

## Submissions received

- Tuck C
- Tuck F
- Tylden C and M
- Underground in Manukau (note due to the documents security having restricted access placed on the submission, part of this submission is not included in this merged document)
- Unison

Submission by

C Tuck

Catherine Tuck

## **Submission to the Electricity Commission**

Re: Transpower's Auckland 400kv Investment Proposal: Draft Decision

1. I support the Underground in Manukau submission on the EC draft Decision relating to the Transpower 400Kv Proposal. It is obvious that upgrading the existing infrastructure makes commonsense and has the added benefit of a more integrated planning approach to the needs of Auckland relating to Transmission, Generation and Visual impact of overhead HV Transmission on the narrow south Auckland Isthmus south of Manukau city, travelling to Auckland city.

2. In light of recent events it also allows time to assess if in fact taking all of Auckland's Transmission into Otahuhu Substation site is a wise decision. I raised this issue with Transpower at the outset of the 400kv proposal At the Whitford Community consultation meeting. Despite Transpower receiving the question well in advance of the meeting, Transpower refused to discuss the topic with the Community stating that it was not our place to challenge TP decisions.

3. In the EC draft decision we are asked to comment on a future planned corridor.

In relation to this topic which obviously has merit I would like to respond in relation to the south Auckland isthmus as it is the area that I'm most familiar with. With respect to the existing corridor, I hope that the EC can encourage the government to legislate that no new houses can be built under the existing transmission lines. This needs urgent attention.

4. It is a complex issue to plan for future Transmission through the south Auckland isthmus to Otahuhu and further north. There are already too many overhead transmission lines. It is untenable to keep on planning for further overhead transmission. Given that TP plan to build further transmission into Auckland in the not too distant future there needs to be an integrated policy to plan for this. The true environmental cost needs to be considered before the least cost of the GIT is applied rather than the GIT limiting the best environmental outcomes. I realise that the GIT test is limited in addressing this problem but I believe that the EC should have its powers broadened to address environmental

issues where necessary rather than leave it to the last minute in the Environment Court.

5. In planning a future corridor, there is no social justice if it is not recognised now that further power from the south that needs to access the Otahuhu substation or other substations in South Auckland must be underground through the south Auckland isthmus

6. I recognise that Auckland needs more power for the future but a new overhead transmission corridor is unacceptable, so therefore, support a planned underground route. Where a city seems to have to rely on nearly all its power coming from one direction over a geographical constraint, it seems pointless to ignore this problem.

7. If an overhead transmission corridor is planned for the future then all landowners impacted by the corridor should be afforded the opportunity to have their properties bought outright if they so wish.

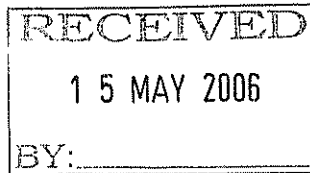
8. As nobody seems to know where future generation is to come from maybe there needs to be an incentive based policy from government for a peaking plant in Auckland. This will remove the perceived uncertainties immediately.

9. I would like to thank the Commission for giving me the opportunity to make a submission on their draft decision.

Catherine Tuck

Submission by

F Tuck



Cc: MG  
JG

**FRANCIS H. TUCK**  
CA, CMA  
CHARTERED ACCOUNTANT (Retired)

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YOUR REF:

11<sup>th</sup> May 2006

Mr Roy Hemingway  
Chairman  
Electricity Commission  
PO Box 10041  
Wellington

Dear Mr Hemingway

**Re: North Island 400KV Project**

As part of your interim decision on the above project you have asked for public submissions on the question of securing a route for possible increases in supply from sources south of Auckland.

Significant additional generation south of Auckland is not readily identifiable to make use of a new 400kv line from Whakamaru and upgrading existing lines will increase capacity to carry existing and projected generation for some extended time.

If the 400kv AC line is eventually constructed the whole narrow Auckland isthmus is totally adversely impacted.

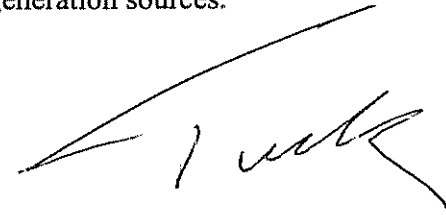
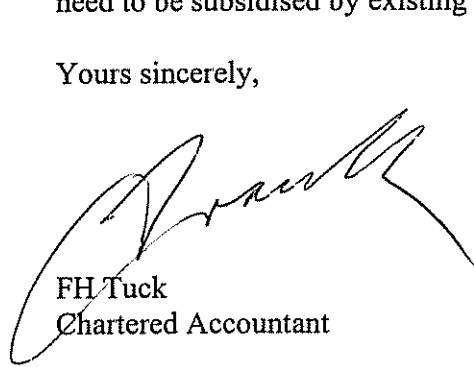
Where it is obvious in Whitford, Ardmore/Clevedon and Brookby that Auckland's residential expansion will be developed Transpower should look to 21<sup>st</sup> century expectation of a tunnel to cope with Auckland's needs not 19<sup>th</sup> century technology of pylons.

If pylons are to be used then the more modern pylon requirements of DC bulk feed to Auckland should be the supply method and there is the Ara-Pak line route already available. DC will not require any more impact than the present line which has been established since 1930s and development and property transaction decisions have been made with knowledge of the route. To move to a greenfields route will impact directly on owners who purchased property with no indication that there could be a deviation from the present Ara-Pak route.

To summarise I believe that due to the expansion of Auckland and the constraints of the narrow isthmus that a future-proofed decision to build a power infrastructure tunnel should be made. Failing that, bulk DC on the existing Ara-Pak line.

Returning to the need for increased generation and if it is not hydro it seems logical that the wholesale power market be structured in such a way that there are price incentives to locate new generation close to demand and make it profitable on a project basis and not need to be subsidised by existing generation sources.

Yours sincerely,



FH Tuck  
Chartered Accountant

Submission by

C and M Tylden



if they have already purchased them.

surely it is smarter to build something that most landowners will agree to, i.e. O.C. line, than to fight to build these giant ugly pylons.

Make no mistake, these pylons will be very difficult to build.

Submission by  
Underground in Manukau

From: Cathie Sherning  
Sent: Friday, 23 June 2006 12:00 p.m.  
To: Info Electricity Commission  
Cc: 'Catherine Tuck'  
Subject: Transpower's Auckland 400kv grid investment proposal: draft decision

Attachments: EC Draft Dec sub.doc; Makin Submission.doc; Future Transmission.pdf

Attached is our submission on the Electricity Commission's draft decision. We have also enclosed a submission from one of our members - which is referred to in the UIM submission.

