Submission to the Economic Regulation Authority

REQUEST FOR WAIVER OF REGULATORY TEST

66/11 kV Medical Centre Zone Substation expansion and voltage conversion of distribution network

DATE:

24 March 2008

DOCUMENT PREPARED BY:

Western Power
GPO Box L921, Perth WA 6842
ABN 18 540 492 861

safe reliable efficient

Contents

Executive Summary

The State Government plans to rationalise Perth's health facilities over the next decade or more, in particular expand Sir Charles Gairdner Hospital ("SCGH") into a major hospital to service the northern and central metropolitan area. To achieve the proposed expansion of SCGH it is necessary to upgrade the electricity supply to provide sufficient additional capacity. The required upgrade to the network will constitute a *major augmentation* to the network under the Electricity Networks Access Code 2004 ("the Code*")* and consequently requires consideration under the requirements of the *regulatory test* in the Code.

After evaluating 7 alternative options, Western Power has concluded that the only feasible solution that will provide the required capacity to support both the load growth due to the expansion to the QEII Medical Centre and for the surrounding areas is the establishment of a new 66/11 kV Medical Centre substation (with some associated minor works) to be located on land immediately adjacent to the existing 66/6.6 kV Medical Centre substation.

The total capital cost of the project is approximately $28.4M, which includes both transmission work (substation and transmission lines) and approximately $2.6M for distribution work (voltage conversion from 6.6kV to 11kV). The project is customer driven and a customer capital contribution has been determined in accordance with the Western Power Capital Contribution Policy approved under the 2006 Access Arrangement.

Western Power hereby requests the *Authority* to waive the application of the *regulatory test* for the proposed *major augmentation* (66/11 kV Medical Centre substation and associated works to be completed by October 2010) in accordance with section 9.23 of the Code.

1 Introduction

To achieve the proposed expansion of SCGH it is necessary to upgrade the electricity supply to provide sufficient additional capacity.

This submission to the Economic Regulation Authority provides a summary of Western Power's evaluation of 7 alternative options to increase the capacity at the Medical Centre zone substation. However, Western Power has determined that there is only one feasible solution that constitutes a *major augmentation* to the network under the Electricity Networks Access Code 2004 (a new 66/11 kV Medical Centre substation and associated works to be completed by October 2010).

Consultants Kellogg Brown and Root (KBR) have provided the load forecast for Sir Charles Gairdner Hospital up until the last quarter of 2016, showing an increase in load from 13MVA to 20MVA over the period from 2009 to 2016, with an approximate forecast for beyond 2016 also included. The proposed growth at the SCGH exceeds the current available capacity at the existing 66/6.6kV Medical Centre substation prompting the need for a higher capacity supply.

The major component of the proposed project is construction of a new 66/11 kV zone substation and upgrade to distribution lines in the area to 11kV. The new substation would be in service by October 2010 to meet the forecast capacity growth at the Medical Centre and surrounding area. Following commissioning of the new substation, the existing substation would be required to stay in service for around 3 years permitting disruption from the changeover of facilities to be kept to a minimum.

The total capital cost of the project is approximately $28.4M. The project is required to provide expanded electricity services to the hospital and a customer capital contribution has been determined in accordance with the Western Power Capital Contribution Policy approved under the 2006 Access Arrangement.

This submission consequently requests the Authority to form a view under section 9.23 of the Electricity Networks Access Code 2004 (the Code) and specifically seeks for the Authority to waive the application of the *regulatory test* for the proposed *major augmentation* (66/11 kV Medical Centre substation and associated works to be completed by October 2010).

1.1 The Regulatory Test

A *major augmentation* to the network constitutes an augmentation where the *new facilities investment* exceeds $5M for the distribution assets or $15M for the transmission assets. The *regulatory test* is an assessment under 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.

