



T R A N S P O W E R

**Investigation into Wairakei Ring and lower
South Island investments**

Summary of Submissions

July 2008

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1 Introduction

On 28 May, Transpower published its consultation document seeking feedback from interested parties on the preparatory work for potential economic upgrades of circuits in the Wairakei Ring (WRKR) and in the Lower South Island (LSI) regions. This consultation, along with the industry workshop held in Wellington on 6 June, represented stage one of a two stage consultation process. Depending on the outcome of consultation and application of the Grid Investment Test, each economic investment proposal could be submitted to the Electricity Commission as part of Transpower's 2008/2009 GUP.

The purpose of this document is to summarise the responses received. This is presented in Section 2 of this paper in the same order that the questions were asked. Transpower received eight submissions from interested parties:

- Contact Energy
- Meridian Energy
- Mighty River Power
- Trustpower
- Genesis Energy
- South Waikato District Council
- Unison
- Taupo District Council

The submissions can be found on Transpower's Grid New Zealand website. For more information please refer to <http://www.gridnewzealand.co.nz/n1648,270.html>.

2 Submission Summary

2.1 General Comments

2.1.1 Consultation process

One party appreciated Transpower's consultative approach in determining a list of future generation developments, economics and timeframes. Another felt that while two stages of consultation have been agreed, the preliminary consultation was not sufficient to understand how the GIT would be applied and that there should be consultation when Transpower has developed its approach to analysing the proposed investments. A third felt that consultation was targeted at gaining comment from existing and potential generators and those in the energy sector, rather than the general public and the Council.

2.1.2 Separating projects

Two parties submitted that the projects should be run separately as they are different parts of the National Grid, with different requirements and that further consultation should be specific to each project. One of them stated that it would be unacceptable to have the Wairakei Ring held up if there were delays in developing the Lower South Island since the Wairakei Ring is simpler than the Lower South Island given the technical issues and distances involved.

2.1.3 Need for investments

One view was that more emphasis should be placed on procuring land and property-based transmission options that can be exercised at relatively short notice if required. Another view was for Transpower to provide evidence that the WRKR and LSI parts of the grid are the two most cost-effective locations for upgrading in order to facilitate a 90% renewables target. A third identified that the transmission investment provided 'option value' for generation investment, and indicated the quantity of generation that could be enabled by the LSI proposal.

2.1.4 Timing

Three parties identified that the development plans of both projects need to align with generation build - i.e. upgrades need to occur before capacity is used. Two of the three pointed out that the Wairakei Ring upgrades need to occur before 2011 to ensure circuit outages can be accommodated on existing capacity otherwise generation will be constrained.

2.1.5 Transmission alternatives

One view was that options which involve providing extra capacity should only be considered after non-transmission options have been identified as impractical. Another view supported non-transmission alternatives that made more efficient use of the existing network rather than the construction of new transmission lines. It was felt that supply side and demand side solutions should be in the GIT application short list. There was support for Transpower using Grid Support Contracts to procure generation or demand side services that would enable transmission investments to be deferred.

Two submitters were not in favour of the use of transmission alternatives outlined in the long list of options, indicating that they would at best defer further upgrades for a relatively short time in both regions. It was felt that no potential transmission alternative would substitute or cancel indefinitely the need for upgrades e.g. Special Protection Schemes are a short term operational alternative to manage transmission

congestion but not a long term replacement for upgrading transmission assets. It was also felt that an over-reliance on such schemes would probably increase the loading on the National Grid to the point where outage windows to complete the low cost incremental upgrades to existing assets became impossible to find.

2.1.6 Level and appropriateness of GIT analysis

One party pointed out that since the transmission expenditure is relatively small, the GIT analysis does not need to be as stringent as that applied to the HVDC.

Another party considered that the theoretical Generation Expansion Model should not be relied on. It suggested that transmission projects should be pre-approved subject to generation projects being committed and raised a concern about the effectiveness of the GIT in assessing generation-based transmission investments.

A third party also raised concerns regarding the effectiveness of the GIT when assessing generation-based transmission investments even though compliance with Part F of the Rules and the GIT is required. The primary purpose of the upgrade should be identified so as to establish whether the upgrade is on interconnection or connection assets and to determine who pays. An inappropriate application of the GIT to renewable transmission projects has the potential to lead to inefficient investment that selectively benefits a few generators. By applying the GIT to projects for pre-selected regions, funding would be secured from all parties. However the 'problem space' is nationwide (a 90% renewables target) while the proposed 'solutions' are restricted to two specific regions. A further concern was that if the GEM model were altered to apply to specific regions then comparability across projects would be limited and any project could be made to work by manipulating inputs.