Please acknowledge that you have received our submission.

Many thanks  
Cathie Sherning  
Secretary  
Underground in Manukau

# UNDERGROUND IN MANUKAU

Submission to the

Electricity Commission

Transpower's Auckland 400kV Investment Proposal: Draft Decision

## **This submission is from:**

Underground in Manukau  
Whitford Residents & ratepayers Association Inc  
PO Box 89  
WHITFORD

## **The contact person is:**

Ms Catherine Tuck  
Telephone: 530 8777  
Email: [tuckfam@ihug.co.nz](mailto:tuckfam@ihug.co.nz)

- 1:1 In broad terms, Underground in Manukau supports the Commission's draft decision and the basis on which it was reached.
- 1:2 In particular, we agree with the Commission's view that there is a benefit in postponing the investment. As well as the financial benefit, delaying a major investment has the potential to avoid the "Think Big" scenario, where commitment to a major project impedes the adoption of new, better emerging technologies.
- 1:3 A number of the questions posed by the Commission are of a technical or economic nature which we, as laypeople, are not qualified to answer.
- 1:4 At the time of preparing this submission, Transpower has indicated it may make an amendment to its proposal. We will comment on this in general terms.
- 2:1 Underground in Manukau supports four key principles agreed by all the member branches of New Era Energy (NEE):
- 2:2 NEE supports the draft decision that "Transpower's proposal does not meet the Grid Investment Test and cannot be approved". While appreciating that the Commission reached this conclusion entirely on economic grounds, NEE goes further and contends that additional social and environmental costs arising from the scale of the 400kV proposal absolutely ensure that it is untenable. For all these reasons, NEE members are unanimously implacably opposed to **any** 400kV proposal.
- 2:3 NEE supports the interim investments to up-rate the existing 220kV grid. The commercial common sense of getting the maximum utilization from the existing assets before investing in new assets is, however, only one reason for this support. More importantly, in the view of NEE members, is that this course "buys time", during which more careful and better-informed planning of the generation and distribution of electricity can be developed.
- 2:4 While understanding that the draft decision relates entirely to Transpower's proposal, NEE members remain extremely concerned that the Commission is able only to view the proposal in isolation, without taking into full account the generation side of

the supply of electricity. NEE is hopeful that an important outcome if the draft decision is confirmed will be the encouragement of generation close to demand – that is, power stations in and north of Auckland. However this doesn't go far enough, in NEE's view. NEE believes that the Commission should make representations to the Government with a view to establishing mechanisms that see power stations being built close to demand, which will increase the security of supply and avoid the need for new transmission lines.

2:5 NEE supports the investigation of a dedicated transmission corridor within the context of an overall national electricity plan. While believing that this issue is worthy of proper investigation, NEE does not at this stage necessarily support the concept itself, foreseeing a number of practical, legislative and economic difficulties.

3:1 **Question 1** – value of a dedicated transmission corridor. Underground in Manukau supports further investigation of this proposal, but it seems unlikely to find itself supporting the proposal itself.

3:2 While we understand the objectives of protecting a route and of achieving stability for land owners, we foresee a number of pitfalls.

3:3 The main pitfall is the one described in 1:2 above. A dedicated route could jeopardize the adoption of better alternatives that arise in the future. For example, there is a proposal to rebuild Mill Road (Alfriston) as a regional highway. This highway would be parallel to the Southern Motorway, linking with roads through to the Bombays. It lies between existing transmission lines. Underground in Manukau's preferred option is a tunnel from Otahuhu to the Bombays. It would appear feasible, with appropriate planning, to build the new highway as the roof of a transmission tunnel, which could carry all existing lines and any required in the future.

3:4 Another major concern is that, while a dedicated transmission corridor could create certainty for land owners directly affected, it could increase uncertainty for their neighbours. Those close to the corridor, but not directly in its path, would face certain reductions in property values and possible difficulties in selling, without compensation.

3:5 Public knowledge of a transmission corridor could blight the whole of a closely-settled district like Whitford-Brookby-Clevedon. While the corridor might be certain, what could eventually end up on it would be unknown. This could lower property values across a wide area.

3:6 Assessing compensation for land owners in the path of a corridor could be difficult. Because the impacts of, say, a HVDC line would be less than for a 400kV AC line, the value of any easement would be affected. Land owners would expect compensation on a "worst case scenario", which means Transpower might pay considerably more than needed if a lower-impact line was ultimately built.

3:7 Value of an easement would also be affected by its width. Changing attitudes to EMF emissions may require an easement of 200 metres or wider.

3:8 Transpower's stated objective is a desire to protect the 400kV route, regardless of whether the decision is made to proceed with this line. Representatives have told land owners that protecting this route would be a return on the work put in to date. However this route would probably not be suitable for an underground line, so dedicating it as a corridor now might preclude an underground option in future.

3:9 Dedicating a transmission corridor now could preclude upgrading of the existing 220kV line. If Transpower was purchasing easements for a corridor, it would be less motivated to purchase easements to upgrade another line. The result would be less than optimum utilization of an existing asset.

3:10 Achieving a dedicated corridor may require legislation, as it appears to be outside the scope of the Resource Management Act. It appears that designation of a

route under the Act requires consideration of environmental and social impacts, which in turn requires a reasonably precise design and appearance of a line, plus accurate assessment of earthworks, which may be required to bring a line below Ardmore Airport protection measures, as one example. Legislation takes time, which presupposes interim measures to ensure security of supply to Auckland.

3:11 Protecting a corridor now would be unlikely to remove it from the prospects of resource consents in the future. Transpower could pay large sums for a corridor, but still be unable to obtain resource consents to build a line on it, with obvious implications for the electricity consumer.

3:12 As the Commission has pointed out, time itself introduces changes. If a corridor were dedicated now, land owners faced with the prospect of large pylons in the future might still find grounds for legitimate objection, particularly if the appearance of a line was unlike anything envisaged at the time compensation was paid.

2:13 Overall, the prospect of a dedicated transmission corridor may appear to have merit, but might also introduce costs to Transpower and severe impacts on neighbouring land owners now without solving problems in future.