However, under certain circumstances the *Authority* may form a view under section 9.23 of the Code to waive the application of the *regulatory test.*

9.23 If the *Authority* forms the view that the application of the *regulatory test* in respect of a proposed *major augmentation* would be contrary to the *Chapter 9 objectives*, including because:

(a) there are no, or it is unlikely that there are any, viable *alternative options* to the proposed *major augmentation*; or

(b) the nature of the proposed *major augmentation* is such that significant advance planning is required and no *alternative options* exist; or

(c) the nature of the proposed *major augmentation*, or part of it, is such that it should be submitted to the Independent Market Operator established under the *Electricity Industry (Independent Market Operator) Regulations 2004*, or

(d) the nature of the funding of the *proposed major augmentation* means that the *proposed major augmentation* will not cause a net cost (measured in present value terms to the extent that it is possible to do so) to those who *generate*, *transport* and *consume* electricity in the *covered network* and any *interconnected system*,

then the *Authority* may, by *publishing* a notice:

(e) expedite or otherwise modify the application of the *regulatory test* in respect of the *major augmentation* to the extent the *Authority* considers necessary to meet the *Chapter 9 objectives*; or

(f) waive the application of the *regulatory test* in respect of the *major augmentation* if the *Authority* considers it necessary to do so to meet the *Chapter 9 objectives*.

Western Power proposes that the proposed *major augmentation* (a new 66/11 kV Medical Centre substation and associated works to be completed by October 2010) meets the requirements of section 9.23(a) and 9.23(d) of the Code and consequently requests the Authority to waive the application of the *regulatory test*.

1.2 Details of Major Augmentation

The State Government plans to rationalise Perth's health facilities over the next decade or more and in particular expand SCGH into a major hospital to service the northern and central metropolitan area.

To achieve the proposed expansion to the SCGH it is necessary to upgrade the electricity supply to provide sufficient additional capacity.

The scope of work includes a 66 kV line and cable work to form the incoming supply to the new substation. Where cable is used, a 132 kV rating will be specified to facilitate a future voltage conversion of the substation to 132 kV if and when required.

The substation will include two 33 MVA transformers with provision for a third transformer to be installed when required to meet further load growth. The 66 kV switchgear will be of GIS construction and rated for 132 kV operations. This is to reduce the land requirement for the substation and to minimise future disruption if a voltage conversion is required. Switchgear to accommodate three transformers and three lines needs to be installed as part of the initial project. Sections of 11 kV indoor switchboards will also be provided to allow the conversion of the Western Power-owned distribution network voltage from 6.6 kV to 11 kV.

The delivery date for this project (substation and line/cable work) is October 2010. An optimistic expected completion date for the distribution network conversion is December 2013.

1.3 Load forecast

The load forecast for SCGH has been compiled by consultants KBR and can be seen in Appendix A to this submission.

1.4 Constraints and Limitations

The pressure to reduce the footprint of the new substation requires the use of gas-insulated switchgear (GIS). This is of a higher cost than conventional outdoor switchgear but it allows the land area for the substation to be reduced to a practical minimum. The drivers for this are:

- SCGH's imperative to maximize the land use for medical purposes – a GIS substation requires only about 50% of the area of a standard outdoor substation;
- The extremely high value of other land in the area; and
- Aesthetic reasons.

There are expected to be legislative impediments to Western Power acquiring the new substation site freehold. As a result, Western Power will lease the land from the Queen Elizabeth II Medical Centre Trust for 99 years under a peppercorn lease consideration. The leasing of the site is not expected to pose any issues to Western Power with respect to tenure.

Given the importance of the hospital to the Western Australian community, it is expected to be in service at the current site for the very long term. Thus, the risk of asset stranding is expected to be very low.

The new 66/11 kV substation will also play a role in supplying the long-term energy requirements of SCGH and other electricity consumers' (mainly residential and commercial) in the area.

1.5 Drivers for Reinforcement

The main drivers for this project are:

- Shortfall in capacity to meet forecast load growth at SCGH through it's development to a major hospital for the Perth Metropolitan area;
- Shortfall in capacity at the University Substation to meet the forecast load growth at the University of Western Australia;
- A need to upgrade distribution system architecture in the surrounding areas from 6.6 kV to 11 kV to meet the increase in general consumer demand.

2 Overview of Options

Western Power has investigated major reinforcement options to address the forecast increase in load at the Medical Centre Substation. The only feasible option has been deemed to be the construction of the new 66/11 kV zone substation.

