Geoff Brown & Associates Ltd

NEW FACILITIES INVESTMENT TEST
MEDICAL CENTRE SUBSTATION

Technical Review

Prepared for

ECONOMIC REGULATION AUTHORITY

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CONCLUSION

We have reviewed Western Power's application for NFIT approval for the construction of the Medical Centre (MCE) substation for commissioning in 2014 and consider that:

- the construction of the new substation for commissioning in 2014 fully meets NFIT requirements irrespective of the Sir Charles Gardiner Hospital (SCGH) requirement for an 11kV supply; and

- based on our understanding of the AA3 access arrangement and the application of NFIT, the only cost that Western Power is entitled to recover from SCGH is the forecast $1.22 million connection asset cost.

This conclusion differs from the Western Power application in two key respects. In its application Western Power considers that:

- construction of the new MCE substation will not meet NFIT requirements until 2016 if there was no requirement for an additional block load and 11 kV connection at SCGH; and

- in addition to the connection asset cost, it is also entitled to recover the bring-forward cost of distribution works associated with the construction of the new substation from SCGH.

1. INTRODUCTION

Western Power is planning to construct a new 132/11 kV zone substation at the QEII Medical Centre, located at Nedlands, an inner western suburb of Perth. The substation will replace an existing 66/6.6 kV substation and is planned because an expansion to the facilities within the Medical Centre complex requires an 11 kV incoming supply by June 2014. The existing substation at the Medical Centre cannot provide this.

In April 2008, the Economic Regulation Authority (Authority) waived the new zone substation from the regulatory test prescribed in Chapter 9 of the Electricity Networks Access Code 2004 (Code) in accordance with clause 9.23 of the Code on the basis that there was no viable alternative option to the new substation. In October 2011, the Authority's Secretariat confirmed that this waiver remained valid.

A regulatory test waiver does not exempt Western Power from complying with the new facilities investment test (NFIT), prescribed in clause 6.52 of the Code, if the value of the new substation is to be included in its capital base. This will allow it to recover the cost of the project from its regulated revenue cap. Western Power has applied to the Authority under clause 6.71(b) of the Code for a determination that the proposed substation meets NFIT requirements.

We (Geoff Brown & Associates Ltd) have been engaged by the Authority to comment on and investigate whether the estimated cost of the proposed substation meets NFIT requirements. In particular we have been asked to comment on whether the estimated cost of the new substation does not exceed an amount that would be invested by a service provider efficiently minimising costs, having regard to such things as economies of scale and scope. In addition we are required to comment on and investigate whether the substation is required to maintain the safety and reliability of the Western Power network or the ability of the network to provide contracted covered services.

The MCE substation works covered by this NFIT application include:

- civil works for the construction of a new substation (referred to as MCE) within the QEII Medical Centre complex on a site immediately to the north of the existing zone substation (referred to as MC). The site is currently used as a car park;
- an outdoor 132 kV switchyard with the capacity to accommodate two incoming 132 kV circuits and three 132/11 kV transformers;
- three switchgear buildings and two 11 kV indoor switchboards. Each switchboard will include provision for three feeders supplying the Sir Charles Gairdner Hospital (SCGH)[1] and three for Western Power's own use. Each transformer will supply its own switchboard, so the third switchboard will not be installed until the third transformer is installed;
- a control building and the controls, SCADA, protection and other ancillary equipment required to support a fully functional 132 kV substation;
- cable terminations and cabling required for a temporary incoming supply, which will be taken from the incoming supply to the existing substation on the site;
- decommissioning, removal and site reinstatement of the MC substation.

Initially, it is planned to energise the substation at 66 kV. However it is intended to energise the substation at 132 kV through two incoming circuits supplied from the proposed new 132 kV substation at Shenton Park. This is likely to occur in 2018.

[1] SCGH is a hospital within a larger complex known as the QEII Medical Centre. The Medical Centre complex has a single point of connection to the Western Power network and the SCGH is the consumer that takes supply at this connection point.

Apart from supplying the SCGH and local Western Power load, it is planned that the substation will replace the existing University substation (referred to as U) and the third transformer and switchboard will provide for this. However this is a separate project and not part of this NFIT application.

