



Otahuhu Security Upgrade

Report to MEUG

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Preface



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1. Introduction

Transpower New Zealand Ltd (Transpower) has made an application to the Electricity Commission (the Commission) seeking approval to spend up to \$77.3 million on a grid development proposal at the Otahuhu substation. The application is under rule 16 of Section III of Part F of the Electricity Governance Rules 2003 (the Rules). This rule relates to approval for interim grid expenditure (IGE).

The process for the consideration of applications for IGE includes ability for the Commission to consult with persons that the Commission thinks are representative of the interests of persons likely to be substantially affected by the proposal. The Commission has decided to consult interested parties. One of those parties is the Major Electricity Users' Group (MEUG). MEUG has asked NZIER and Strata Energy for a report on Transpower's proposal¹ and on the Commission's assessment of Transpower's proposal.²

In the next section, we outline Transpower's proposal and the alternatives it has considered and rejected. In section 3, we discuss the rules applying to IGE and the Commission's application of those rules. Our conclusions are summarised in section 4. Answers to the consultation questions posed by the Commission in its Consultation Paper are contained in Appendix A.

2. Transpower's proposal and alternatives

2.1 The proposal

Transpower proposes to:

- construct a new 220 kV gas insulated switchgear (GIS) facility adjacent to, but physically separated from, the existing outdoor 220 kV switchyard at Otahuhu;
- share transmission key circuits between the new facility and existing switchyard; and
- remove crossovers of transmission lines over the existing outdoor busbars.

We will refer to the proposal as Option 3. Transpower claims Option 3 will:

- provide switchyard diversity that significantly increases the reliability of the supply to Auckland and Northland;

¹ Electricity Commission, *Assessment of Transpower's application for interim grid expenditure dated 11 August 2006*, August 2006, Appendix 2.

² Electricity Commission, *Assessment of Transpower's application for interim grid expenditure dated 11 August 2006*, August 2006

- largely mitigate a switchyard wide event that could result in a total loss of supply; and
- be consistent with short and longer term strategic plans to improve the reliability of supplies into Auckland.

Transpower's estimated cost of the project is \$60.5 million in 2006 prices and it has sought approval from the Electricity Commission for \$77.3 million. The latter figure Transpower claims to be the 5% probability of exceedance point for estimated costs in constant 2008 prices, after making allowance for project and financial contingencies.

2.2 The alternatives

The alternatives Transpower has considered according to its published material are:

- Option 1 - redevelop the existing substation by:
 - removing all crossovers of the existing switchyard and cabling relevant feeder entry and exit points; and
 - adding bus sections to reduce the severity of bus faults by:
 - adding a new 220 kV bus coupler circuit breaker and two new bus section circuit breakers to the existing air insulated switchgear (AIS); and
 - removing over crossings of the existing switch yard.
- Option 2 - establish a second AIS switchyard adjacent to the existing switchyard with:
 - a modern standard high reliability configuration of at least 1.5 circuit breaker per feeder circuit;
 - all over-crossings removed by cabling all relevant feeder entry and exit points;
 - reconfigure the substation so as to share transmission key circuits between the new facility and existing switchyard; and
 - securely connect the new switchyard to the existing switchyard busbars using cabled and switched ties.

The estimated costs of these two alternatives in 2006 prices are \$14.1 million and \$44.1 million, respectively.³

³ In some places the figure given for the second AIS switchyard is \$41.9 million but Transpower has subsequently corrected this figure to \$44.1 million. See Electricity Commission, *op. cit.*, Appendix 4: Transpower's response to Commission's questions of 16 August 2006, p.8.

Transpower rejects Option 1 on the grounds it “does not address the underlying issue of having all of Auckland’s supplies routed through a single switchyard or using a lower reliability switching configuration.”⁴

Transpower does not reject Option 2 because it fails to address the fundamental security issue due to having only one switchyard. It accepts it fulfils this objective. Transpower rejects Option 2 because it believes it has a number of drawbacks compared with Option 3, the new GIS switchyard. These drawbacks are:

- timing - the consent process for a large new AIS switchyard may take considerably more time than for a GIS switchyard because the GIS will be housed in a building and have minimal impact and so likely to be a non-notifiable resource consent;
- limitation of future development options because of the large space that the new AIS switchyard would occupy;
- limited separation - a new AIS switchyard would be large and therefore will have to be located relatively close to the existing AIS switchyard to fit on the site; and
- vulnerability to the elements and localised external events. A new GIS switchyard would be indoors and so largely immune for events that are external, like wind damage and roofing iron being blown onto equipment.

3. The rules applying to IGE

3.1 Three tests

Rule 16 of Section III of Part F of the EGRs contains transitional provisions that allow the Commission to approve IGE proposed by Transpower under certain circumstances. These circumstances are specified in rule 16.2. From the rule, three tests can be developed that each application for approval of an IGE must pass in order for the Commission to be permitted to approve it.

