- Environmental Protection Authority (EPA) approval on the line corridor.

4 Assessment of Alternative Options

The Regulatory Test requires specific expertise to perform the technical and economic evaluations of alternative options as required by the Electricity Networks Access Code. Summaries of the evaluations performed by Western Power and independent consultants are contained in this section of the submission to the ERA.

4.1 Assessment Methodology

The economic assessment takes into consideration:

- The Net Present Value in accordance with the requirements of the Regulatory Test (the transmission options have been assessed by Western Power and reviewed by an independent consultant (CRA International).
- Evaluation of *anticipated incremental revenue* from prospective connections in accordance with the New Facilities Investment Test (NFIT) for the proposed option. Specifically referring to Section 6.41(b)

  (i): *the additional revenue for the alternative option is expected to at least recover the alternative option costs*;
- Review of the economic evaluations and the NFIT by the Independent Consultant – CRA International.

NOTE: For more details please refer to the internal Western Power report in Attachment 1 or to CRA's evaluation report in Attachment 2.

Discount Rate

The rate of return represents the return expected by investors or stakeholders for investments of a given level of risk. The rate of return is that which provides an income from the investment of funds that would be sufficient to attract and retain that investment.

Normally, Western Power's economic analysis is based on returns on transmission investment that are regulated through open access arrangements. The analysis period used is 55 years.

At the time of commencing economic evaluations for the alternative reinforcement options by CRA an appropriate weighted average cost of capital (WACC) indicated by the Authority was a WACC of 6.6 percent (real pre-tax). All rates of return used in Western Power's and CRA's reports are real pre-tax. As Western Power's WACC may vary over time, sensitivity analysis has been used to compare its impact.

Sensitivity Analysis

Sensitivity analysis with various discount rates has been used to compare its impact on the economic evaluation.

A summary of the results of the sensitivity analysis is included in confidential Appendix B.

4.2 Evaluation by Independent Consultant

Western Power appointed an independent consultant, CRA International, to assist in the analysis of technical and economic issues covered by the *regulatory test*. Western Power also appointed an independent consultant, Hydro Tasmania (HTC), to review the technical studies including transmission power limits for the existing network.

Conclusions of these evaluations are listed below. For more details please refer to the following reference documents:

- Western Power's internal report – Attachment 1
- CRA's evaluation report – Attachment 2
- HTC's Due Diligence Study – Attachment 3

4.3 Summary of CRA's Evaluation

The conclusion of the CRA's report *(as per extracts in italic)* is as follows:

"The rank-ordering of net benefits supports the hypothesis that the proposed transmission augmentation Option 1 is superior to the other transmission options considered, including doing nothing. Sensitivity testing to different demand and discount rate scenarios demonstrates the robustness of this result. The results are also robust to a shorter modelling period. Demand side management options were considered, but were found to be insufficient to defer capacity investment even by one year. The three generation options considered failed to satisfy the threshold feasibility test—in part because new transmission capacity would be needed anyway to support new generation.

This case is somewhat unusual because of the scale of and uncertainty over possible industrial developments in the NCR. The fact that Option 1 is flexible, in that it provides scope to connect significant new load, but is still preferable under low demand growth, is an added and important factor in it being the superior option."

CRA's conclusion supports the proposed transmission reinforcement option.

4.4 Summary of HTC's Evaluation

The transmission network in the Mid West is weak and can not transfer large amounts of power due to thermal and voltage limitations. This 400 km transmission network is also susceptible to stability issues caused by disturbances in the network. Heavy reliance is placed on the use of generating plant at Mungarra and Geraldton to maximise capacity in the region.

The weakness of the transmission network combined with a system disturbance can cause generating units to fall out of synchronism. It is necessary for the network to operate within a number of power transfers constraints to ensure stability in the region.

HTC's due diligence report is included as Attachment 3. A summary of the conclusions is detailed below:

- Western Power's assessment of the existing power transfer limit and supply capacity to the region is valid.