4:1 **Question 2** – has the Commission adequately identified alternatives to Transpower’s proposal? Because the Commission has to compare alternatives within the framework of the Grid Investment Test it appears to have ruled out further undergrounding on the basis of cost. However, as the Environment Court could well find that the only way to mitigate the impact of any proposed line on the local community is to bury sections of it underground, we believe that the Commission should at least conduct a high-level analysis of the cost of undergrounding further sections of Transpower’s proposed lines and the alternatives. It is our understanding that undergrounding HVDC or 220kV lines is considerably less costly than undergrounding 400kV ones.

4:2 We remain concerned that work on the promotion of generation alternatives has apparently ground to a halt. While this issue is beyond the scope of the draft decision and we realize that the Commission’s resources are stretched, we are convinced that the Commission is uniquely placed to take an over-view of the electricity industry and make a credible approach to Government with a view to encouraging the planning of new generation alongside the planning of new transmission investments.

5:1 **Question 3** – are you aware of any further information the commission should rely on? Yes. Underground in Manukau committee member John Makin has made a separate submission to the Commission outlining a number of emerging transmission and generation technologies. His submission is endorsed by Underground in Manukau.

5:2 Regardless of the success (or otherwise) of these and other new technologies, the sheer number of them and the speed at which they are developing provides a further strong argument supporting the Commission’s view on the value of postponing any major investment, particularly one with a potential 100-year operating life.

6:1 **Question 8** – do you agree with the Commission’s treatment of forecast demand? We again refer to John Makin’s submission and endorse his comments.

6:2 A range of factors presently appear to conspire against higher growth forecasts than those used. An ageing population, a slowing economy, other deterrents to growth in Auckland such as traffic congestion, plus increased competition from regional ports like New Plymouth could all see growth outside Auckland at the expense of growth within the city in the coming decade.

7:1 **Question 20** – would the proposal or its alternatives result in a reliable supply of electricity to Auckland? Unfortunately, Underground in Manukau believes that none of these proposals, on their own, will guarantee a reliable supply to Auckland and north.

7:2 We believe the only way to ensure reliable supply in both the short and longer terms is by increasing generation capability within or immediately north of Auckland. In light of recent events adequate security also undoubtedly requires distribution of sub-stations as well as generators.

7:3 The difficulty with any transmission investments, except limited up-rating of existing lines within the framework of the Electricity Act, is the time it may take to meet the requirements of the Resource Management Act.

7:4 We appreciate that the Government could “call in” an investment to bypass the requirements of the RMA, but this may not be politically achievable in the face of a viable alternative, such as the construction of a power station in Auckland.

7:5 Underground in Manukau is already encountering opposition in our district to any prospect of upgrading the A & B 220kV lines. The Commission is aware that these lines, as well as the proposed 400kV line (and, in fact, all other transmission lines to Auckland) pass through our district.

7:6 Extensive publicity about Transpower’s proposed 400kV line has aroused considerable concern about all high-voltage lines, which will inevitably be reflected during the RMA process.

7:7 The Commissioner commented in our district that “no one in Wellington” believes that a 400kV line can be consented in time to meet Transpower’s 2010 deadline. We agree. The real question is how long delays might become, particularly if they begin to encroach on the lead-up to the next General Election, making political decisions more difficult.

7:8 We believe it is the Commission’s role to recognize the potential for delay now, and make immediate representations to the Government with a view to promoting the construction of new power stations in industrial parts of Auckland as soon as feasible.

7:9 In addition to 7:8 we urge the Commission to immediately relocate its Whirinaki peaking station to Auckland as a backstop measure. Another option would be for the Commission to lobby the government to provide incentives for generators to build a new peaking plant in Auckland.

8:1 **220kV** – why bother with 400kV at all? One of the clear outcomes from the draft decision on the 400kV proposal is that 220kV beats 400kV on every count.

8:2 When comparing the Commission’s transmission-based alternatives, upgrading 220kV to meet demand until 2017 is the most cost-effective alternative under the Grid Investment Test.

8:3 In every sensitivity analysis test considered, the 220kV option is the winner. While transmission losses are higher for 220kV than for 400kV, the cost of avoiding those losses appears to be uneconomic.

8:4 While acknowledging New Zealand’s unusual position in having a wide geographical separation between major generation and major demand, we have been unable to find another country of similar size and population where 400kV is even being considered. In New South Wales, for example, the recent grid investment to supply Sydney is for 330kV.

8:5 Clearly the environmental and social impacts of 220kV, particularly in visual impact and EMF emissions, is considerably lower than for 400kV.

8:6 At a regulatory level the Commission can only consider a specific proposal (in this case for 400kV) against alternatives. However, we urge the Commission to take a

leadership role and investigate the costs and benefits of the whole national grid at a maximum of 220kV against a maximum of 400kV.

8:7 Underground in Manukau notes that extended undergrounding of 220kV is far more economic and technically achievable than extended undergrounding of 440kV cables.

9:1 **Possible amended proposal** – the Commission is well aware of the proposal (at time of writing) to build a 400kV line as proposed by Transpower, but run it at 220kV in the short term.

9:2 Underground in Manukau understands that this would save in the order of \$180 million by delaying the requirement for 220-400kV transformers and associated investment.

9:3 Without having yet had any opportunity to study a specific proposal, we feel this amended proposal appears to offer the worst of all worlds. It introduces all the negative environmental impacts of the over-sized 400kV line without any of the claimed economic benefits of 400kV. It also imparts just as much inflexibility as the original plan with an equivalent inability to avail New Zealand of new technology within the approximate 10 years period of grace that infrastructure upgrades and improvements would grant. We believe that it is possible that potential costs of premature commitment to a new grid have been understated in the Commission's assessment.

9:4 It appears to us that this proposal is merely a ruse designed to get the original 400kV proposal past the Grid Investment Test, which clearly demonstrates that 220kV is a more economic alternative.

9:5 If it is more economic to run a 400kV line at 220kV, it would presumably be even more economic again to build only a 220kV line, with less environmental and social impact, in the first place.

9:6 Transpower's amended proposal should be considered against the Commission's upgrade alternatives and against a new 220kV line with extended undergrounding.