The three tests are:

- Test A - the interim grid expenditure must be proposed by Transpower before the Commission makes final decisions on whether to approve or reject investments proposed in the first grid upgrade plan (GUP);
- Test B - the interim grid expenditure must be additional to Transpower’s normal ongoing grid expenditure; and
- Test C - the interim grid expenditure must be reasonably prudent and necessary to meet Transpower’s current grid reliability standards, or be

⁴ Electricity Commission, *op. cit.*, Appendix 2, p.7.

prudent expenditure on preparatory work necessary for other grid expenditure or emergency expenditure.

3.2 Application of the tests

3.2.1 Test A

The Commission is of the view that for IGE to pass Test A the expenditure must not have already occurred before the application for approval is lodged because actual expenditure cannot be proposed expenditure.⁵ We believe this interpretation of the rule is incorrect. The word ‘proposed’ is used as part of the phrase ‘proposed by Transpower’ and is intended to indicate that the Commission cannot approve IGE proposed or put forward for approval by parties other than Transpower. Moreover, the Commission’s interpretation is at odds with the provisions of rule 17.2. This rule permits Transpower to recover from designated transmission customers approved costs it has incurred in relation to IGE “irrespective of when they were incurred”.

In this case, whether expenditure before application can be approved is not an issue. Transpower has stated that it “has not made any financial commitments to this project (as at 11 August 2006) other than the normal ‘business as usual’ investigative costs.”⁶

Since the Commission has not made final decisions on the first GUP the application by Transpower passes Test A.

3.2.2 Test B

In previous IGE applications, the Commission has interpreted the requirement the proposed IGE be additional to Transpower’s normal ongoing grid expenditure as requiring two conditions to be met:

- the IGE must be over and above the aggregate historic level of Transpower’s typical or regular, and continuous, expenditure relating to the grid; and
- the IGE must not be in the nature of Transpower’s typical or regular, and continuous, expenditure in relation to the grid.

Transpower’s application and other papers submitted with the application fails to address these matters. This is surprising and very regrettable. The requirement is clearly stated in the rules and the Commission’s approach to seeing that it has been fulfilled has been employed to assess previous applications by Transpower.

⁵ Electricity Commission, *op. cit.*, p.13 and <http://www.electricitycommission.govt.nz/pdfs/opdev/transmis/pdfsttu/TTU-sub-sum.pdf> para 3.2.1

⁶ Electricity Commission, *op. cit.*, Appendix 1, p.1.

The Commission has reached the view that “it does not consider that it has sufficient information to assess whether the expenditure ... is additional to Transpower’s normal ongoing grid expenditure.”⁷ The Commission goes on to note that some part of the proposed expenditure would be considered a normal part of prudent asset maintenance.

3.2.3 Test C

a) *Three limbs*

Transpower has not specified whether it believes the IGE is needed because it is ‘reasonably prudent or necessary to meet Transpower’s current grid reliability standards’, ‘expenditure on preparatory work necessary for other grid expenditure’ or ‘emergency expenditure’. Once again, this omission by Transpower is surprising and very regrettable as the need for this information should have been well known to Transpower and its failure to provide the information has made the task of the Commission unnecessarily more difficult. The Commission is required to follow the rules.

b) *‘Reasonably prudent or necessary’*

The Commission notes that the Otahuhu IGE application does not provide additional transmission capacity and has been justified by Transpower on the basis of the increased reliability it would bring to Auckland electricity supply and with reference to ‘good electricity industry practice’⁸. The rules are very clear on this matter, however. To pass Test C under the ‘reasonably prudent or necessary’ limb the expenditure must be ‘reasonably prudent or necessary to meet Transpower’s **current** grid reliability standards.’ A demonstration that expenditure will cost effectively improve the grid reliability standards in a ‘reasonably prudent or necessary manner’ will generally justify the expenditure being approved as an economic investment under the ordinary provisions, but it cannot justify expenditure under Rule 16. Since, as we show below, the Otahuhu IGE does not qualify under the other two limbs of Test C either, we believe the Commission should inform Transpower that it should pursue the investment approval in the manner required for a normal economic investment under the rules.

However, the Commission does not address this requirement and does not take this line with Transpower. Instead, it forms the preliminary view that Transpower has not provided sufficient information to support the statement

⁷ Electricity Commission, *op. cit.*, p.13

⁸ Transpower uses the UK national grid as an example of good electricity industry practice against which standard the proposal is justified.

“Good industry practice for critical loads requires the use of multiple substations. For example, National Grid UK requires more than one terminal station for loads greater than 1500MW. The peak load supplied through Otahuhu is presently around 2200 MW.”

about the reliability improvement that would occur as a result of this IGE application and, in particular, the average annual benefits of avoiding a 1-in-20 year event. The Commission has requested this additional information from Transpower.