- The addition of more gas turbines in the Mid West region (particularly at Mungarra) will reduce the transmission transfer limits and will provide no increase to the overall supply capacity.

As stated in section 3, generation options (9-11) were discounted by Western Power on the basis of non-compliance with the requirements of the *technical rules*. Western Power's technical studies concluded that the additional capacity requirements could not be met with the connection of additional generation alone due to the synchronous stability requirements of the *technical rules*. HTC's due diligence study confirms Western Power's assessment of the network, and these findings validate the drivers for reinforcement to the Mid West transmission network.

5 Summary of the Public Consultation Submissions

5.1 Discussion of submissions:

Western Power has conducted a public consultation process to obtain public submissions on the proposed reinforcement for the Mid West region's electricity network. Western Power has followed the process outlined in Section 9.16 and Appendix 7 of the Electricity Networks Access Code.

This process requires Western Power to show regard to public views and alternative options and give reasonable consideration to any information obtained under the consultation process when forming its view and conclusion.

To improve community awareness and to encourage stakeholder submissions, Western Power went beyond the requirements of the code by holding a public forum, advertising submission details in many prominent newspapers and conducting a media release.

The submission documents, including an "Invitation for Submissions" and the "CRA evaluation report" were published on Western Power's and the ERA's website. The documents were also handed to the participants at the forum. This process gave interested persons reasonable opportunity to state their views and to propose alternative options.

At the close of submissions, on 18 April 2007, Western Power received a total of 13 submissions and 2 more were received after the deadline. All 15 submissions were considered equally, in accordance with A7.21 of the code relating to late submissions.

Overall, the majority of submissions were positive, with eleven endorsing the proposed reinforcement (Option 1). Some of these submissions endorsed both the proposed reinforcement and the 500 kV tower reinforcement (Option 6). Two submissions (IMO and Newmont) supported transmission reinforcements and recognised the need for a strong transmission network without expressly endorsing any specific option. The remaining two submissions (Transfield Services and Eneabba Gas) did not endorse the proposed transmission reinforcement and supported a variation of one of the alternative options.

Western Power responded to each individual submission with a letter to address any issues that were raised. The response clarified reasons for the proposed reinforcement and responded to any alternative options proposed.

Table 1 provides a brief summary of the submissions received and includes some of Western Power's comments. A copy of the letters received and sent by Western Power is attached as part of this submission.

Table 3: Short Summary of Received Submissions

	Person/Company	Support / Doesn't support	Brief Summary with Western Power comments *(italics)*
1	Geoff Crothers, **Mid West Gascoyne ACC**	Support	Wholly supportive of the transmission upgrade. Prefers to shorten the project time line. *WP considers the project timeline based on a balance between economic and technical factors.* Would like the line to continue to Oakajee. *WP will consider supply to Oakajee as part of a separate project, however no connection application for power supply to Oakajee has been received.* Supports the construction of a 330 kV line with 500 kV towers (Option 6). *The CRA report concluded that the 500 kV tower option would cost 21% more, with benefits not received until approximately 20 years.*
2	Raoul Abrutat **Energy Visions**	Support	Fully supports proposal to build a 330 kV transmission line. Recommends varying current proposal to allow for 1,000 MW transmission line capacity. Supports the construction of a 330 kV line with 500 kV towers (Option 6). *The CRA report concluded that the 500 kV tower option would cost 21% more, with benefits not received until approximately 20 years.* Notes that the renewable energy targets cannot be met without reinforcement.
3	Wayne Trumble **Griffin Energy**	Support	Supports the proposed double circuit 330 kV transmission line. Holds concern that potential delays in the regulatory process may impact on the tight timeframe for the project. Holds concern that treasury may under fund this investment.
4	Andrew Woodroffe **SkyFarming**	Support	Supports the proposed double circuit 330 kV transmission line. Requests the transmission line be capable of 1,000 MW transfer.