**Submission to the Electricity Commission on its draft decision  
on Transpower's Auckland grid investment proposal.**

**1) General**

The Commission is to be congratulated on its draft decision, which is undoubtedly the correct one in the circumstances. Whilst in general agreement with the Electricity Commission (EC) rationale for most of its findings, we would question extent of new and developing technologies considered and certain aspects of demand growth projections. We understand that the existing AraPak line, which crosses our property, is approaching 90 years old. It is therefore reasonable to project from longevity of existing pylons, that given approval for the Whakamaru - Otahuhu link, NZ will be committed to this overpowering infrastructure well beyond the year 2100. Moreover we understand this to just be stage 1 in a Transpower (TP) plan to extend a 400kV, HVAC line the length of New Zealand.

As you are no doubt aware, Prof. Richard E. Smalley of Rice University, Houston is world renowned in the Energy sector, was awarded the Nobel Prize for Chemistry in 1966 and has outstanding and impeccable credentials, awards and achievements in areas of Physics and Chemistry. He presented a far-reaching and rather bold vision of aspects of world energy, at the Ohio Nanotechnology Summit, on 2/03/05, which included some of the following projections:

- *An increase in world energy consumption from 14 to between 30 and 60 Terawatts from 2003 to 2050.*
- *Significant reductions in energy output from fossil fuels- oil, coal and gas.*
- *A major increase(100X), in energy production from solar, wind and geothermal sources.*
- *A significant input of energy production from fusion technology.*
- *Static and increasingly insignificant production of energy from hydroelectric and biomass sources.*

Accompanying this, he projected a scenario in which a worldwide grid will operate, interconnecting 100 million asynchronous local storage and generation sites. Energy will be transported worldwide as electrical energy instead of as a fossil fuel. He envisaged mass primary power input into such a grid via HVDC transmission from existing plants together with input from remote new plants on a Terawatt scale, with transmission links of up to 2000 miles.

This bold and innovative picture obviously requires certain technological developments amongst which Prof. Smalley included:

- *Major cost reductions in Photovoltaics.*
- *Photocatalytic reduction of CO<sub>2</sub> to methanol*
- *Photoconversion of water to produce Hydrogen, which becomes the future transportation fuel.*
- *Drop in cost of fuel cells.*
- *Development of batteries, supercapacitors and flywheels for automotive and generation applications.*
- *Use of superconductors or quantum conductors, which will rewire the electrical transmission grid and which will enable continental and even worldwide electrical energy transport.*

This submission is not suggesting that the above vision will necessarily become fact. It does however emphasize that by 2050 the TP transmission option would be between 20 and 30 years old and would not necessarily be fully financially depreciated. It would still have a practical working life remaining of at least 60 years and would influence siting, nature and cost of future generation developments. We would also like to re-emphasize the exponential growth of world technology. There is a very real danger that early commitment to the grid suggested by TP, would preclude New Zealand from taking advantage of developing technologies without a massive financial sacrifice. In the worst-case scenario, this could be the total cost of the TP project plus unrealized financial benefits from the new technology together with an unspecified environmental cost to the country.

Thus, despite TP's projection of dire consequences soon after 2010 we fully endorse the alternatives suggested by the EC, which allow a medium term increase in supply to Auckland and to points north, through upgrades to existing infrastructure with a corresponding ability to take advantage of new technology if and when it occurs within this time frame.

## **2) EC Function.**

The Commission describes their 3 priority areas of operation as being in ensuring security of supply and reserve generation, in assessing priorities in investment in the transmission grid and in demand side participation.

As we see it, Generation and Transmission should be irrevocably linked almost in a horse and cart fashion, with Generation represented by the horse coming first and Transmission having to follow its lead. It is inconceivable that, in a structured, efficient and supposedly self-regulating market, controls were not initiated by statute ensuring future integration between transmission and generation companies prior to freeing the market. As things stand the ludicrous situation exists whereby commitment can be made to transmission without a corresponding, clearly defined commitment to future generation or its location. It is moreover apparent that the EC is unable to directly influence integration other than by affecting the ability to recover capital outlay through pricing.

We note that South Island farmers have rejected the idea of the South Island bearing the upgrade cost of the Cook Strait HVDC link and have emphatically stated that TP will have no access to South Island farmland for future pylons. They see TP's projected shortfall in electricity to Auckland as an Auckland problem with Auckland having both the responsibility and ability to address this through enabling and encouraging local generation. Local generation, if adequate, could well have the result of indefinitely postponing the need for a new grid to the south of Auckland and TP's responsibility might then change to upgrading and to adequately maintaining the existing grid.

If TP is permitted to proceed with its proposal, there is the potential danger of developing "Bridge to Nowhere" scenarios, and it is our opinion that the powers of the EC should be increased to allow it to encourage and to initiate integrated and rational development of the total Supply side of the Electricity Industry in New Zealand.

## **3) New Technology.**

We do not pretend to have any expertise in the fields of new or developing electrical technology and imagine that the EC is fully *au fait* with relevant published information. But even by 2010, technology now in the course of development could reach a point where the 400kV HVAC line envisaged by TP would become obsolete with implementation of technically and commercially more viable alternatives. We wish to list a few of these for reference in our response to questions raised by the EC.

### **3.1) Generation technology.**

#### **3.1.1) Hydrogen / Boron focus fusion technology:**

There is planned development of this technology by Lawrenceville Plasma Physics Inc. in conjunction with the Chilean Nuclear Energy Commission. Commercialization is projected by 2011/ 2012. Energy production is forecast at around 0.01% present costs. The fuels, Boron and Hydrogen are in abundant supply and are not radioactive. The reaction product is Helium, which is not radioactive. Generation does not involve steam driven turbines or expensive tokamaks. There is no chance of a runaway chain reaction and there is no emission of high-energy neutrons. A 20MW focus fusion reactor could be assembled at a cost of around \$US 300,000 and the dimensions of such a unit would be of the order of 1meter x 1meter x 3meters. Larger units will probably be made by stacking together the 20MW base units.

Commercial realization of this project would enable Central Auckland generation with minimal transmission distances. The smallest unit planned for development will be 5MW and installation in industrial premises with an objective of energy self reliance would be a possibility.

#### **3.1.2) Deuterium / Tritium fusion:**

Considerable worldwide resources are being invested into research and development of this type of reactor. Although the fuels are in plentiful supply, Tritium does not occur abundantly in nature and must be formed in a reactor. It essentially consists of a Hydrogen atom with two neutrons in its nucleus and an atomic weight of close to 3. It is weakly radioactive emitting Beta particles and has a half-life of 12.3 years. The fusion process is confined by tokamak and the derived energy produces steam, which drives a turbine. There is no chance of a chain reaction with this particular fusion process and reaction products are not radioactive although high-energy neutrons are formed. Deuterium /Tritium fusion

may well fit into the New Zealand political landscape and could be a future possibility for generation close to Auckland.