A summary of the alternatives is given in the following table;

Alternative	Estimated Capital Cost	Comment
Do Nothing Option	$0	This option is not acceptable
Delay the Project		This option is not acceptable
Demand Side Management	Not costed.	This option is not acceptable for the power demand of SCGH

On-site Generation	$50M	This is significantly more expensive than the preferred option, and is most unlikely to be technically feasible.
Distribution Solution	Not costed	This option is not acceptable for the power demand of SCGH
Convert Existing Substation to 66/11 kV	Not costed accurately, but greater than $28.4M	This is more expensive than the preferred option due to the need to carry out the work in stages.
Install additional capacity at the existing 66/6.6kV substation.	Costs range from $27.5M to $39.3M depending on option.	Refer to Appendix 1. This is not feasible as some of the key assumptions are not valid.
Construct a new 66/11 kV substation and convert distribution network to 11kV	$28.4M	This is the preferred and only feasible option.

An overview of the alternative options are outlined below, further investigation of some of the alternative options is supplied in Appendix A1:

Do Nothing Option

The “do-nothing” option is not acceptable as the existing zone substation, with a 6.6 kV distribution voltage, will not be able to supply the forecast load growth at SCGH.

Delay the Project

This option is not acceptable as it does not meet the customer’s required time frame and would entail significant disruption and re-work on the SCGH distribution network.

Demand Side Management

Demand side management (“DSM”) will only have a very limited impact on deferring the necessity for network reinforcement. This is especially so given that the SCGH load is forecast to grow by 10 to 15 MVA by about 2020. As such, this alternative is not suitable for the longer term and was not considered further.

In the situation that DSM was effective in delaying the need for a new substation, new facilities at SCGH would need to be connected at 6.6kV (initially) and then reconnected at 11kV when the new substation came into service. This would involve rework and disruption to the SCGH's operations that could otherwise be avoided.

Further here is a high probability that load growth at the University of WA will be supplied from the 66/11 kV substation (commencing in 2012), as this will defer the need for a new substation at University by about five years. This additional load will also tend to reduce the effectiveness of any DSM measure (and of retaining the 6.6kV network for any significant period of time).

On-Site Generation

On-site generation could either be used to provide a peak demand lopping facility or it could be used to supply the base load of the hospital. However, this option is not practical

because it has perceived negative environmental impacts; it would be within close proximity to residential dwellings; there is uncertainty with future gas prices, and it would require a new or upgraded connection to the Western Power network.

If islanded operation is proposed for the supply to SCGH, at least two generating units (two by 25MVA) would be required for redundancy purposes and this together with the other considerations, would make this option more costly that the recommended option.

A notional capital cost for installed generating plant is $1 million per MW and so the applicable capital cost for SCGH would be in excess of $50M.

The SCGH advised that it has not investigated the "on-site generation" option in detail, as it was not considered to be a serious alternative for some of the reasons given above, as well as the relatively large area/real estate requirement. SCGH has also commented that power stations were not part of their core business and that an upgraded substation would suffice for their electricity supply purposes for the long term.

Distribution Solution

The existing 6.6kV distribution network within the SCGH site has limited capacity (as advised by the customer) due to the thermal ratings of the electrical cables. Consequently, this limits the load growth that can be supplied and also provides for less operational flexibility as it restricts the transfer of load between different parts of the SCGH network.

The existing Western Power 6.6kV distribution network also has capacity limitations and so cannot be relied upon to supply any significant load growth at SCGH.

There is currently no 11 kV distribution system in the area that could be used to supply the load growth at SCGH. The earliest date at which an 11 kV system will become available is 2014 with the conversion of the Nedlands substation. This does not meet the customer's project time frame and will only be able to supply a limited amount of load growth at SCGH, and not the full increase to 20MVA. Therefore, this option is not acceptable.

Convert the Existing Substation to 66/11 kV

This alternative would involve the replacement of plant at the existing substation to convert the secondary side of the substation from 6.6kV to 11kV operation together with installing transformers of higher capacity. To convert the existing substation will present significant challenges maintaining adequate supplies to SCGH during the construction phase.

The changeover of feeders to 11kV operation is expected to be very disruptive, both for SCGH and Western Power. The security of supply would be reduced during the conversion. Also, due to the careful staging of the work required there is some risk that the customer's time frame may not be met, negatively impacting on the government's improved health care system plans.