	Person/Company	Support / Doesn't support	Brief Summary with Western Power comments *(italics)*
5	John Hackett **Landcorp**	Support	Supports the proposed double circuit 330 kV transmission line. Suggests availability of a 330 kV line linking Oakajee to the South West will provide social and economic benefits to the region. *WP agrees that the proposed project will be greatly beneficial to the Oakajee region. Supply to Oakajee will be more feasible if the proposed reinforcement is approved.*
6	Steve Douglas **Mid West Development Commission**	Support	Supports the proposed double circuit 330 kV transmission line. Received many proposals for iron ore projects – up to 80 mtpa by 2013. Recognises the constraints on the network by 2010. Third party advice indicates the "existing network does not support new generational capacity". *This is consistent with WP studies that show no net capacity is created through generation options.* Indicates the proposed option is a sustainable option that demonstrates commitment to regional development.
7	Andrew Everett **Verve Energy**	Support	Supports the proposed double circuit 330 kV transmission line. Notes that continued bolstering of the 132 kV network is not cost effective. *Results of CRA's economic analysis are consistent with this conclusion.*
8	Anne Nolan **IMO**	Support (transmission option)	Strongly supports the timely development of appropriate transmission enhancements. Notes that transmission infrastructure is required to support new generation and loads. Adequate transmission facilities will be required to provide genuine choice in the provision of power supplies.

	Person/Company	Support / Doesn't support	Brief Summary with Western Power comments *(italics)*
9	David Jones **Transfield Services**	Doesn't support	Does not support the proposed transmission option.
			Supports an alternative option to terminate a 330 kV line at Three Springs instead of Geraldton. This is based on the (unconfirmed) potential for mining load to the east of Three Springs. *WP's proposal to construct a 330 kV transmission reinforcement to Geraldton was determined to provide the greatest net benefit when considering a probability weighted assessment for each new load or generation connection.*
			Suggests more accuracy in the analysis of staged transmission development options is needed. *Staged development options were assessed in the CRA report but were deemed less attractive. There are also a number of connection applications that can only be accommodated with a 330 kV (or higher) reinforcement.*
			Suggests more non-network and generation options should be investigated. *Non network and generation options were considered in the CRA report. Study results have demonstrated that additional generation or network support contracts will not result in an increase to overall network capacity. Therefore these options cannot be used to defer network reinforcement.*
			Consideration for the creation of an islanded network. *The CRA report and WP have investigated the option of operating an islanded network. This option was ruled out due to technical and economic concerns detailed in WP's response letter.*
			Suggests the discount rates used were too low, favouring high early capital expenditure. *The weighted average cost of capital (WACC) pre-tax real discount rate used in the analysis was similar to the ERA approved WACC used in the Access Arrangement with WP. Although not published in the CRA report, WP's analysis shows that using a pre-tax real discount rate of 6.6% with sensitivity studies of 4% and 9% will not impact on the overall ranking of the preferred reinforcement option.*

	Person/Company	Support / Doesn't support	Brief Summary with Western Power comments *(italics)*
10	Ray Wills **WA SEA**	Support	Supports the proposed double circuit 330 kV transmission line. Recognises that Option 6, a 330 kV line with 500 kV towers offers the best technical solution for both now and the future. *WP recognise that construction of a transmission line with 500 kV towers would provide potential for easily increasing capacity, however the increase in cost would not be justifiable using current demand forecasts and the probability of new generation in the region.*
11	Grant Draper **Synergy**	Support	Supports the proposed double circuit 330 kV transmission line. Notes the benefit of a strongly interconnected system for growth of generation in locations close to electricity demand centres. Notes the benefit to renewable generation. Requests the proposed project to be completed much earlier. *The design of this line has not yet advanced and it is difficult for WP to commit to any specific dates before ERA and ministerial approvals. WP is keen to ensure the project is completed in the shortest feasible timeframe.*