The NFIT application also provides for the transfer of local load from the MC substation to the new MCE substation, including the replacement distribution substations and other equipment needed to allow the distribution network to operate at 11 kV. The six dedicated 11 kV feeders to supply SCGH will be installed by others but terminated onto the new switchboard by Western Power.

This report presents the results of our review.

2. BACKGROUND

2.1 NEW FACILITIES INVESTMENT TEST REQUIREMENTS

The NFIT requirements are set out in clause 6.52 of the Code, which states that a new facilities investment satisfies the new facilities investment test if:

(a) the new facilities investment does not exceed the amount that would be invested by a service provider efficiently minimising costs having regard, without limitation, to:

(i) whether the new facility exhibits economies of scale or scope and the increments in which capacity can be added; and

(ii) whether the lowest sustainable cost of providing the covered services forecast to be sold over a reasonable period may require the installation of a new facility with capacity sufficient to meet the forecast sales;

and:

(b) one or more of the following conditions is satisfied:

(i) the anticipated incremental revenue for the new facility is expected to at least recover the new facilities investment; or

(ii) the new facility provides a net benefit in the covered network over a reasonable period of time that justifies the approval of higher reference tariffs; or

(iii) the new facility is necessary to maintain the safety or reliability of the covered network or its ability to provide contracted covered services.

This review assesses the extent to which the project meets the requirements of the test. In this report we refer to the different components (or legs) of the NFIT as follows.

- The test described in clause 6.52(a) of the Code is referred to as the "efficiency test". This test has a capacity component, which determines whether the size and scale of the proposed augmentation are appropriate taking into account the forecast demand requirement, and also a cost component, which determines whether the estimated cost is reasonable and also whether the actual delivered cost is likely to be efficient, based on the actual conditions encountered by Western Power at the time of project delivery. The latter assessment is necessary because the amount added to the capital base will be the actual delivered cost rather than the NFIT amount approved by the Authority. The approved NFIT amount is only relevant in that it provides an upper bound to the approval; if the actual delivery cost exceeds this upper bound Western Power would need to further satisfy the Authority that the excess expenditure met NFIT requirements. This situation could arise if circumstances occurred during project delivery that were not foreseen in the pre-approval application.

- The test described in clause 6.5.2(b)(i) of the Code is referred to as the "incremental revenue test". It is relevant when an augmentation is required to service a large new load and requires that the capital and maintenance costs of the augmentation are offset by the additional revenue that the new load will generate. This is typically established through a discounted cash flow financial analysis.

- The test described in clause 6.52(b)(ii) of the Code is referred to as the "net benefits test". It is applicable when the additional revenue required by Western Power to fund the augmentation is offset by the value of benefits to network stakeholders. This test would apply, for example, to an augmentation that

allowed new lower cost generation to connect to the network. Such an augmentation would pass the test if it could be shown that the savings in generation costs over time exceed the costs of the augmentation. Compliance with the net benefits test is typically established through economic analysis.

- The test described in clause 6.52(b)(iii) of the Code is referred to as the "safety and reliability" test. This is applied to capital expenditure necessary to ensure that the existing network can continue to function safely and reliably.

The NFIT is not applied to connection assets, which are funded by a user in the form of an upfront capital contribution in accordance with clause 8.1 of Western Power's approved Contributions Policy. Connection assets are defined in the Code but the definition is not helpful in distinguishing a connection asset from a shared asset. For our purposes we categorise a connection asset as one which, if disconnected from the network, would not impede in any way the supply of electricity to other network users. However there could be a need for a more explicit definition of connection asset in the Code in order to ensure that all connection applications are treated equitably.

A second issue with the NFIT is the treatment of network augmentations triggered by incremental demand growth, generated through the connection of large numbers of new small users to the network. In applying the NFIT to this situation, it is assumed that small users have a right to connect to the network (although they must meet the cost of the assets between their network connection point and their load), and the safety and reliability test is normally applied. Augmentations to meet incremental demand growth are normally considered to meet NFIT requirements if they are necessary to ensure that the network continues to meet the safety and reliability criteria specified in Western Power's technical rules, once the forecast growth in incremental demand materialises.

