

BEFORE THE BOARD OF INQUIRY

IN THE MATTER of the Resource Management Act
1991

AND

IN THE MATTER of applications for resource consent
and notices of requirement by
Transpower New Zealand Limited for
the North Island Grid Upgrade Project

**STATEMENT OF EVIDENCE OF TIMOTHY ANDREW GEORGE IN REBUTTAL
FOR TRANSPOWER NEW ZEALAND LIMITED
(Process in selecting the 400 kV capable line option)**

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Introduction

1. **MY** name is Timothy Andrew George. I wish to present rebuttal evidence to the statements of evidence of:
 - (a) Mr Geoff Copstick and Ms Kate Brennan; and
 - (b) Ms Catherine Tuck, on behalf of Underground in Manukau (**UIM**) and Whitford Residents and Ratepayers Association Incorporated.
2. I address the evidence of each submitter below.

Mr Geoff Copstick and Ms Kate Brennan (Submission number 0405)

3. **AT** paragraphs 30-33 of their revised statement of evidence, Mr Copstick and Ms Brennan raise a number of issues about the proposed line not being energised at 400kV. I wish to respond to those points.
4. **THERE** is no technical reason why the proposed line cannot be energised at 400kV and operate in parallel with the existing 220 kV and 110 kV transmission grid. The technical reports produced by Transpower as part of the Proposal deal with this manner of operation.
5. **TRANSPower** agrees with the quoted comments from Commissioner Dell, at paragraph 31 of the revised statement of evidence. The way the Grid Upgrade Plan submission and approval procedures work in practice is that each new future investment requires a Grid Upgrade Plan to be submitted for approval. The Proposal only seeks approval for those works that must be built to deliver the first stage of the project.
6. **SUBSEQUENT** investments to 'release' additional capacity (at both 220 and 400kV operation) must be justified by future Grid Upgrade Plans. Fitment of series capacitors, for example, is a modelled project in the Proposal. A Grid Upgrade Plan and justification will need to be submitted to the Electricity Commission before they can be installed. It is expected that the timing of these modelled projects will be such that they occur just prior to the capacity of the existing equipment being exhausted.

7. **WHILE** the capacity at 220 kV might have been exhausted, conversion to 400 kV significantly increases the available transmission capacity. Converting the Proposal from 220 kV to 400 kV almost doubles the transmission capability through the line.
8. **TRANSPOWER'S** Proposal does not contemplate construction of a second 400 kV line before conversion of the Proposal to operate at 400 kV. The concept was mooted in analysis undertaken by Electricity Commission staff but was not upheld in the final decision on the project. It is not part of the Upgrade Project and it is not necessary for converting the proposed line to 400 kV operation.
9. **IT** is not part of the Rules or standard international practice to consider loss of both circuits of a double circuit transmission line as a credible contingency. I refer to the Transmission Planning Standards for North America where such events are Category C events for which controlled loss of demand is permissible.
10. **PARAGRAPHS** 35-54 of the revised statement of evidence of Geoff Copstick and Kate Brennan relate to the Electricity Commission's approval of the Amended Proposal.
11. **AT** paragraph 35, Mr Copstick and Ms Brennan state that there are alternatives to the proposed line, all of which cause less environmental damage than the proposal, and that "*The question has to be why Transpower has chosen to use the most environmentally damaging option*". At paragraph 38, they state that when Transpower lodged its Original Application with the Electricity Commission in 2005, the Commission found that three alternatives would provide the same security of supply to Auckland at less cost to the electricity consumer.
12. I wish to clarify this point. The Electricity Commission developed an exhaustive list of alternatives to meet Auckland's electrical energy needs as part of their consultation processes associated with the Original Proposal. This list included a range of transmission technologies and non-transmission alternatives.
13. **AS** outlined in my evidence in chief at paragraph 94, the Electricity Commission produced a short-list of alternatives justified on technical and economic arguments. The Electricity Commission assessed the Original Proposal against these alternatives and found that Transpower's Original Proposal was not the most economic.