The Commission also notes that the Government's Connell Wagner report into the events of 12 June 2006, which gave rise to Transpower's Otahuhu upgrade plan, suggested it may be prudent to investigate developing the eastern corridor supply route in the Auckland region to provide diversity and that the GIS proposal which Transpower is now promoting "will leave considerable residual risk."

The Commission further notes that it does not require either a new AIS or GIS switchyard to mitigate the risk that an overhead conductor will drop into a busbar causing widespread loss of load. "... it may be sufficient to simply cable the last transmission spans ... and replace the existing overhead lightning protection earth wires with lightning arrester rods ..."⁹

The Commission makes a number of comments about the advantages and disadvantages of a GIS switchyard compared with an AIS switchyard. These are matters that Transpower has not mentioned or emphasised in its assessment of the advantages and disadvantages of its three options.

A substation such as Otahuhu is exposed to various risks. The proposal is intended to cover the internal component failure risks and some external events but does not cover the catastrophic, Force Majeure type risks such as flood, plane crash, cyclone etc. The single location of the proposed second bus arrangement does not provide the security levels which some stakeholders may be expecting. The level of risks that the proposal does not cover are important to record. Transpower does not make this clear.

Transpower has provided analysis of the level of risk in terms of mean time between failures (MTBF) for the three options. Transpower has used the Subrel analysis that is based on international experience and data. However, Transpower acknowledges that the Subrel analysis would not have highlighted the deficiencies that led to the 12 June 2006 failure and presumably does not consider the risks associated with the close proximity of the proposed two bus arrangement but rather assesses risk on an asset by asset basis.

Rule 16.2.4 provides that the Commission is not required to undertake a formal cost/benefit analysis (CBA) or apply the grid investment test (GIT) when it decides whether or not to approve an IGE proposed by Transpower. This rule does not, however, stop the Commission from conducting a CBA

⁹ Electricity Commission, *op. cit.*, p.16.

or from applying the GIT. Nor does rule 16.2.4 stop the Commission from insisting that Transpower provide such analyses for any IGE application.

Even if it could be shown that the current proposal is reasonably prudent or necessary to maintain **current** grid reliability standards, the current IGE proposal is one that we believe would benefit from formal application of the GIT by Transpower. Its application of the tool should be subject to review by the Commission. The amount of money potentially involved is up to \$77.3 million and this is a very material sum. The disparity in the costs of the various options is large and so considering if the additional benefits are worth the increases in costs in a formal framework would be desirable.

Moreover, that obviously required information is inexplicably missing from the current application and the failure of Transpower to identify some significant costs and benefits of the various options provides more than a hint that Transpower sees the transitional provisions as involving a less rigorous process and standard. This is not intended by the rules and a requirement Transpower adopt the more rigorous evaluation for IGE proposals would re-impose necessary rigour.

The Commission's conclusion in regard to this limb of Test C is that "it needs more information before it can be reasonably satisfied that the Option 3 expenditure to which the Otahuhu IGE Application relates is reasonably prudent or necessary to meet the grid reliability standards."¹⁰ We would go further. In our view, the Commission needs the outcome of the application of the GIT to the three options considered by Transpower and to one or more options involving development of the eastern corridor, as suggested by Connell Wagner. Only then do we think the Commission will have the information reasonably necessary to enable it to properly consider and decide whether or not to approve the Otahuhu IGE proposed by Transpower.

c) 'Prudent expenditure on preparatory work'

The Commission concludes on the basis of the information provided by Transpower that the 'prudent expenditure on preparatory work' limb of Test C does not appear to be relevant. We concur with this conclusion.

The Commission goes on to note that substation works at Otahuhu that are very similar to those in the IGE application were part of the now suspended 400 kV upgrade application. As the Commission points out, "If Transpower's revised Auckland grid upgrade proposal (which is yet to be submitted) is for a line to Otahuhu and if the Otahuhu IGE application as it presently stands is approved by the [Commission], then a major aspect of

¹⁰ Electricity Commission, *op. cit.*, p.16.

Transpower's proposed Auckland grid upgrade would then be a sunk cost in the application of the GIT."¹¹

This is most alarming, as it suggests the possibility that Transpower is using a political reaction to a failure of its own maintenance subcontractors at the Otahuhu substation to put forward a proposal that will effectively gazump the Commission's attempts to ensure rational economic decision making in relation to a major piece of grid investment.

That the three options considered by Transpower do not address one of the fundamental concerns in the Connell Wagner report – the concentration of routes serving Auckland on Otahuhu – adds to the concern about Transpower's motives. Is it genuinely responding to the issues raised by the events of 12 June 2006 or is it using it as an opportunity to progress a major investment project it is committed to for other reasons? That this question needs to be considered underlines to us how essential it is that the Commission insists on a proper GIT evaluation of Transpower's options against one another and alternatives involving the eastern corridor.

d) 'Emergency expenditure'

The Commission notes there is no information in the Otahuhu IGE application to suggest that Transpower considers the expenditure as 'emergency expenditure'. On that basis it does not consider the criterion further.¹² We concur with the Commission's decision in this regard.