2.2 Specific Responses

The following table summarises the response to each question asked.

Q1. Are there any other significant power system analysis factors or issues that should be incorporated into the analysis of the WRKR?

Power system analysis factors identified:

- How does the WRK Ring post upgrade impact on wider CNI transmission?
- It is not clear if the potential Bay of Plenty geothermal has been considered?
- Consider embedded generation (industrial and distribution), effect of low lake levels on power flows, reduction in injection/decommissioning, DSM of relevant lines companies, government policies on emission constraints.
- What capacity is unlocked after the upgrade options?
- What are the indicative constraint equations applied for each stage of the upgrade (outage)?
- Analysis should consider the impacts of transmission constraints on security and capacity adequacy.
- One submitter indicated that no additional factors need to be incorporated.
- One submitter identified that there is insufficient power system analysis on paper to conclude what the issues are.
- Two submitters gave no specific response.

Q2. Are there any other significant power system analysis factors or issues that should be incorporated into the analysis of the LSI?

- New wind generation in 110 kV region (including ROX_T10) should be included in the analysis by way of 110 kV export to 220 kV and; 220 kV+ 110 kV total export out of LSI. Analysis should also include extreme dry (e.g. current-2008, high LSI import and HVDC south flow) and extreme wet weather conditions (LSI export, HVDC north transfer)
- The planned windfarm at Kaiwera Downs (240 MW) is not included in the generator list.
- The analysis that all new generation will be connected at Roxburgh on the 220 kV system ignores the know issues with the ROX T10 interconnecting transformer.
- What are the indicative constraint equations applied for each stage of the upgrade (outage)?

- Since relatively small levels of investment are needed to alleviate transmission constraint levels for power export out of Southland/Otago, issues covered are sufficient.
 - Consider the impacts of transmission constraints on security and capacity adequacy.
 - Three submitters gave no specific response.
- Q3. Are there any other qualifying options which should be considered as part of Transpower's Long List for the WRKR? These may include non-transmission demand side or non-transmission supply side options or transmission options. If so, please state what these are with as much information about them as you are able to provide.
- Load-growth options should be in the long-list for projects where the 'problem' is defined as excess generation in a particular region
 - Construction of new 220 kV line in a new corridor with provision for second circuit to be added.
 - Two submitters gave no specific response, three others stated there were no further options.
- Q4. Are there any other qualifying options which should be considered as part of Transpower's Long List for the LSI? These may include non-transmission demand side or non-transmission supply side options or transmission options. If so, please state what these are with as much information about them as you are able to provide.
- ROX T 10 interconnecting transformer upgrade, replacement or addition of a transformer at ROX.
 - New transmission circuit as a long list option.
 - Three submitters gave no specific response, two did not respond.
- Q5. Do you consider that any of the identified options in Transpower's draft long list for either the WRKR or LSI projects do not come within the definition of "alternative projects" as defined under the rules, or are inconsistent with good electricity practice? Please explain.
- Two submitters described issues with consideration of SPS and runback schemes as viable options.
 - Another submitter appreciated the need to include demand side alternatives in order to satisfy the rules regarding the GIT. For WRKR there are no demand side alternatives. It is a core grid circuit.
- Q6. Are there any other "clause 9" benefits that should be considered for each long listed option for either WRKR or LSI?
- One submitter considered that market benefits and potential dis-benefits are central to the proposed approach of 'enabling' generation in chosen regions.
 - Benefits for security of supply resulting from a transmission augmentation then from incentives for new generation. There may also be market capacity benefits that can be quantified when transmission limits are upgraded to available generation limits. Transmission projects create option value (for further generation) which should also be considered as a positive benefit.
 - Note the proposed capacity adequacy standard would result in geothermal operation presenting significant benefits. Competition benefits are too large to ignore.
 - One submitted 'no', four gave no specific response.
- Q7. Are there any other factors which should be considered to assist in the determination of a short list of alternative options?
- The project shortlist criteria does not directly consider financial issues. It is inefficient to wait until the options are short listed, and subsequently analysed at great depth, before applying any financial criteria.
 - The 'approval risk' associated with cursory dismissal of long list options should naturally be higher for economic investments than for reliability investments. A permissive approach to transmission alternatives in particular should be adopted.
 - Short and long term timeframes need to match the timing of generator projects.
 - No, but alternative options should not disproportionately advantage or disadvantage individual market participants.
 - Extend the purpose statement of 6.2 to include security and reliability of core grid. These support the operation of the national market.
 - Three gave no specific response.
- Q8. Which analysis approach do respondents consider to be appropriate for Transpower to apply when considering the WRKR and the LSI projects?
- Should adopt the market development scenarios provided by the Electricity Commission in its statement of opportunities, anything else needs to be explicitly justified.
 - Method 2 acceptable. Method 3 for any critical issue. Simplified GEM with more robustness testing.
 - Method 1. Does not consider Transpower will have access to sufficient information to accurately implement models 2 and 3. Necessary only to identify a solution that is clearly better than the other proposals.
 - Analyse a simplified view of the future based solely on generation projects already known to be committed, consented or generation sites that are currently in the consenting process. Small