2.2 PROJECT BACKGROUND

2.2.1 Existing Medical Centre Substation

The existing MC zone substation has three 66/6.6 kV transformers, two rated at 13 MVA and one at 15 MVA. The two smaller transformers were installed in 1959 and the larger transformer was installed in 1961. All three transformers have an assessed condition of 9 on a scale of 1-10, where 1 represents an as-new transformer and 10 a transformer in poor condition in need of immediate replacement.

The current peak demand is approximately 18 MVA, although it is anticipated that this could increase to more than 20 MVA during a really hot summer. The current SCGH peak demand is 12.5 MVA but this is expected to double to 23 MVA by 2015 and increase further to 27.5 MVA by 2020.

2.2.2 Redevelopment of Western Terminal Load Area

The MC substation is one of six supplied from the 132/66 kV Western Terminal substation, five of which supply a 6.6 kV distribution network, from transformers rated between 10 MVA and 15 MVA and installed over the 11 year period 1957-1968[2]. Most of these substations are operating close to or above their N-1 capacity. The most heavily loaded substation is U, where at peak demand both transformers are currently loaded to around 90% of their rating.

A further concern is the 6.6 kV distribution voltage, which is now obsolete. The relatively low transfer capacity at this voltage restricts the transfer capacity available to shift load between substations, which in turn limits the operating options available to maintain supply in the event of an asset failure.

In early 2012, Western Power engaged Sinclair Knight Merz (SKM) to prepare a redevelopment plan for the Western Terminal load area taking account not only the

[2] The exception is Wembley Downs, which has two 35 MVA 66/11 kV transformers that were manufactured in 1977 and reconditioned before installation in their current location in 2009.

forecast growth in demand but also the condition of the existing zone substation assets. We reviewed this plan for the Authority as part of our regulatory test review of the Shenton Park substation proposal[3]. While we had reservations about some components of the SKM plan, we did support:

- the upgrade of the 6.6 kV distribution network to 11 kV; and
- the construction of new 132/11 kV substations at the Medical Centre and Shenton Park. In part, this was because this solution provided an opportunity to rationalise zone substation transformer capacity and avoid the need to replace two existing zone substations (University and Herdsman's Parade) where the existing assets were approaching the end of their economic life.

On the basis of this earlier review, we conclude that construction of the proposed MCE substation is consistent with the least cost development strategy for the Western Terminal load area. We further note that the 33 MVA transformer size is Western Power's standard transformer size for zone substations in non-CBD urban areas and see no reason to deviate from this standard design.

[3] *Technical Review of Western Power's Shenton Park Zone Substation Regulatory Test Application;* Geoff Brown and Associates Ltd, 10 September 2012.

3. TIMING CONSIDERATIONS

The timing of this project is determined by the requirement to make an 11 kV supply voltage available to SCGH by June 2014. The analysis in Attachment 2 of Western Power's application considered the counter-factual scenario where the SCGH expansion did not proceed and there was no consumer requirement for a voltage upgrade. In this event, Western Power indicated that it would undertake a number of minor distribution network reconfigurations to offload the U substation and defer its capacity constraint. However, even without the new SCGH requirements, this would only defer the need for a replacement substation at the Medical Centre, and a new two-transformer MCE substation would still be required by 2016. On this basis Western Power submits that the SCGH expansion has brought forward the need to replace the existing MC substation by two years.

In this section we look at Western Power's analysis of the counter-factual scenario and particularly the basis on which it determines the timing of the construction of the MCE substation, where there no requirement for additional block load or an 11 kV connection at SCGH. This is significant because it forms the basis for determining the capital contribution required from SCGH.