14. **AT** paragraph 39 of their revised evidence, Mr Copstick and Ms Brennan state that "*Transpower withdrew its application and lodged a new one in October 2006. The new proposal was larger and more environmentally harmful than the original.*" At paragraph 40 they state "*Evidence shows Transpower did not treat the alternatives to its proposal in an equitable way and instead favoured its proposal.*"
15. **WHEN** Transpower amended its proposal, it relied on the short-list produced by the Electricity Commission as there was no basis to assume the relative rankings of the technologies would change. This was based on the fact that no known new technology options were available and costs of existing technologies would not have changed in a material manner in the period. For example, if the HVDC alternative was found to be more expensive than a 220 kV HVAC line, there was no basis to assume that it somehow became more economic for purposes of the amended application.
16. **AT** paragraph 41, Mr Copstick and Ms Brennan state that the option to duplex existing lines was not adequately examined.
17. **WITH** respect to the duplexing of existing lines, the Electricity Commission challenged Transpower on costs and its analysis of this alternative, but concluded in its own GIT analysis that the Amended Proposal was superior. It is acknowledged that there was a dissenting view on this matter but the majority view was in favour of the Amended Proposal.
18. **THE** method of assessing the costs and benefits of the alternatives takes into account option values so the points referred to by Mr Copstick and Ms Brennan at paragraph 42 of their revised evidence (quoting Commissioner Pinnell opinion (1)(d)) would presumably have been taken into account by the Commissioners that voted in favour of the project.
19. **WITH** respect to costs of the Amended Proposal and alternatives, these were very closely scrutinised by the Electricity Commission. Sensitivity studies were also reported by the Electricity Commission to confirm the robustness of the results.
20. **AT** paragraph 60 of their revised statement of evidence, Mr Copstick and Ms Brennan state that "*Transpower's proposal calculated the NZ\$ equivalent cost of components which would be purchased in foreign currencies using ten-year*

average exchange rates. The Electricity Commission required them to use 40 day average rates around a specific date. Rather than converting the raw cost data at the 40-day rates, Transpower multiplied all capital costs by an exchange rate scale factor in order to effect the conversion. The exchange rate scale factors calculated by Transpower were different for each alternative."

21. **WITH** respect to the foreign exchange rate calculations, these are subject to fluctuations and there will be unders and overs depending on the amount of overseas content. The approach to exchange rates for the purposes of the Grid Investment Test was specified by the Electricity Commission. Transpower is not aware of which aspect of the exchange rate calculations the Electricity Commission were supposedly not aware of (as is alleged in paragraph 60 of Mr Copstick and Ms Brennan's revised evidence) but all base data was available to the Electricity Commission.

Ms Catherine Tuck (UIM) (Submission number 1244)

22. **AT** paragraph 18 Ms Tuck states that *"in its 2007 Grid Upgrade Plan Transpower cites a Net Present Value (NPV) mean capital cost of \$293 million for the 27km long Penrose to Albany underground cable proposal – a total of \$10.8 million per kilometer."*
23. **WITH** respect to comments on the cost of the 220 kV cables for North Auckland and Northland cables, the cost estimates used by Ms Tuck exclude the (approximately) \$60M already expended by Transpower over a five year period to provide cable ducts for two cables along the route from Penrose to Albany. This work was opportunistic and cost effective as the ducts were (mainly) installed at the same time as other works, such as the Northern Busway, were being undertaken.
24. **ANOTHER** relevant issue is that cables of significant length generate reactive power because of their capacitance. This produces reactive currents that result in voltage increases. Intermediate substations would be required along the route to provide for compensating reactive power devices to maintain these voltage rises to within the technical limits of the cables and the acceptable standards of the power system. These substations contribute to the undergrounding costs.
25. **THE** rating of a single set of 220 kV cables is in the order of 600 MW (perhaps 900 MW if cooling is used). The approximate rating of *each* circuit of the Proposed

220/400 kV transmission line is 1450 MW / 2700 MW. To provide an equivalent capacity of the Proposal operating at 220 kV, it would be necessary to install two sets of cables for each circuit, combining to a total of four cable circuits. Even more sets of cables would be required to deliver an equivalent capacity to the Proposal when operated at 400 kV. Comparing the cost of a single set of cables to a high capacity transmission line is therefore not balanced.

Timothy Andrew George

17 March 2008