### **3.2) Transmission technology.**

#### **3.2.1) Superconductors:**

Companies in the US, Europe, Japan and Australia are producing Nitrogen cooled, multi-wire cables which apparently carry up to 5 times more power than Copper cables of the same diameter.

\*Where and How are They Used? (Ref. America Superconductors. )

HTS transmission cables would be used for power transmission and distribution in urban areas throughout the United States and the world.

#### **What are the Benefits?**

- Can meet increasing power demands in urban areas via retrofit applications carrying two to five times more power than conventional cable
- Eliminates need to acquire new rights of way
- Replaces overhead transmission lines when environmental and other concerns prohibit their installation
- Enhanced overall system efficiency due to exceptionally low losses
- Increased utility system operating flexibility
- Reduced electricity costs

With an estimated 80,000 miles of existing underground cable throughout the world, High Temperature Superconducting (HTS) cables will provide enormous benefits to a utility industry that is poised for growth and is faced with an ever rising demand for electricity and tightening constraints on siting flexibility.

A flow-on from this technology might be that in the short to medium term there could well be the potential for significant sections of the existing New Zealand transmission grid to be laid underground utilizing a smaller diameter cable and at the same time reducing energy loss.

### **4) Current Technology.**

#### **4.1) Nuclear fission reactors:**

It was a clear impression at a particular EC presentation that the reason for not considering nuclear reactors as a generation source was that their output was far too great for New Zealand requirements for the foreseeable future. We therefore include a list of relatively small nuclear reactors designed for production of electrical energy in the course of development, as follows:

#### **Small-medium reactors with development well advanced ( ref. Uranium Information Centre Ltd.)**

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CAREM	27 MWe PWR	CNEA & INVAP, Argentina
KLT-40	35 MWe PWR	OKBM, Russia
MRX	30-100 MWe PWR	JAERI, Japan
IRIS-50	50 MWe PWR	Westinghouse, USA
SMART	100 MWe PWR	KAERI, S. Korea
NP-300	100-300 MWe PWR	Technicatome, France
Modular SBWR	50 MWe BWR	GE & Purdue University, USA
PBMR	165 MWe HTGR	Eskom, South Africa, et al
GT-MHR	285 MWe HTGR	General Atomics (USA), Minatom (Russia) et al
BREST	300 MWe LMR	RDIFE (Russia)

The most prominent modular project is the South African Pebble Bed Modular Reactor, which appears to have an output of a similar order to that of Wairakei or Arapuni. The following specific information and timing given by the UIC may be of interest.

*South Africa's Pebble Bed Modular Reactor (PBMR) is being developed by a consortium led by the utility Eskom, and drawing on German expertise. It aims for a step change in safety, economics and proliferation resistance. Production units will be 165 MWe. The PBMR will have a direct-cycle gas turbine generator and thermal efficiency about 41%, the helium coolant leaving the bottom of the core at about 900°C. Up to 450,000 fuel pebbles 60 mm diameter and containing 9g uranium enriched to 10% U-235 recycle through the reactor continuously (about six times each, taking six months) until they are expended, giving an average enrichment in and average burn-up of 80 GWday/t U (eventual target burn-ups are 200 GWd/t). This means on-line refuelling as expended pebbles (which have yielded up to 91 GWd/t) are replaced, giving high capacity factor. The reactor core is lined with graphite and there is a central column of graphite as reflector. Control rods are in the side reflectors and cold shutdown units in the centre column.*

*Performance includes great flexibility in loads (40-100%) without loss of thermal efficiency, and with rapid change in power settings. Power density in the core is about one tenth of that in light water reactor, and if coolant circulation ceases the fuel will survive initial high temperatures while the reactor shuts itself down - giving inherent safety. Power control is by varying the coolant pressure and hence flow. Each unit will finally discharge about 19 tonnes/yr of spent pebbles to ventilated on-site storage bins.*

*Eventual construction cost (when in clusters of four or eight units) is expected to be very competitive and generating cost below 3 US cents/kWh. Investors in the PBMR project are Eskom, the South African Industrial Development Corporation and Westinghouse. **A demonstration plant is due to be built in 2007 for operation in 2010. The first commercial units are expected on line in 2014 and Eskom has said it expects to order 24, which justify fully commercial fuel supply and maintenance.***

Whilst there is an existing NZ government negativity towards Nuclear Fission Reactors, projection of such a reactor close to Auckland may have made quite interesting financial modelling, particularly when considering the long term costs of Kyoto, and may have given indications as to the future comparative financial viability of Deuterium / Tritium fusion, when this comes on stream

## **5) Consultation Questions.**

### **5.1) 0.1 Current establishment of an overhead transmission corridor:**

This action might be of advantage if overhead transmission from the south were the only solution to the TP projected Auckland power shortage. It would perhaps have the advantage of providing a definite scenario for landowners, but it is unlikely that the PWA could be enforced without a clear mandate for TP to proceed with grid construction. Such a corridor could, in our opinion, only therefore be currently established on a goodwill basis, and unfortunately TP actions to-date have largely negated or precluded goodwill on the part of landowners. Establishment of a corridor at an early stage would have two distinct disadvantages:

First, there is the cost of establishment of the corridor, which in some instances could include the necessity to purchase land. It is probable that the need to purchase property would be most prevalent in the high-price, 'lifestyle' areas, where restrictions on land use and possibility of future erection of giant pylons would have a major impact on resale, property values. The cost of finance over the period of non-utilization of the asset would have to be included in the total cost estimate for TP, as an additional cost.

Secondly, having committed to a corridor, future flexibility is reduced for scenarios suggested under 3.1.1 and 3.2.1. Inability to take advantage of future technology because of reduced flexibility through prior major financial commitment to an overhead corridor could be far more costly, both to TP and to the Nation.

The development of Flatbush as a residential area is likely to have flow-on effects, with pressures on planners to extend designated residential areas further south to Brookby and to the existing green belt of the Clevedon valley within the next 15 years. Such a scenario, together with likely growth of future activity from Ardmore Airport, would make it sensible to consider a corridor, which includes an underground possibility for a distance of up to 20km south of Otahuhu, if securement of a corridor is deemed essential.

However the overriding consideration in our opinion is that such action would only be appropriate if new, overhead transmission were the only solution to projected future power shortage and it is abundantly clear that there could be other, more viable options.