A further disadvantage is that there is insufficient land area available adjacent to the existing substation to allow the conversion to be carried out efficiently.

The cost of this option is greater than the cost of building a new substation on a clear site. This is due to the project needing to be staged in a way that will adequately maintain security and continuity of supply. Thus, the higher cost and the unavailability of additional land to facilitate a staged project make this option unattractive (and not achievable) when compared to the recommended option.

Install Additional Transformer Capacity at the Existing Substation

This alternative would involve the installation of 66/6.6kV transformers of higher capacity than the existing units.

However, this alternative is not acceptable because of the limitations that a 6.6kV distribution voltage would place on the customer's ability to supply their required electricity demand over the longer term. This was discussed earlier under the section on "Distribution Solution".

This alternative is also not acceptable for some of the reasons including the risk to security of supply during the transformer changeover and the risk of not meeting the customer's required time frame. It would not be prudent (from both a political and community point of view) to attempt to implement a solution that reduces supply security to a major public hospital. The consequences of an event leading to the loss of supply to SCGH are expected to be significant and possibly severe.

This option is examined in more detail in Appendix A.

Construction of a New 66/11 kV Zone Substation

This is the recommended option as it meets the long term needs of SCGH and also allows improvements to the Western Power infrastructure in the surrounding area.

This option also allows for a smoother and less disruptive conversion of the distribution network to 11 kV operation. The existing 66/6.6 kV substation will continue to operate until the voltage conversion on both the SCGH and Western Power distribution systems is completed.

The new assets are expected to have a lower probability of failure (and require less maintenance initially) than the existing equipment, which has been in operation since approximately 1960. This is expected to lead to an inherently more reliable supply to both SCGH and other customers.

3 Proposed 66/11 kV Medical Centre Zone Substation

3.1 The project

The work will involve the construction of a 66/11 kV zone substation that is to be located on land immediately adjacent to the existing 66/6.6 kV substation. The footprint size allocated for the substation site is nominally 80 metres by 40 metres.

The new substation will be of a 66/11 kV design with two 33MVA transformers and two incoming lines initially, with provision for a third transformer and a third line at some later date.

The existing Medical Centre substation will need to remain operational for approximately 3 years after the commissioning of the new substation, to allow sufficient time for the hospital to transfer their load to the new substation while keeping disruptions to a minimum. This time frame will also allow Western Power to convert their distribution network from 6.6 kV to 11 kV.

After all loads have been transferred onto the 11 kV network, the existing 66/6.6 kV substation will need to be decommissioned and the site "rehabilitated" to vacant land.

This is likely to occur about 3 years after the commissioning of the new substation and will involve, among other things, the removal and disposal of the existing plant.

3.2 Cost of the proposed option

Capital Cost

The total capital cost of the project is $28.4M, which includes $25.8M for the transmission work (substation and transmission lines) and $2.6M for the distribution work (the voltage conversion from 6.6 kV to 11 kV). These amounts have been calculated in accordance with Western Power's Project Financial Evaluation Model.

Allocation of Capital Cost to SCGH

The allocation of the capital cost to SCGH (for determining their capital contribution) is based on:

- the relative peak loads between the hospital and other consumers, and
- the capital cost of the new substation assets shared between SCGH and WP (that is, the 66 kV busbar, the 66/11 kV transformers and the 66 kV line/cable work).

It should be noted that assets that are dedicated to either SCGH or Western Power have not been considered in the allocation process. They will be fully funded by the party to whom they are dedicated.

Based on the 2007 peak load day, the allocation is approximately 60% to SCGH and 40% to Western Power. This has historically been the relative proportion of peak load and is a reasonable estimate of the future trend.

Incremental Network Revenue

The incremental revenue stream has been estimated by assuming an average load growth of 1,000 kVA per year for 15 years. This was based on the load forecast profile provided by Kellogg Brown and Root, with some averaging applied to facilitate the calculations.

Using Western Power's Price List for the SWIS for 2007/08, the network charge applicable to the SCGH incremental load is $42 per kVA (rounded to the nearest dollar and excluding GST). Thus, the incremental annual revenue for each year in the fifteen-year cash flow period is assumed to be $42,000 per year (excluding GST).