	Person/Company	Support / Doesn't support	Brief Summary with Western Power comments *(italics)*
12	David Lyne **Newmont**	Support (transmission option)	Supports Western Power's proposal to undertake a substantial upgrade of the transmission network. Shows concern that most projects evaluated are "announced" rather than "committed" projects. *WP's proposal to construct 330 kV transmission reinforcement to Geraldton was determined using a probability weighted assessment for each new load or generation connection.* Shows concern over an apparent lack of evenness in Western Power's treatment of new load and generation proponents elsewhere (outside of the Mid West). Strongly believes that Western Power has an obligation to provide an adequate transmission network (funded by all network users in general). *Newmont's view that WP should (be obliged to) invest in "deep" transmission assets, funded by all network users is noted. However, the effective funding of investments is ultimately an outworking of the requirements of the Networks Access Code, which is strongly founded on principles of economic efficiency.*
13	Richard Harris **ERM Power**	Support	Strongly supports the proposed 330 kV transmission option. Requests the project be completed in the shortest possible time frame, in particular Stage 1 to Eneabba. *The design of this line has not yet advanced and it is difficult for WP to commit to any specific dates before ERA and ministerial approvals. WP is keen to ensure the project is completed in the shortest feasible timeframe.* Notes that significant extra benefits could be achieved through generation if the 330 kV transmission reinforcement proceeds.

	Person/Company	Support/Doesn't	Brief Summary with Western Power comments *(italics)*
14	Peter R Oates, Mark Babidge **Eneabba Gas Limited**	Doesn't support	Does not support the proposed transmission option. Supports minimal transmission reinforcements, similar to option 2 or 3 of the CRA report. Suggests new customers can be supplied from either self generation, direct purchases or from an islanded grid. *Options 2 and 3 were evaluated in the CRA report and dismissed, as they did not satisfy the technical requirement. As a consequence Option 2A (which does meet the technical requirements) was investigated.* *In the evaluation a probability weighted assessment for each new load or generation connection was considered when determining which reinforcement provided the greatest net benefit. For a range of forecasts, from low to high demand, CRA concluded in each case that the proposed 330 kV option would provide the optimal investment.* Notes WP's risk that speculative loads in the region may not eventuate, resulting in a "stranded asset". *WP's analysis used low, central and high load and generation forecasts. These forecasts included a probability weighted assessment of each load and generation connection. The results showed that even under the low demand scenario, the proposed reinforcement was the best investment.* EGL questioned the appropriateness of the weighted average cost of capital (WACC) discount rate and the term of the analysis. *The WACC pre-tax real discount rate used in the analysis was similar to the ERA approved WACC used in the Access Arrangement with WP. Although not published in the CRA report, WP's analysis shows that using a pre-tax real discount rate of 6.6% with sensitivity studies of 4% and 9% will not impact on the overall ranking of the preferred reinforcement option.* *The Networks Access Code states that the new facilities investment must be recovered by the anticipated incremental revenue over a reasonable period, which is not defined. Western Power believes that for this project, being a major infrastructure development with an expected life of 60 years, an economic analysis over a period up to the year 2030 is appropriate.*

	Person/Company	Support / Doesn't support	Brief Summary with Western Power comments *(italics)*
15	Lane Crockett **Pacific Hydro**	Support	Fully supports the proposed 330 kV transmission option. Notes the state governments commitment to renewable energy targets. Also supports the construction of a 330 kV line with 500 kV towers (Option 6). *The CRA report concluded that the 500 kV tower option would cost 21% more, with benefits not received until approximately 20 years.*

5.2 Discussion of non-supportive submissions:

The submissions received for the Mid West reinforcement proposal have demonstrated an overall support from major stakeholders in the region. However, there were two exceptions, Transfield Services and Eneabba Gas Limited, who did not support the proposal.

These companies expressed support for a number of the alternative options including the islanded grid, generation and staged development options. However, given the assessed quantum and timing of additional capacity required, the Pinjar to Geraldton 330 kV link proves to be the best overall option, under all growth scenarios and other sensitivities.