Since the Commission is of the view that on the basis of the information provided the Otahuhu IGE proposal does not pass Tests B and C it has declined to approve it and has sought further information.

4. Conclusions

We support the Commission's preliminary decision to not approve the Otahuhu IGE proposal on the grounds that it has not yet been demonstrated that the expenditure passes Tests B and C.

We believe that the Otahuhu IGE proposal is unlikely to pass Test C even after the provision of more information. This is because the only limb to Test C that is relevant in this case requires the expenditure to be 'reasonably prudent and necessary to maintain **current** grid reliability standards'. The Otahuhu upgrade is designed to **increase** the grid reliability standard for Auckland not maintain the **current** one. The investments should be considered under the provisions dealing with economic investments and not through the transitional provisions. The Commission should have responded

¹¹ Electricity Commission, *op. cit.*, p.17.

¹² *loc. cit.*

to Transpower very quickly on receiving the application in this vein and should adopt this approach even now.

Even if this argument is not accepted, the circumstances are such that the Commission should insist on a full GIT analysis by Transpower of its three options and of one or more options involving developing the eastern corridor, as suggested by Connell Wagner in its report on 12 June 2006. The amount of money involved the disparity in the costs and benefits of the options and that Transpower's discussion has missed many of the benefits and costs identified by the Commission all point to the need for a thorough analysis using the GIT. The rules do not preclude this even if the Commission forms the view that the proposals are IGE and not economic investments but 'reasonably prudent and necessary to maintain the current grid reliability standards.'

Appendix A Consultation questions

Questions/issues	Paragraph number	Comment
Q1: Do submitters consider the issue that the Otahuhu IGE Application intends to resolve should be considered as “additional to normal ongoing grid expenditure”?	4.3.4	We believe that the proposals are an economic investment aimed at increasing the grid reliability standard in Auckland and as such should be evaluated under the standard provisions for economic investments and are not eligible for consideration under the transitional provisions.
Q2: Do submitters have any views regarding the reliability of GIS vs AIS installations?	4.4.4	GIS installations are considerably more reliable than AIS (this is reflected in the cost) However, in a situation such as Auckland the time to restore supply following a fault is an important consideration. It is likely that GIS equipment failures will take longer to restore than AIS failures. Whilst the many benefits of GIS have been recorded by Transpower there are also disadvantages that have to be considered.
Q3: Do submitters consider the proposed IGE is prudent in light of the comments by Connell Wagner that an ‘eastern corridor’ reinforcement and alternative termination point has advantages in terms of providing security of supply diversity into Auckland, and if so why?	4.4.5	We believe that whether the proposal is evaluated as an IGE or as an economic investment that it should be subjected to the GIT. Moreover, one or more eastern corridor options should be evaluated along with the three Otahuhu options identified by Transpower. The Commission will rightly be open to very severe criticism and sanction if it accepts a proposal that does not address a fundamental point in the Connell Wagner report on 12 June 2006 events without any analysis at all.
Q4: Do submitters have any views regarding Transpower’s statement that Option 3 will provide better reliability than that provided by Option 1?	4.4.6	GIS will generally provide increased reliability levels (number of years between failures) than options 1 and 2. None of the options addresses the concerns raised in the Connell Wagner report regarding the concentration of plant at the Otahuhu location.

<p>Q5: Do submitters have any view as to whether it would be sufficient to simply cable the last transmission spans of the circuits connected to the Otahuhu switchyard busbars and replace the existing overhead lightning protection earth wires with lightning arrester rods? Please provide reasons.</p>	<p>4.4.10</p>	<p>One possibility might be to consider this option as ‘emergency expenditure’ under rule 16 and consider the second substation options further under the GUP provisions and through the Grid Investment Test.</p>
<p>Q6: Do submitters have any views as to the appropriate balance between expenditure submitted to the Commission under rule 16 and the submission of an investment proposal in a GUP for the Auckland security of supply?</p>	<p>4.5.3</p>	<p>Yes we do. See comments above. We believe Transpower has applied under the transitional provisions for approval of an economic investment that does not qualify. We note that Transpower has failed to provide key information necessary to justify that its proposal qualifies for consideration under the transitional provisions even though the need to do this should have been known to it and its failure has made the work of the Commission more difficult and has caused delays. We note with concern the possibility that if the investments are approved under the transitional provisions without a proper GIT evaluation then this could unjustifiably gazump the Commission’s attempts to have the 400 kV decision based on rational economic grounds according to the rules.</p>