Capital Contribution

To determine the customer's up-front capital contribution, the allocated 60% of the capital works is offset by the net present value of the additional revenue forecast from the SCGH expansion over the first fifteen years of operation of the new substation.

It has been determined that SCGH will make an upfront capital contribution of $9.693M to the substation and 66 kV line/cable works.

3.3 Expected benefits

The benefits available from building the new 66/11 kV zone substation at Medical Centre can be assessed using the following criteria.

- Customer Satisfaction

Commissioning the new substation provides capacity to allow the SCGH to expand it's operations over the next 15 years or more without the need for further reinforcements to the substation or on the adjacent Western Power 66 kV network.

- Reliability of Supply

The new assets are expected to have a lower probability of failure (and require less maintenance initially) than the existing equipment, which has been in operation since approximately 1960.

This is expected to lead to an inherently more reliable supply to both SCGH and other customers as it provides all the benefits of a supply comprised of new plant and equipment as compared to a supply from an aging substation.

- Business Efficiency

The new substation will allow Western Power to transfer some of the load currently supplied from the University substation to the new Medical Centre substation. This would free up capacity at University substation to supply load growth at the University of Western Australia (Nedlands Campus).

This may allow a major substation development at University to be deferred for approximately 5 years and this provides a saving of about $3M in net present value terms assuming a capital cost of $30M.

Conversion of the distribution network from 6.6 kV to 11 kV will reduce line losses for a given amount of power transfer. A simplified analysis indicates that the energy savings equate to between approximately $30,000 and $50,000 per year.

- Minimise disruption to customer's operations

The construction of the new substation will be carried out while the existing 66/6.6 kV substation continues to operate uninterrupted, providing a continuity of supply to SCGH and to the district load.

When the new substation is commissioned, the two substations will continue to operate simultaneously for about three years while SCGH transfers its load to the new asset. The three-year time frame also allows Western Power a reasonable time frame to convert the distribution network from 6.6 kV to 11 kV.

- Security of Supply

The decision to construct a new substation rather than converting the existing substation provides a higher level of supply security to SCGH during the construction phase.

The existing substation will not need to be disturbed during the construction of the new substation and so it can continue to supply the SCGH load with a higher level of confidence. The alternative to convert the existing substation will present significant challenges to maintain adequate supplies to SCGH during the construction phase and the security of supply will be reduced.

- Alignment with Asset Replacement and Network Reinforcement Plans

The network reinforcement plans for the Medical Centre 66/6.6 kV substation include the installation of transformers of higher capacity by 2011 and a new 6.6 kV switchboard by 2020. The 2011 upgrade was to accommodate SCGH's projected load growth but did not take into account the limitation that a 6.6 kV voltage would place on the customer's ability to reticulate electricity around their site for the longer term.

Without SCGH's projected load growth and disregarding asset replacement plans, additional capacity would be required at the existing Medical Centre substation by 2016.

The corresponding plans for University substation would be to increase transformer capacity by 2011/12 based on the forecast load growth at the University of Western Australia's Nedlands campus. Without this projected load growth the asset replacement plan is to replace the major plant by 2015/16.

The construction of the new substation in 2010/11 aligns reasonably well with these plans albeit requiring an advancement of the work by approximately five years.

- Necessary to maintain safety, reliability or existing network capability

The recommended option has been selected as it provides a secure and safe supply to SCGH during the construction phase. It places the supply to SCGH at a lower risk than the alternative option of converting the existing substation, which would be a staged and prolonged process.

The new plant will replace existing equipment that is about 50 years of age. The newer plant is expected to provide a supply arrangement that is inherently more reliable that the older existing substation.

It is to be acknowledged that there is a close relationship between the benefits mentioned under "Minimise disruption to customer's operations", "Security of supply" and "Necessary to maintain safety, reliability, or existing network capacity".

3.4 Consequences of Late delivery

The consequences of not adhering to the project deadline are:

- Inability to meet the load growth of the SCGH and associated new plans to develop the site into a major medical facility.
- Significant disruption and re-work on the SCGH distribution network from using temporary measures or not running the new and old substations in parallel.
- Negative media attention to Western Power, the Minister for Energy, and perhaps the Western Australian Government.
- Dissatisfaction with Western Power's inability to connect customers in a timely manner.