Information provided to us by Western Power for the Shenton Park regulatory review (footnote 3) was that:

- the forecast peak demands in 2013 for the MC and U substations were both in excess of 20 MVA, assuming a 10% probability of exceedence (POE10)[4];
- the U substation has two 10 MVA transformers to give it an N-1 capacity of 10 MVA;
- the MC substation has two 13 MVA transformers and one 15 MVA transformer to give it an N-1 firm capacity of 26 MVA;
- the condition of all but one of the transformers at both substations is rated 9 on Western Power's condition assessment scale. One 13 MVA transformer at MC is in marginally better condition and is rated 8; and
- the condition of the 6.6 kV switchboards at both the MC and U substations is rated 10 on Western Power's condition scale indicating an immediate replacement requirement.

Other relevant information provided in the planning report in Attachment 2 of Western Power's NFIT application for MCE, as well as in response to questions asked by us to clarify the application, includes:

- the MC substation is classified as a "reduced firm" substation in that only two of the three transformers can be on load at any given time. The substation provides N-1 security (as we would expect for a substation supplying a major hospital) but, should a fault occur, there would be a short break before supply was restored through the third transformer by an automatic transformer switching scheme.
- The U substation has been classified as a normal cyclic rating substation under clause 2.5.4(b) of the technical rules. This permits a loss up to 75% of the cyclic rating of the smallest transformer at the substation (in this case up to 8.5 MVA of

[4] All else being equal, peak electricity demand will be greater in a hot summer than one with normal or average temperatures. It is therefore good industry practice to design a network with sufficient capacity to meet the demand in a hot summer; this is normally quantified as the POE10 demand, which can be expected to be exceeded once every ten years.

load[5]) for a target period of twelve hours while an emergency transformer, kept specially for this purpose, is put in place.

- The 6.6 kV switchboard at U, and presumably also at the switchboards at MC, have two busbars. This means that, following a busbar fault, it would normally be possible to transfer supply to the second busbar. Put another way, the double bus arrangement provides N-1 redundancy within the one switchboard[6].

- In the absence of the new SCGH load requirement, in order to defer the need to replace or augment the U substation and to redistribute the loads in the Western Terminal load area, Western Power would undertake the following distribution network modifications:

    - transfer 4 MW of load from U to MC through the installation of a new distribution feeder. This would advance a distribution network modification that would be needed to transfer load from U to the new MCE substation;

    - transfer 3 MW of load from Nedlands to Cottesloe zone substations; and

    - transfer 3 MW of load from Wembley Downs to Herdsman's Parade.

  Western Power estimates that this would not only reduce the existing load at U by 4 MW, but also give it the ability to transfer an additional 4 MW of load to other substations in the event of a contingency arising.

We are surprised that the U substation is classified as NCR given that a large portion of its load is dedicated to the University, a single, commercial customer with a high profile. Eight of the twelve distribution feeders at U supply the university and it is not clear what load shedding arrangements have been agreed with the University in the event of a transformer fault at U.

Leaving this aside, should the SCGH load increase not materialise, Western Power would continue to operate the U substation until 2016. It justifies this as follows:

- the loading on the substation will be reduced to a level compliant with the NCR criterion as specified in clause 2.5.4(b) of Western Power's technical rules once the distribution networks configurations described above have been completed.

- notwithstanding its condition assessments that have determined that the 6.6 kV switchboard has reached the end of its useful life and that both transformers are in poor condition, it will be able to prolong the life of these assets through an increased level of condition assessment and asset maintenance.

We consider that the risk of a switchboard fault or a transformer fault, following the network reconfiguration and load transfer proposed by Western Power, must still be considered high given the condition of the assets and their relatively high loading, even after the 4MW load reduction. We also suggest that, in the event of the failure of one transformer, Western Power could consider it prudent to immediately de-rate the remaining transformer, given its poor condition, to minimise the risk of a second failure. Assuming it de-rated this transformer by 25% to 7.5 MVA, and assuming a peak demand of 16 MVA at U at the time of the failure, this would leave a load of up to 4.5 MVA that could not be supplied (after transferring 4MVA to other substations). This shortfall would persist for the time taken to deploy the rapid response spare transformer, estimated to be 12 hours.

Western Power's assessment of 2016 as the date it would need to replace is based on its assumed growth in peak demand and the year when it consequently expects to no longer

[5] The nameplate rating of a transformer assumes continuous non-varying loads. In reality, distribution loads are cyclical and vary with time. Western Power has assessed the cyclical rating of the 10MVA transformers at U to be 11.3 MVA.