transmission spend should require less stringent GIT analysis - recommend that Transpower use method 1.

- Presumption in favour of most rigorous approach (method 3) but as cost/benefit trade-off not presented, it is not possible to provide a view. Method that best accounts for uncertainty of generation schemes.
- Given the relatively minor nature of the proposed transmission augmentations and the immediate need for the augmentations based on current generation proposals (for example, proposals at Mahinerangi, Hayes and Kaiwera Downs) required for the Lower South Island, method 1 preferred.
- Two gave no specific response.

Q9. What are the key issues that Transpower needs to be aware of when undertaking the analysis?

- Justification of generation assumptions.
- Pre-selection of winning regions before entering the GIT analysis phase may well be a misapplication of the GIT. If the problem of meeting a 90% renewable target is ultimately national in scale, then analysis of options should also commence with a national solution domain.
- Does not see the need for excessive GEM type analysis. Analysis should be commensurate with size of the investment.
- The alternatives Transpower describes would entail considerable work (at the same time they are analysing HVDC and Auckland upgrade) which could cause delay. Additionally, the alternative analysis methods could potentially require us to contend with conjectural generation and transmission projects that are not consented and have no proponent, again leading to delays.
- Key issues covered
- Three submitters gave no specific response.

Q10. To what extent do respondents consider that hydro/wind co-ordination should be accounted for within the analysis and what is the magnitude of the impact that hydro/wind co-ordination may have on transmission investment? Please fully explain your reasons for your view.

- The effort put into hydro/wind coordination must be sized relative to a capital cost of under \$3.8M per year (based on SSG report which showed a transmission cost of \$38 Million to connect 300 MW of new generation). Low capital cost of transmission versus accounting for larger costs of hydro/wind co-ordination.
- Unrealistic to assume perfect hydro/wind coordination with any given generation portfolio.
- Commensurate/"fit for purpose" approach should be adopted. It is difficult to accurately determine the level of co-ordination that may occur in the future and thus little value in attempting to model the level of hydro wind co-ordination to the nth degree.
- In the case of the Lower South Island, there are times when the inflow levels are so high and for so long (approximately 6 weeks per year) that Manapouri, which is a run of river system, generates at maximum output and therefore cannot be coordinated with wind.
- Should not assume ability for hydro and wind co-ordination in that water will be conserved during periods of high wind. Also cannot assume that when hydro is low, wind will be available. Resource management constraints mean that hydro stations can not necessarily rapidly increase/decrease water flows to match decreases/increases in wind flows because of the damage it would do to rivers.
- Three submitters gave no specific response.

Q11. What triggers or constraints should Transpower take into account when devising development plans for its list of options? If possible, please reference to specific options.

- Needs to align with generation build and upgrades need to occur before transmission capacity is used up.
- One of the most significant triggers for the proposed investments would have to be generation project commitment, based on final investment decisions. Linking capital investment to investment decisions could reduce the severity of the information asymmetry problems inherent in investing in transmission in anticipation of generation investment.
- Timing, staging and optionality of projects, whether they be generation or transmission, are the key issues facing the Transmission to Enable Renewables project. Supports procurement and use of land and property based "options".
- How much wind generation needs to be committed to south of the Roxburgh constraint to satisfy the GIT for duplex upgrades of the Roxburgh to Livingstone line, and thermal upgrades to the Clyde to Twizel line? That is, what is the next stage in transmission development and how much wind generation needs to be built south of the Roxburgh constraint to satisfy the GIT for this and following stages?
- Not necessary to stage the WRKR project. The generation projects proposed in the area are typically single machine developments that cannot be staged. Question more relevant to the LSI project where large wind is more likely to be staged
- Three submitters gave no specific response.