4 Recommendation

Given that there are no feasibly *alternative options* and that the customer will be required to pay a capital contribution, Western Power hereby requests the *Authority* to waive the application of the *regulatory test* for the proposed *major augmentation* (66/11 kV Medical Centre substation and associated works to be completed by October 2010) in accordance with section 9.23 of the Access Code.

APPENDIX A 1

INSTALL ADDITIONAL TRANSFORMER CAPACITY AT EXISTING SUBSTATION – FURTHER ANALYSIS

This section provides a further analysis of this option, which was mentioned in Section 2 of this submission "Overview of Options". The aim is to show that a single 66/11 kV substation (shared between SCGH and Western Power) is the best alternative.

In the initial analysis, the option was ruled as being not acceptable for reasons that impacted more on the customer than on Western Power. These reasons include supply security during construction and the limitations of a 6.6kV distribution voltage.

As such, the argument has arisen that the 6.6kV distribution network is sufficient for Western Power's needs and that an 11kV network is only required for the SCGH. This analysis addresses this argument by investigating the scenario outlined below.

The scenario involves a 66/11 kV substation to be built by October 2010, to provide a higher distribution network voltage for SCGH's use only. (It is assumed that Western Power will not have any rights to the 11kV capacity).

The existing Medical Centre 66/6.6kV substation and surrounding distribution network will be retained indefinitely and upgraded as required to supply loads other than SCGH. The feasibility of this option is based on the validity of certain assumptions given later in this analysis.

A further consideration is that all plant at the existing substation (aged about 50 years) may be upgraded under Western Power's asset replacement plans. The timing for this is nominally 2016/17 and would essentially involve a complete rebuilding of the substation.

As far as rearranging the load in concerned, the intention would be to transfer the SCGH load (10 MVA) from the 66/6.6kV substation to the 66/11 kV substation over a period of about three years starting in 2010/11. The spare (or freed up capacity) can be used to supply load growth at the University of Western Australia (forecast to be an additional 7.8 MVA by 2015), which cannot otherwise be supplied from the existing University substation. Additional infrastructure (in the form of a 6.6kV switchboard) would be required at Medical Centre by 2012 for this purpose, given that the SCGH load transfer from the old 6.6kV to the new 11kV will not be completed by this time.

The following analysis compares a number of alternatives that involve the retention of the 66/6.6kV substation, either on the existing site or on an alternate site.

It should be noted that the cost information used is indicative, however we believe that this is sufficient in presenting the case for the preferred alternative (this being a new shared 66/11 kV substation).

Preferred Alternative (Build a new 66/11 kV shared substation)

Scope of Work	Cost Information	Timing
Construct a new 66/11 kV substation for the sole use of SCGH. Western Power and SCGH will share the new substation.	Estimated value of Western Power owned assets is $25.8M.	Commissioned by October 2010.
Voltage conversion of distribution network from 6.6kV to 11kV.	Estimated value is $2.6M	2014/15
Substation Site	Peppercorn Lease to apply	

The total capital cost for this option is $28.4M.

For comparison in today's dollars, the net present cost of this alternative is $14.9M.

This assumes an upfront capital contribution of $9.7M.

Alternative 1 (Western Power retains the existing 66/6.6kV substation and upgrades and reinforces as required).

Scope of Work	Cost Information	Timing
Construct a new 66/11 kV substation for the sole use of SCGH. This will include 66 kV shared network asset (busbar and line circuits) to be owned and operated by Western Power.	Estimated value of Western Power owned assets is $12.3M.	Commissioned by October 2010.
Upgrade Medical Centre 66/6.6kV substation – two new transformers and new switchboard 6.6kV section.	Estimated value is $8.5M. A 20% premium has been included (in addition to the $8.5M) for installation to take account of the need to carry out the work in stages.	2016/17.
Additional land to allow additional 66/6.6kV plant to be installed.	$5M (2500 sqm x $2000 per sqm).	

The total capital cost for this option is $27.5M.

For comparison in today's dollars, the net present cost of this alternative is $13.8M.