[6] Under normal circumstances, double busbar switchboards are no longer considered cost effective design solutions and the switchboards planned for the new MCE substation have only a single busbar.

comply with clause 2.5.4(b) of the technical rules. This approach attempts to interpret what is essentially a risk assessment requiring the application of engineering judgement as an issue of rules compliance in relation to network capacity and security. In clarifying its application, Western Power provided a more detailed analysis of how it determined the timing of 2016 for construction of the new MCE substation (assuming the counterfactual scenario of no additional MCE load). We have reviewed the analysis and note that:

- Western Power's analysis determining the timing for construction of the new substation appears very sensitive to the assumptions on demand growth and transformer rating.

- there appears to be a lack of consistency in the basis on which Western Power has determined its maximum acceptable loadings on the MC and U substations. It has assessed the maximum acceptable demand on U as 16.75 MVA on the basis of a transformer *cyclic* rating of 11.3 MVA (see footnote 5). In the case of MC, which is assessed on the basis of N-1 security (given that it supplies a hospital) Western Power has assessed the maximum load as 25MVA, which is lower than the N-1 capacity based on the lower *continuous* rating of the two smallest transformers. The reason for basing the assessment on the cyclic rating in one case and the continuous rating in the other is not clear[7].

- The analysis appears to compare loads in MW with transformer ratings in MVA. Had the loads been converted to MVA, the analysis may have concluded that the replacement of the U substation should be accelerated by one year.

- The 75% NCR criterion specified in clause 2.5.4(b) of the technical rules (and the key criterion determining the timing of the replacement of U substation) is, to our knowledge, an arbitrary number (although we are not suggesting that it is unreasonable). Had the criterion been 80% NCR. replacement could have been deferred by about two years, whereas had it been 70% NCR, then the replacement would need to be accelerated by about the same amount.

Given these issues with Western Power's analysis, we have considered the advice we would have given the Authority were we asked to comment on a hypothetical NFIT pre-approval application for the immediate construction of the new MCE substation, instead of implementing the distribution network augmentations and load transfers, even though there was no requirement for a new block load at SCGH. In this event we would advised the Authority that:

- the load at U was at or approaching the full rating of the transformers and action is necessary to address this situation, irrespective of the condition of the assets;

- the assets at both U and MC (and the other 6.6 kV substations in the Western Terminal load area) are in poor condition, with some considered by Western Power to be in need of immediate replacement. The probability of a failure of one of these assets is significant;

- the available distribution transfer capacity is small, which makes it more difficult to manage the consequences of a contingency event;

- we are satisfied that the proposal to construct the new MCE substation to replace the existing MC and U substations is the most cost effective development approach, given the information in the SKM report and other information provided to us by Western Power;

- the proposed strategic distribution network upgrades and load transfers, while low cost, would only defer the replacement requirement at U by a maximum of

[7] If the N-1 capacity at MC was determined on the basis of cyclic rating, and if the cyclic rating of the 13 MVA transformers was assumed to be 14.7 MVA (based on the corresponding uplift at U) the N-1 capacity at MC would be 29.4 MVA. If Western Power considered it desirable to be conservative and assume a rating of 90% of that, it would still be 26.4 MVA, 1.4 MVA higher than Western Power assumed in its analysis.

two years and the risk to Western Power over that period would still be significant. A single transformer failure at U could mean a loss of supply of more than 4 MW of load for a period of approximately 12 hours.

On the basis of this holistic risk assessment, our conclusion would be that we saw little point in deferring the construction of MCE, which we believed already met the requirements of the safety and reliability component of the NFIT, as set out in clause 6.52(b)(iii) of the Access Code.

We believe this assessment would be consistent with other advice we have given the Authority with regards to compliance with NFIT requirements. We have been reviewing Western Power's capital investment proposals on behalf of the Authority for some years now and have reviewed a number of capital investment proposals intended to mitigate risks that appeared to us to be significantly lower (in terms of both probability and consequence) than the current risk at U substation. These investments have often been justified by Western Power purely on the basis that demand is forecast to increase to the point where a failure to intervene would result in a non compliance with the relevant security criterion in Western Power's Technical Rules.