Q12. Do respondents consider that proposed approach, the level of cost accuracy and the proposed

categorisation of transmission costs are appropriate for the analysis of the WRKR and LSI?

- Given the margins of error involved there is little value in determining costs to the nth degree. Break the costs into separate components. The property and easement cost information will also be of value in determining the costs involved in securing options to undertake various projects.
- Project proponents have more accurate information than third parties and will always be best placed to provide information on projects. Highly supportive of Transpower's approach in this regard.
- Level is appropriate. Care should be taken estimating the range for property and easement costs particularly when looking at upgrading or replacing an existing line.
- Three submitters expressed general agreement to level being sufficient (including above).
- Three submitters gave no specific response.

Q13. Do respondents consider that the proposed approach to costing is appropriate? Please explain the reasons for your view and provide any suggestions as to how Transpower might otherwise approach any cost issue.

- Four agreed, three no response.
- Foreign exchange sensitivity analysis in all proposals recommended.

Q14. Do respondents consider that the proposed approach to determining market benefits is appropriate for the GIT application? Please explain the reasons for your view.

- Other benefits - include that geothermal generation contributes to meeting peak capacity adequacy standard in meeting peak demand.
- The discussion on market benefits is too light at this stage to make any informed comment as to whether or not it is appropriate.
- In general, the proposed approach is compliant with the GIT, however the GIT in its present form is not ideally suited to assessing the merits of investing in transmission to facilitate renewable generation. The GIT is more suited to transmission decisions involving load. Include the achievement of the 90% renewables target by 2025 as a significant benefit and include in "Other Benefits" category. Terminal Benefits may be very significant.
- The cost of generation plant far exceeds the cost of incremental transmission upgrades and therefore, in many cases, the cost of the incremental transmission upgrades will fall well within the margin of error of the net market costs. Generation estimates that are +/-30% out also make it difficult to accurately compare one renewable generation proposal on one side of a constraint to another on the other side of the constraint in order to determine which would provide the least market cost outcome. The scale of error suggests that Transpower's analysis will be misleading for a large proportion of the time. In many cases it will be not possible for the Commissions methodology to find the least economic cost option.
- Proposed approach to determining market benefits is appropriate. Sympathetic to the difficulties of quantifying competition benefits - schedule F4 of the rules should be changed to allow competition benefits to be evaluated in the qualitative sense (other market benefits that cannot be justified are treated in this way). Not to do so will understate benefits of a GUP.
- Three submitters gave no specific response.

Q15. Are there any other issues that respondents consider are important to consider in regard to the proposed the approach for this investigation? If so, please explain the reasons for your view.

- How will the approach adopted for these investigations establish precedent for future investigations.
- The project has moved from being a project about how to facilitate renewables in order to meet the NZES' 90% by 2025, to what appears to be being a rather focused project concerning how to comply with the GIT in its present form.
- Include competition benefits.
- Three submitters gave no specific response, two 'no'.

Q16. Do respondents agree with the proposed amendments to the scenario drivers?

- SOO scenarios should be updated to reflect new firm information (such as newly commissioned plant, newly decommissioned plant, or firm investment commitments) but less comfortable with ad hoc changes to scenario drivers and the requirement to revisit GEM for every potential investment.
- O&M costs associated with wind plant, as referred to in 8.1.A.5 should be input on either a Fixed or Variable basis.
- The best way to get quality information is to ask the proponents of these projects (as Transpower has been doing to date).
- Three 'yes'.
- Three submitters gave no specific response.

Q17. Are there any changes or additions that should be made to the generation list in Appendix D? Please explain the reasons and details for any suggested changes.

- Wind generation costs are understated looking forward. Wind capacity cost per kW after 2015 tend

towards \$3,100/ kW.