### **5.2) 0.2 Adequate identification of alternatives:**

In view of the mounting opinion from the rest of New Zealand that the TP projection of power shortage is a problem for us here in Auckland and that it should be addressed here, there could perhaps be a weighting applied for not encumbering other parts of New Zealand with a new transmission network. On a basis of cost/benefit, the relocation of Whirinaki to Otahuhu should be promoted for immediate consideration and certain of the demand side residential efficiency options should be planned, promoted and implemented by government on a gradual scale between now and 2010/2015. The identification and assessment of alternatives to the TP proposal by the EC has been impressive.

We do however think that there is a gap in generation options, in the area of New Technology. Fusion technology (3.1.1/3.1.2) would appear to be a generation probability in the medium term and certainly within the time frame of this exercise. Moreover Hydrogen/Boron focus fusion would appear to have the potential to revolutionize existing small to medium generation concepts and to negate future major transmission need by generation at, or close to load.

In view of the New Zealand commitment to Kyoto, and the associated costs, it may also have been worthwhile including a scenario based on a 165MW Pebble Bed Modular Reactor specifically for power supply to Auckland.

### **5.3) O.8 Treatment of forecast demand:**

Whilst the EC treatment of demand is apparently based on econometric modelling, future demand estimates seem to be an almost straight line projection of historical growth. (Ref. SOO fig.14) It also appears from the sectoral breakdown in the SOO, that the commercial and light industrial sector accounts for approximately half of total power consumption, and with an average p.a. growth rate of 3% has by far the greatest influence on predicted long-term national baseline growth of 2%p.a. This compares with growth of 1.22%p.a. in residential demand and 0.7%p.a. in heavy industrial demand.

When translating demand growth to regions, it must be assumed that that the commercial and light industrial sector is just as influential, if not more so, on the projected growth rates in demand from Auckland and Northland. Demand growth in these two regions is predicted to be 2.93%p.a. and 2.92%p.a. respectively, almost 50% above the national average. Bay of Plenty demand for example is predicted to grow at 1.95%p.a. and Otago/Southland at 1.075%p.a.

Whilst not competent to comment on the mathematical treatment of demand but as recent CEO of a multinational, manufacturing and marketing operation based in Auckland, the writer would like to act as Devil's Advocate.

In setting up or expanding light industrial or commercial operations in New Zealand, responsible management would obviously have to consider a number of factors. Some of these would be as follows:

- a) Company taxation level and available tax exemptions or tax breaks for activities such as R&D, which benefits the nation, introduction of new technology, or attitude towards company contributions to superannuation, which effectively supplements employee retirement savings.
- b) Cost of compliance with government imposed activities and restrictions.

These two factors alone might persuade some potential operators that neither New Zealand nor Auckland provides a satisfactory location and that somewhere in Australia offers far better potential.

- c) If a local or national logistics function were included in their operation, they would have to consider road and highway access, mobility in and around Auckland and propensity towards gridlock.

- d) Property cost and cost of rental property would also be a consideration.

- e) Consideration of modern electronic communications, ability to involve staff via pc networks and various electronic options for communicating with clients and with service providers.

These and other factors could well convince them that advantages of operational investment away from Auckland outweigh disadvantages, resulting in much more significant light industrial growth in the Waikato, Bay of Plenty and even in Wellington, than in Auckland.

As a result over a 20 year period power demand in Auckland within the light industrial /commercial sector could possibly remain static or grow at a much lower rate than that projected.

Population demographics indicate a rapidly growing percentage of elderly people in the total population mix. The stress of living in and getting around Auckland, as well as the comparatively high cost of property here, could well convince many that a shift to a more peaceful and less costly part of New Zealand is a practical

move. This would possibly in time, affect residential numbers and hence residential power demand growth in Auckland.

Combining these factors, a growth in demand much closer to, or perhaps even slightly below the national average is a possibility. This net result could have an influence on the necessity for and timing of a major grid upgrade.

**5.4) Q.11 Choice of Reference Case for application of GIT:**

We find it difficult to reconcile use of "The Proposal" as a base-case, with the statement made under 6.7.3 in the Draft Decision whereby the GIT requires that the base-case used for evaluating a proposed investment or alternative project *not* include the proposed investment or any alternative project.

It is possible that pressures from outside Auckland could escalate to the degree that a "generation only" option would be a sensible base-case. We wonder whether a combination of Marsden co-generation with Whirinaki relocation to Otahuhu, which would apparently have a combined capacity of around 235MW, an apparent cost of around \$150mio and could be completed by 2010, would be a satisfactory alternative base-case scenario. A diesel peaking facility to provide a further 100MW when necessary, at an approximate cost of a further \$80mio, might be considered in conjunction.

However it is difficult to see the mathematical factors used for comparison or the final decision, being affected by choice of the reference case.

**5.5 Qs.12/13/14 Option Values:**

It is our opinion that real option value of flexible investment timing combined with the technology option value as expressed, should play a significant part in the decision arrived at through the GIT and as such should be included in the reference case. We believe that there is a possibility for distinct deviation from the forecast demand scenario, a probability of localized generation projects and a strong possibility of opportunities arising from advances in technology, all within the medium term. Inability to take advantage of any of these developments because of prior, premature commitment to the TP proposal could result in major costs and in long-term disadvantages.

Excess transmission capacity, whilst providing the benefit of capacity for rapid generation response, has the weakness of dictating certain aspects of the response. Consequently it would contribute towards some constraints and to lack of flexibility in supply side options. We believe that the benefits of excess demand would have to be balanced against potential costs incurred by loss of some options.

**5.6 Q. 24 Base case costings:**

It has been of real concern to many of us that at the so-called "consultation meetings" organized by TP, alternatives to their 400kV AC scheme have been constantly decried and cursorily rejected by them on the basis of comparative costs. This particularly applied to HVDC alternatives, and yet it appears from work carried out by the EC and its consultants, that by 2017 an HVDC link would be less than 7% more expensive than the TP model. At the same time we note that Parsons Brinckerhoff Associates, have quoted significantly different costs from those used by TP. It would appear that TP have failed to present a fair or unbiased case for public scrutiny but instead seem to have produced figures to fit a final scenario, which they intended pushing through regardless.

We believe that the GIT is objective, is designed in as quantitative manner as possible and we certainly support the EC findings and the pragmatic manner in which they arrived at their draft decision.