While the Technical Rules are very prescriptive in relation to network security they are necessarily much less so in relation to acceptable asset condition. Because of this, we suggest there is a need for Western Power to take a holistic risk management approach to prioritising its capital investment requirements. This would focus on the probability and consequences of an asset failure, and also on Western Power's ability to manage such an event, including the ability to transfer load to other substations, rather than simply on the load-driven security criterion assigned to a particular substation and the need for strict compliance with this criterion.

4. NFIT ASSESSMENT

In this section we assess the compliance of Western Power's proposed new MCE substation with the NFIT components discussed in Section 2.1 of this report.

4.1 EFFICIENCY TEST – CAPACITY COMPONENT

The capacity component of the efficiency test assesses whether the new substation is an investment that would be undertaken by a service provider efficiently minimising costs having regard, without limitation, to whether the new facility exhibits economies of scale or scope and the increments in which capacity can be added.

In essence, the proposed MCE substation is a 2x33 MVA 132/11 kV substation designed to Western Power's N-1 security criterion as set out in clause 2.5.2.2 of its Technical Rules. It will replace the existing MC and U substations in the Western Terminal load area. Western Power is also planning to install a third 33 MVA transformer and 11 kV switchboard at the substation but these works are not included in the NFIT application.

We consider that the project as planned by Western Power meets the requirements of the capacity component of the efficiency test on the following basis:

- Redevelopment of the network in the Western Terminal load area is needed to meet emerging condition and capacity constraints of the existing network assets. We have already reviewed the construction of the new 132/11 kV Shenton Park substation and are satisfied that it is a component of all network development scenarios that are likely to meet the objectives of the Code.[8]

- The substation will be built to Western Power's standard substation design and use the standard transformer capacity for zone substations in non-CBD urban areas;

- Given that the substation is intended to replace both the MC and U substations, which each have a current load in excess of 20 MVA, and the requirement for N-1 security, the proposed transformer capacity is not excessive.

While the installation of a third 33 MVA transformer is not part of this application, we consider that the installation of a third transformer would also meet the capacity component of the efficiency test, given the N-1 security criteria and the current loads at MC and U substations.

4.2 EFFICIENCY TEST – COST COMPONENT

As discussed in Section 2.1, in order to meet the cost component of the efficiency test Western Power must show that (i) its estimated cost of the project is reasonable and (ii) processes are in place to ensure that the actual cost of delivering the project will be efficient, irrespective of issues or impediments that arise during the course of implementation. We consider each of these issues separately.

4.2.1 Cost Estimate

Given our findings in Section 4.3 of this report, for completeness we have extended our analysis to include the cost components associated with the replacement and decommissioning of the U substation. This has been possible, even though this work was not included in Western Power's application, because the relevant costs have been estimated in the attachments to the application.

[8] *Technical Review of Western Power's Shenton Park Zone Substation Regulatory Test Application;* Geoff Brown and Associates Ltd, 10 September 2012.

The estimated costs of the project are shown in Table 1. The costs are planning (A2) cost estimates (+/-10%) prepared in July 2012. They are in 2012 currency and do not provide for price escalation beyond that.

Table 1: Estimated Project Cost ($ million, real 2012)

Component	Direct Cost	Indirect Cost	Risk[1]	Total	Source
Included in application					
Construct new MCE substation (2x33 MVA)	15.30	3.08	1.57	19.96	Attachment 4
Load transfer and distribution (MCE)	4.23	0.89	0.28	5.40	Attachment 5
Decommission MC	2.27	0.48	0.74	3.48	Attachment 4
Subtotal	**21.80**	**4.45**	**2.59**	**28.84**	
Not included in application					
Install third transformer at MCE	3.43	0.71	0.34	4.48	Attachment 4
Load transfer and distribution - U	4.18	0.82	0.28	5.27	Attachment 5
Decommission U	1.69	0.37	0.41	2.47	Attachment 4
Subtotal	**9.30**	**1.90**	**1.03**	**12.22**	
TOTAL	**31.10**	**6.35**	**3.62**	**41.06**	