- Caution against over-reliance on less firm or reliable information. There is a risk that the process creates a one-way bet for any proponent wishing to talk up their projects.
- 240 MW Kaiwera Downs wind farm should be included.
- Not at this stage however it is a dynamic list, for example following Project Hayes tender for equipment the site may be optimised differently, within resource consent conditions, resulting in changes in the parameters in Appendix D.
- Comfortable with generation list Appendix D but notes that the Appendix information is not consistent with the information in the consultation document.

Q18. Do respondents consider that the demand assumptions are appropriate for the consideration of the WRKR and LSI projects?

- Three submitters agreed, five gave no specific response.

Q19. Are there any additional issues that Transpower should take account of in determining the proposed assumptions? Please explain the reasons for your view.

- Work is being driven by the New Zealand Energy Strategy target of 90% renewables. This is a legitimate project-driver, but has implications on the scope of the solution space and the nature of any assumptions built into the analysis. A later consultation round would provide an appropriate opportunity for further input on assumptions.
- Three responses 'no' and four gave no specific response.

Q20. Do respondents agree that the sensitivity analysis should be conducted using 4% and 10% discount rates? If not, what do you propose should be used?

- Four 'yes', three gave no specific response.
- Should also consider intergenerational and social benefits, and externalities and non-linear risk preferences, instead of debating the exact numbers used.

Q21. Do respondents consider that the proposed sensitivities to be included are appropriate for the analysis of the WRKR and LSI? Please explain the reasons for your view.

- Care in scenario analysis that varies too many variables. CO2 pricing looked at on its own rather than varied by scenario. Concern about weightings applied to scenarios - 50% weighting to 90% renewable scenario is optimistic.
- Agree it is appropriate. Interested to know the sensitivities in capital cost estimates.
- Three 'yes', three gave no specific response.

Q22. Do respondents consider that there should be any other factors included in the sensitivity analysis?

- Undertake sensitivity testing of generation build scenarios - could be informative.
- Sensitivity around the cost of fuels, otherwise appropriate.
- Four submitters gave no specific response, two 'no'.

Q23. Do respondents consider that the use of runbacks could be used today as an alternative for core grid investments? If so how would they be implemented?

- Technically feasible using one or more units from the Huntly power station as run-up units that maintain some capacity headroom to cover transmission constraints. However, the cost of any such arrangement would be likely to make it unviable as an alternative. The cost would reflect foregone opportunities in the energy and ancillary services markets, as well as the operational costs of arming and availability.
- Runbacks would require complex location orientated coordination of instantaneous reserves and interruptible load. At times, instantaneous reserves cannot be dispatched on the excess generation side of the constraint or interruptible load on the other. Opportunity costs may need to be paid to those generators who are not able to bid into the instantaneous reserves market. This may also require compensation to be paid to planned and existing participants. The instantaneous reserves market is co-optimised with the energy market. Adding location restrictions will further complicate the real time optimisation process. Core grid runbacks would have commercial implications on many parties. Runback generators would need to be compensated for the period when they are runback to ensure commercial fairness. In the case where energy could be stored by the runback generator for later release, it could create the potential for gaming. If continued use of runbacks due to transmission constraints result in the spilling of renewable energy then this would appear to be an economically inefficient outcome. In the case of Te Apati, runbacks during south flow constraints are currently resulting in the spilling of valuable wind energy at a time when the energy market is very tight and conservation of water is a high priority. Runbacks should only be an interim measure until such time as a satisfactory transmission solution can be implemented.
- SPS runbacks should not be used on a core grid investment. It is not consistent with international best practice to use SPSs to avoid long term transmission investment. Typically they are used to manage abnormal or temporary system conditions that may exist due to construction delays, equipment outages or unusual system demand. Their use could result in running an already fragile grid to the absolute limit. Using SPS in the manner proposed would be a significant move away from

the market model with dispatch based on offered price. This would result in out of merit order dispatch and would violate the key dispatch principle based on nodal price and would be a step towards the utilisation of a central dispatch model.

- 3 gave no specific response.

Q24. Are there any other issues that should be taken into account in terms of the proposed approach and methodology in applying the GIT in relation to the WRKR and LSI projects?

- Generally no. The proposed approach is consistent with GIT.
- Beneficial for Transpower to consider the impact the proposed investment will have on transmission charges compared with the cost of wholesale electricity. This will provide context for the relative cost of transmission to the delivery of electrical energy. This cost will be dramatically outweighed by the cost that constraints in the wholesale market have on the delivered cost of energy.
- Three submitters gave no specific response.