It is also apparent that the specific line route and final termination point will have an impact on the locations of electricity growth. Western Power has evaluated the known connection applications and "announced" major projects, combined with existing load growth. This evaluation determined that the Geraldton area was the most likely load centre, with the possibility of some generation connections. Therefore Western Power determined that Geraldton would be the most appropriate location to terminate supply. Potential loads to the east may prefer the 330 kV line to initially terminate at Three Springs, but Western Power believes that maximum net benefit can be achieved by construction of a transmission asset that would facilitate connections up to and beyond Geraldton.

For more detail, please refer to the attached submissions and Western Power's individual response to each submission.

6 Conclusions

The proposed *major augmentation* is required to allow Western Power to meet it's obligations under the *technical rules* as approved by the Authority, and to meet a forecast capacity shortage and to enable connection of new industrial customers (loads and generators) in the Mid-West region of Western Australia.

Western Power concludes that the proposed *major augmentation* (being Option 1, a 330 kV transmission line from Pinjar to Geraldton and associated works to be completed by November 2010) maximises the *net benefit after considering alternative options*.

In accordance with the requirements of section 9.16 of the Code, this *major augmentation proposal*:

- has described the proposed transmission network augmentation in detail,
- has stated that Option 1 (330 kV transmission line from Pinjar to Geraldton delivered by November 2010) maximises the *net benefit after considering alternative options*,
- has demonstrated that a consultation process as required by the Code (including public consultation) has been conducted, and reasonable consideration has been given to all information thereby attained,
- complies with the requirements for *major augmentation proposals* under the Code (noting that the Authority has not published any specific guidelines).

Western Power requests the Authority to publish a determination under section 9.18 of the Code with respect to the application of the *regulatory test* to the proposed *major augmentation*.

7 Recommendation

With respect to the proposed major augmentation (330 kV transmission line from Pinjar to Geraldton and associated works to be completed by November 2010), Western Power respectfully recommends that the Authority determines that the *regulatory test* as set out in section 9.20 of the Code is satisfied.

Appendix A: Cost Estimate for the proposed reinforcement

The preliminary cost estimates of November 2005 were used in the economic analysis. These costs were reviewed in November 2006 and will be reviewed again before submission for Ministerial and Treasury approvals.

The overall cost of the proposed project is dependent on the outcomes of the line route selection, presently under public consultation. The final cost will be subject to market variations in line construction.

Tables removed because they contain sensitive financial information.

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Appendix B: Results of Sensitivity Analysis

Western Power's economic analysis is included in electronic attachment 5. Sensitivity results with various discount rates are shown below in Table 1 and Table 2.

Results in Table B1 shows that using a pre-tax real discount rate of 6.6% with sensitivity studies at 4% and 9% will not impact on the overall ranking of the preferred reinforcement option.

Table B1: Sensitivity results with various pre-tax real discount rates.

Table removed because it contains sensitive financial information.

The lowest Net Present Cost (NPC) reinforcement is Option 1a (with Stage 1: Eneabba-Geraldton section by Nov 2010). This is a staged variation of Option 1, providing sufficient capacity the low forecast only until 2014. Please note that this option does not meet the requested deadline for many industrial customers, delaying connections until 2015. Therefore Option 1 (ranking 2) is the preferred the reinforcement with a relatively small increase in NPC.

The following table evaluates the reinforcement options using a variety of discount rate types.

Table B2: Sensitivity results with various types of discount rates.

Table removed because it contains sensitive financial information.

The results of this sensitivity analysis, with various types of discount rates, shows that the overall ranking of the preferred reinforcement Option 1 is not changed.

More details of the financial evaluation for each option are included in CRA's evaluation report in Attachment 2. In particular, for the cost of each option see Table 7 of the report, and supporting data is provided in electronic format in the confidential Attachment 5 Files for Financial Analysis (on CD).

Attachment 1: Western Power's Internal Report

(Confidential)

A public version of this attachment is currently not available.

Attachment 2: CRA's Financial Evaluation Report Public Version

Attachment 3: HTC's Due Diligence Review

Attachment 4: Public Consultation and Submissions

Attachment 5: Files for Financial Analysis (on CD)

(Confidential)

A public version of this attachment is currently not available.