Note 1: Includes indirect costs;
Note 2: Totals might not add due to rounding

In respect of the above costs we note the following:

- The risk provision is determined by identifying a range of possible risks and their potential impact on the cost of the project. A Monte Carlo analysis is then applied to get a cost-probability curve. The risk provision is derived from this analysis to be the provision needed to increase the base cost estimate to a level where there is only a 20% probability of exceedence. Put another way, Western Power believes that there is an 80% probability that it will be able to deliver the project at a cost that is lower than its cost estimate. The risk provisions shown in Table 1 include an indirect cost loading, which we have not separately identified for clarity[9].

  Based on this methodology for calculating risk, we are a little surprised at the magnitude of some of the risk provisions shown in Table 1. Specifically:

  - The risk provision for substation construction works is about 8.5% of the base cost, including indirect costs. This is typical for a project of this nature, where the scope is well defined, the project is based on a standard design and it is possible to investigate and minimise areas of uncertainty at the conceptual design phase that precedes the preparation of the A2 cost estimate.

  - The risk provision for distribution works is about 5.5% of the base cost. We consider this low. Distribution works cover a wide area and it is difficult to define a precise scope ahead of time, given that they are often undertaken in a dynamic environment. The potential for scope creep is high and this is exacerbated by the need to transition from 6.6 kV to 11 kV. We have noted in ex post NFIT reviews we have undertaken for the Authority that this is an area where budget overruns are common.

[9] More detailed breakdowns of the costs shown in Table 1 are shown in Attachments 4 and 5 of Western Power's application.

- The risk provision for decommissioning and site restoration works is about 20-25% of base costs. This seems high. Western Power has indicated that this is because additional ground remediation works will be needed if oil is found under the existing transformers. It has also assumed cost savings from decommissioning MC and U substations together and has factored in a risk that the two substations will need to be decommissioned independently.

However, as noted in Section 2.1, it is the actual cost of the project that must be included in the capital base rather than the NFIT amount, which specifies the approval threshold. It would be open to the Authority to reduce this threshold by reducing the risk provision. This would increase the probability of Western Power having to provide the Authority with further justification of the actual project costs but would also likely increase the incentive on Western Power to minimise implementation costs.

- In Attachments 4 and 5 of the application Western Power has, where possible, benchmarked its cost estimates by comparing its risk-free cost estimates with the actual costs of similar projects and sought to explain any significant differences. For example it has compared the estimated MCE cost with the actual costs of the Bentley and Balcatta substations, and adjusted for differences in project scope. After adjusting for the identified scope differences the actual cost of both substations was within 2% of the estimated MCE cost.

  While these analyses show the estimated costs to be reasonable, we question the validity of directly comparing a risk-free cost estimate with the actual cost of another project. Such a comparison will invariably show the risk-free estimate in a good light since it excludes provisions for risk outcomes that have likely materialised to some degree in the completed projects.

Nevertheless we consider the estimated costs in Western Power's application provide a reasonable basis for specifying the NFIT amount in the Authority's decision. We suggest the decision also specifies the basis for escalating the NFIT amount for comparison with the actual project cost. Possible approaches would be to use the real cost escalators assumed in the AA3 decision, allow escalation by actual CPI or to not allow any escalation (effectively requiring cost escalation to be absorbed by the risk provision).

4.2.2 Delivery

Appendix 3 of Western Power's application provides a detailed breakdown of the planned delivery approach, which uses a mixture of preferred vendors or contractors and internal resources. Procurement will be through preferred vendor contracts, with the preferred vendors having been selected through competitive tender. Construction will similarly use preferred contractors selected by competitive tender. Project management, design, environmental compliance and commissioning will be undertaken internally.

This approach to project implementation is consistent with Western Power's standard project implementation procedures.

We conclude that Western Power has acceptable procedures in place to minimise the actual cost of implementing the project.