**5.7 Q.31 Sensitivity Analysis:**

Whilst mathematics is not our *forté*, we wonder whether a stratified sampling technique was used in application of the Monte Carlo algorithm used to predict demand growth. If not, we wonder whether use of age demographics in the case of residential demand, and industry types in the case of commercial/light industrial demand, would make any difference to the final demand forecasts for the regions of Auckland and North of the Isthmus.

**Conclusion:**

Transparency of operation, professional approach and willingness to consult on the part of the EC, have given hope to those of us questioning the TP 400kV HVAC proposal, that there will be a rational

and fair outcome. We have the impression that the approach of the EC is objective and dispassionate and we are convinced that their final decision will be in the long-term interests both of Auckland and of New Zealand.

The apparently coordinated complaints of some people purportedly representing the business interests of Auckland, emanating after release of the draft decision, could perhaps be specifically addressed by the EC when it publishes its final decision.

J L Makin

27/5/06

Submission by

Unison



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23 June 2006

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Unison welcomes the opportunity to submit in response to the draft decision reached by the Electricity Commission on Transpower's Auckland 400 kV grid investment proposal ("the Proposal") from Whakamaru to Otahuhu.

To the extent it has canvassed the Commissions review of the relevant information and analysis, Unison agrees with the conclusion reached that the Proposal in conjunction with other investments such as the Modelled Projects, reflects good industry practice in meeting the grid reliability standards. It further agrees in this regard with the Commissions conclusion that Transpower and therefore the Proposal has complied with the relevant processes and therefore meets the processes set out in the Rules.

The outcome however of the Commissions decision that on the information available the Proposal does not meet the requirements of the Grid Investment Test, taken in conjunction with the processes that must be complied with before a proposal can be approved and therefore a way forward confirmed, leads in Unisons submission, to a less than satisfactory outcome. It is in this regard therefore that Unison feels it appropriate to take up the opportunity to submit before a final decision is released by the Commission.

Specifically Unison has concerns that:

- The process requires Transpower to consider alternatives when as a Transmission expert it is neither able to freely access the necessary information to enable it undertake robust consideration, nor indeed qualified to do so;
- The Proposal has been presented in a vacuum – that is to say the Proposal is based on an assumption of a requirement for significant investment in 2010 when clearly this not the starting point for the Commission;
- There has been a failure on the part of the Commission in applying the GIT to appropriately assess the implementation and operational risks of incremental solutions as proposed in the alternatives;
- In the face of rejection of the Proposal the parties (and the country) are now back to "square one" with the daunting prospect of it now being many months and a requirement for a significant ongoing commitment of resources before any certainty in relation to a GUP can be achieved.

Unison has serious concerns that the position arrived at as a result of the Commissions rejection of the Proposal and support for incremental upgrades which will potentially see no comprehensive investment action until 2017 is one that lends itself to “a third world” outcome that would not be acceptable to any other operator of modern electricity systems in the world.

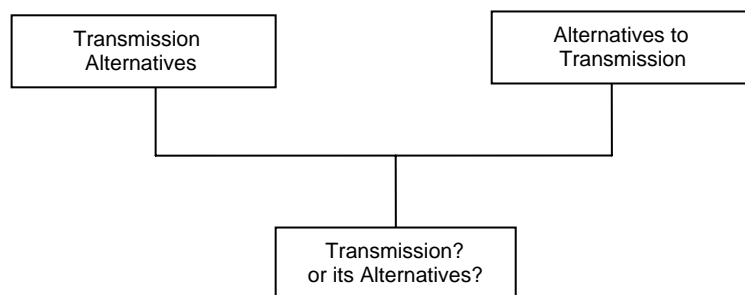
### The Process

Unison considers the Proposal has been presented in a vacuum – that is to say the Proposal is based on an assumption of a requirement for significant investment in 2010 which clearly was not the starting point for the Commission. In contrast to this assumption the Commission has determined there are significant benefits in deferral of investment until 2017, preferring an incremental “just in time” project approach. The extensive engagement that has occurred between the parties throughout this process ought to have identified much earlier there was a lack of common ground between them in this regard and accommodations made.

The problem all parties respond to should be specifically and explicitly defined in the Statement of Opportunities. As it is therefore with this misalignment of belief as to the issue or problem to be addressed - questions must be raised as to whether the advisors to the Commission were charged with consideration of the “right question”

In this regard we question the narrow scope of the Allen Consulting Group report. Whilst this report confirms incremental upgrades can be achieved, thereby giving validity to the Commission's position and alternatives, we consider the questions asked of the Allen Group lacked an appropriate focus. It is not an issue of whether or not an incremental upgrade is possible, but rather whether an incremental approach is a preferred option to one off, albeit large investment.

We believe that the process could have followed a clearer path generally. As demonstrated in the diagram below, the potential transmission solutions and the alternatives to transmission could have been examined initially, and then led to clearer options to consider:



We also note that in carrying out this process, the Electricity Commission seems to be operating in a central planning capacity in its approach to the evaluation of alternatives. We question the appropriateness of a regulatory body promoting alternatives and comparing them against those submitted by Transpower. We consider that the process should involve the Commission evaluating Transpower's submitted proposal and alternatives, following consideration of submissions from interested parties.

Transpower did provide alternatives as requested, yet the Commission responded with its own proposals, meaning that it was potentially assessing itself. It would seem as though the situation was one in which the relative merits of the competing

proposals were determined, as opposed to an assessment of Transpower's alternatives by the Commission.

Ultimately the question to be asked is what are the implications of this process for accountability? If Transpower engaging in this process for its investment decisions is constrained in its ability to operate its business to the extent it may affect the efficiency and effectiveness of the transmission service over time – who is accountable?

If, as a result of the regulatory decision-making process it is concluded that expansion of the transmission system north of Whakamaru should be delayed until 2017, but that decision leads to higher electricity prices and brown-outs – who is accountable?

It is not at all clear how this simple question of accountability for the delivery of the transmission service would be answered, as it appears there are four entities (Transpower, the Commerce and Electricity Commissions, and the Minister of Energy) that would be partially accountable, but none completely (and by implication therefore no one).

### **Incremental Upgrades**

We are concerned with the approach of the Commission, which places high value on deferral of expenditure, regarding incremental upgrades as being the best possible option. This alternative defers expenditure to the point of necessity, and seems to regard it as preferable to point zero investment. This perspective however fails to recognise the Grid is continuously run at capacity, brings with it the problem of operating constantly at a margin, and solutions arriving “just in time”.