This assumes an upfront capital contribution of $9.8M to the shared 66 kV assets at the new 66/11 kV substation.

While the net present cost is slightly lower than that of the preferred option, there are a number of issues (not necessarily all economic in nature) that may make this option not feasible. These are raised in the following table of key assumptions:

Assumptions	Comments
Additional land is freely available at QEII that the SCGH is willing to provide for the use as a Western Power zone substation.	SCGH will not agree to have two substations on their land when a single substation will meet both theirs and Western Power's use. From SCGH's point of view, higher value can be placed on using the land for medical use rather than as a second substation site.
The SCGH is accepting of having two substations on their land.	As above.
The disruption of building two substations	Given that a shared substation will meet

on QEII land over a period of possibly up to ten years will not be an issue.	the needs of both parties, the disruption that would occur in doing work on two substations will not be acceptable to SCGH.
Supply security (during construction) is not an issue to SCGH and other customers.	The main reason for seeking to build a new 66/11 kV shared substation is for supply security reasons (to both SCGH and other customers).
The existing 66/6.6 kV assets will be serviceable to at least beyond 2020, and can be readily replaced on an as-required basis.	Western Power has in mind a complete asset replacement for the equipment at Medical Centre. This is effectively Alternative 2 (see below) and will lead to a higher net present cost than that indicated for this option.
The existing 6.6kV switchgear can support the standard 33 MVA transformer rating.	Rating of existing 6.6kV busbar is about 21 MVA. This limits the transformer capacity that can be added without upgrade of other major 6.6kV plant. Also, the existing transformer foundations may not be adequate to accommodate the larger transformers.
The 6.6kV network can be expanded to supply the forecast load increases at University of WA.	To supply the load (approx 8 MVA by 2015) will require at least 3 x 6.6 kV feeders (each about 2 km long) and there may be technical issues in achieving this load transfer.

It can be seen that most of the assumptions listed above, upon which this alternative depends in order to be feasible, are not valid.

It is expected that it would take more than the net present cost difference ($1.1M approx) to overcome the invalid assumptions.

As a result, this alternative will then tend to default to either Alternative 2 or Alternative 3 (as described below), each of which has a higher net present cost (see later) than the preferred option.

Alternative 2 (Complete Asset Replacement of the Existing 66/6.6kV substation)

Scope of Work	Cost Information	Timing
Construct a new 66/11 kV substation for the sole use of SCGH. This will include 66 kV shared network asset to be owned and operated by Western Power.	Estimated value of Western Power owned assets is $12.3M.	Commissioned by October 2010.
Complete asset replacement at Medical Centre 66/6.6 kV substation.	Estimated value is $16M (assuming outdoor substation is feasible. The cost will be higher if GIS is required). A 20% premium has been included (in addition to the $16M) for installation to take account of the need to carry out the work in stages.	2016/17.
Additional land to allow additional 66/6.6 kV plant to be installed.	$0M. If we allow for additional land, the net present cost will increase.	

The total capital cost for this option is $31.5M.

For comparison in today's dollars, the net present cost of this alternative is $15.8M.

This assumes an upfront capital contribution of $9.8M to the shared 66 kV assets at the new 66/11 kV substation.

This exceeds the net present cost of the preferred option (even when we exclude the cost of additional land) and so Alternative 2 can be discounted purely on economic grounds.

Alternative 3 (Involves a Completely New Site for Western Power 66/6.6kV substation)

Scope of Work	Cost Information	Timing
Construct a new 66/11 kV substation for the sole use of SCGH. This will include 66 kV shared network asset to be owned and operated by Western Power.	Estimated value of Western Power owned assets is $12.3M.	Commissioned by October 2010.
Construct a new GIS 66/6.6 kV substation at the new site.	Estimated value is $21M (assuming minimal 66 kV line work)	2016/17.
Additional land.	$6M (3000 sqm at $2000 per sqm)	2016/17.

The total capital cost for this option is $39.3M.

For comparison in today's dollars, the net present cost of this alternative is $21.8M.

This assumes an upfront capital contribution of $9.8M to the shared 66 kV assets at the new 66/11 kV substation.

This exceeds the net present cost of the preferred option and so Alternative 3 can be discounted purely on economic grounds.