4.3 SAFETY AND RELIABILITY TEST

In order to show that the new substation meets the requirements of the safety and reliability test, Western Power must show that it is needed to maintain the safety or reliability of the covered network or its ability to provide contracted covered services.

On the basis of the discussion in Section 3 of this report, we conclude that there is an immediate need to mitigate the risk of asset failure at U substation and we are satisfied that the construction of the new MCE substation is the most cost effective method of achieving this objective. On this basis we consider that the new substation already meets

the requirements of the safety and reliability test irrespective of whether or not the new block load driven by the SCGH proceeds.

4.4 CONCLUSION

We consider that the proposed new MCE substation meets NFIT requirements for commissioning in 2014, irrespective or of whether or not the addition SCGH block load or the 11 kV connection requirement materialises.

5. COST ALLOCATION

Western Power has calculated that only $27.21 million of the estimated $28.84 million cost of constructing the new MCE substation should be included in the NFIT amount and the balance should be recovered from the consumer as a capital contribution. This calculation is based on the assumption that, were it not for the SCGH requirement to take supply at 11 kV by June 2014, the new substation would not be built for another two years.

The analysis did not include electrical works costs associated with the installation of the third transformer and switchboard, or the transfer of the U substation load to MCE. These costs are unrelated to the supply of SCGH and were not included in the application[10].

The basis for Western Power's calculation of the non-NFIT amount is shown in Table 2.

Table 2: Calculation of the Non-NFIT Amount ($ million, real 2012)

Component		Non-NFIT	Comment
Estimated cost of MCE substation (including disestablishment of MC).	22.21		This is lower than the equivalent cost of $23.44 million shown in Table 1. We have not attempted to resolve this discrepancy.
NPV of MCE cost estimate assuming 2014 commissioning	21.33		A real pre-tax WACC of 4.33% is assumed consistent with the Authority's AA3 decision.
NPV of MCE cost estimate assuming 2016 commissioning	19.60		
Cost of bringing forward construction	1.73		Western Power has treated this as an NFIT cost as it is less than the NPV of the estimated incremental revenue of the additional load, which it calculates as being $7.09 million over a 15 year period.
Connection assets		1.22	This is a component of the MCE cost and includes the cost of the six 11 kV circuit breakers dedicated to the SCGH supply and also the cost of terminating the SCGH 11 kV cables. The consumer is required to pay the forecast cost of connection assets by clause 8.1 of Western Power's Contributions Policy.
Distribution costs associated with MCE substation	4.99		This is lower than the equivalent cost of $5.40 million shown in Table 1. We have not attempted to resolve this discrepancy.
Cost of bringing forward distribution costs		0.41	We have not seen any analysis as to how this was derived but have taken the number at face value.

We have the following comments on the above table.

- As noted in the table, there appears to be a discrepancy between the costs used in Western Power's cost recovery model and the equivalent costs in the application. We have assumed the application costs to be correct as these align with the A2 budgets provided.

- While the $22.21 million cost of the new MCE substation does not include the electrical works costs associated with the third transformer and switchboard it does include the civil works to construct the third transformer bund and switch room (as noted in footnote 10). Since in reality the third transformer and switchboard are likely to be installed immediately following the installation of the first two, there are potential savings to be made if all civil works were undertaken under a single outsourced contract.

[10] The estimated MCE substation cost included the cost of the third transformer bund and switch room, which are also not required to supply SCGH. In our view these costs, which we estimate to be about $600,000, should have been allocated to the third transformer rather than MCE.

- Western Power has made a distinction between the bring forward MCE construction costs, which is considers should be included in the NFIT amount on the basis of an incremental revenue test, and the bring forward distribution costs, where it appears to consider that the incremental revenue test should not be applied. We do not understand the rationale for this distinction. We consider that there is no essential difference between the two bring-forward costs in that the distribution works is a necessary component of the MCE project, rather than an optional extra. This would suggest that the incremental revenue test should have been applied to both bring-forward costs taken together.

Based on our understanding of the AA3 access arrangement and the application of NFIT, we consider that the only cost that Western Power is entitled to recover from SCGH is the $1.22 million connection asset cost.