This piecemeal approach is, we believe, most unsatisfactory in a developed country such as New Zealand, which should have the foresight and the capacity to provide solid investment into a well functioning grid network.

Specifically, we have identified the following difficulties in the Commissions recommended approach:

1. There is reliance on the proposed measures coming on stream at the right time in order for the whole system to function well. We believe this is an unacceptable risk given the possibility of any (or all) number of the measures being adversely affected.
2. The Commission's sensitivity analysis was based on static criterion with each individual factor taken as a single variable. In reality they are not independent variables, but cumulative. The analysis ought to have accounted for this. We further note in this regard that the analysis has not included any sensitivity on demand. As the only non static variable this ought to have been included.
3. We consider the Commission has been dismissive of the construction timeframes. Consideration must be given to project delivery works, which should allow windows for error and unforeseen time constraints. This allowance makes incremental solutions problematic – one should really aim for a 12 month window of opportunity for contingencies. The approach being taken by the Commission seems to be an assumption of efficiency with regard to the construction process.

4. We further believe the Commission has failed to give due consideration to the decommissioning of the 110kV ARI-PAK line. This particular corridor will have to be decommissioned ahead of the 400kV line. We ask whether the Commission has taken into account the restriction in capacity coming into Auckland as a result of this decommissioning? We believe of necessity this will have to be out of service 18 months prior to the livening of the circuits, as it crosses over the proposed path of the 400kV line many times.
5. Part of the Commission's proposal on the duplexing of lines runs into the problem of constructability and easements. We question the ability to secure easements on these developments and believe the cost of doing so ought to have been a factor for consideration of the alternative.
6. The consequences of Loss / Constrained Load. We consider there are wider issues the Commission ought to have factored into its assessment as a result of the constrained load into Auckland resulting from incremental upgrades. These include:
  - a. The constraint value of higher energy prices when the line would be operating at full capacity.
  - b. The opportunity cost of loss of investment into Auckland. One has to consider the effect that deferral will have on investment in Auckland, especially in the light of economic losses suffered by the city in recent events. An investor considering any form of capital input into cities in Australia or New Zealand will not favour that where the supply is less secure and reliable. Whilst it is difficult to measure this loss in dollar figures, it could be said to have an impact on the way investors view Auckland as an option.
  - c. The failure of a part of the current system reducing the reliability of the supply as a whole. As demonstrated in the recent Auckland blackout, the current system is too unstable, given that a mere accident at one point can result in a fairly dire consequence. This risk has a large bearing on both consumer and investor confidence.
  - d. An unconstrained grid has nodal price and market stimulant benefits – in simple terms it provides better access for generators to the market. The alternatives outlined by the Electricity Commission, however, are potentially relying on generation north of the constraint.

### **Utility Value**

We consider there are positive benefits in the Proposal that have yet to be recognised by the Commission.

Transpower's proposed 400kV line will have a longer service life in terms of capacity (2012 – 2045) in comparison to the alternatives. In essence the alternatives provide lesser capacity which start later and require further investment earlier than the Proposal.

The recent outage in Auckland is also a timely reminder that the Proposal not only addresses the issue of security of supply but also provides alternative GXP's into Auckland. In this regard the Proposal has an alternative substation yard in Auckland seven years earlier than the alternatives. It is a reasonable distance from the existing

substation, meaning the capital outlay is the same, but the benefit is greater in terms of security at the GXP.

### **Securing the Corridor**

At issue is whether the 400kV proposal is more than required. It is Unison's view that it is not and accordingly a corridor should be secured for all contingencies it is thought most likely to be required i.e. The highest requirement should be capable of being accommodated. Quite simply the additional capacity provides an option of "derisking" the other parts of the transmission network, which can be retired at the end of their economic life.

### **Conclusion**

We note with much interest the observations of Commissioner Close<sup>1</sup> and concur wholeheartedly with his assessment that:

*"In this process, attention has been diverted from some of the objectives of the grid investment test (such as promoting certainty for investment) and from the prime purpose of the grid investment rules in section III of part F of the Electricity Governance Rules ("to facilitate Transpower's ability to develop and implement long-term plans for investment in the grid").*

On the basis of the concerns raised in this submission we consider the outcomes are such that there will be little certainty for investment going forward and unacceptable constraints upon Transpower's ability to comprehensively plan for sound long term investment in the grid.

Simply put in the context of the Commission's draft decision, specifically:

- We do not accept the Commission has adequately identified alternatives to Transpower's proposal (Question 2)
- We do not agree with the Commission's approach to consideration of costs to use in the application of the GIT (Question 6)
- We do not agree with the Commission's approach to consideration of benefits to use in the application of the GIT (Question 7)
- We do not agree with the Commission's treatment of forecast demand (Question 8)
- We do not agree with the Commission's approach to modification of the scenarios from the Initial SOO (Question 9)
- We do not agree with the Commission's addition of modeled projects to enable evaluation of Transpower's proposal under the Rules (Question 10)
- We do not consider the real value option of flexible investment timing is justified (Question 13)
- We do not agree that the Proposal and Alternative Proposals effectively provide an equivalent level of transmission capacity into Auckland over the 20 year evaluation period (Question 15)

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<sup>1</sup> Draft Decision on Transpower's Auckland 400kV grid investment proposal – 27 April 2006 – Appendix 3

- We do not agree with the Commission's decision not to further consider competition benefits.
- We do not agree with the Commission's approach to the calculation of reliability benefits (Question 22)
- We do not accept that the incremental approach to transmission investment adopted by the Commission is consistent with the GIT (Question 27)
- We do not agree with the Commissions approach to the evaluation of terminal benefits at year 20 of the analysis timeframe (Question 29).
- We do not agree with the Commissions calculation of benefits to be included in the application of the GIT (Question 30).
- We do not agree with the Commissions approach to sensitivity analysis (Question 31).
- We do not agree with the Commissions assessment of risk in relation to investment delay (Question 32).
- We do not accept the Commissions interpretation of the GIT is consistent with the purposes of the grid upgrade and grid investment rules listed in rule 2 (Question 34)
- We do not consider that if one of the Alternative Projects were built, there would be a reliable supply of electricity to Auckland for the foreseeable future (question 20).

We would be happy to expand on these issues if you wish.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Ken Sutherland', written in a cursive style.

Ken Sutherland  
**CHIEF EXECUTIVE**