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10 March 2011

Electricity Authority
Level 7, ASB Bank Tower
2 Hunter Street
Wellington

By Email

Dear Sir/Madam

**SUBMISSION - GENERATION FAULT RIDE THROUGH**

Thank you for the opportunity to provide a submission on the Consultation Paper relating to Generation Fault Ride Through ("GFRT").

In addition to our detailed comments, which are attached below, we wish to raise the following key points in regard to the consultation paper:

1. TrustPower wishes to make it clear to the Electricity Authority ("EA") that while it generally agrees with the final outcome of the analysis, it does not agree with the wind generation based assumptions that it appears were used by the EA in order to justify the review.

   A key reason for the initiating the review was based on the GFRT studies undertaken by the Wind Generation Investigation Project ("WGIP"). These studies found that GFRT may become an issue if a significant amount of synchronous generation was "displaced" by wind generation that contained no GFRT capability. To date what has happened is that wind generation has actually "complemented" as opposed to "displaced" synchronous generation.

   Another key assumption made through out all of the WGIP studies was that all new wind generation would be from simple induction generators and therefore have no GFRT capability. In reality, this has proven to be very pessimistic as none of the windfarms greater than 30 MW that have been commissioned in New Zealand since the WGIP study was undertaken have used simple induction generators. In fact all of them have consisted of either, synchronous machines, doubly fed induction generators with statcoms or full scale converter machines.

2. Upon reading the detailed analysis undertaken by the System Operator TrustPower also formed the opinion that the voltage issues facing New Zealand are not solely as a result of the ratio between synchronous and non-synchronous generation but also related to the rate at which load growth has exceeded transmission investment over time.

3. TrustPower considers the information provided regarding the NPV analysis to be somewhat lacking and therefore ambiguous. However, despite whose assumptions are used, TrustPower does not expect the outcome to be materially different. Further to this, when compared to the financial implications regarding frequency management we consider this to be relatively insignificant.

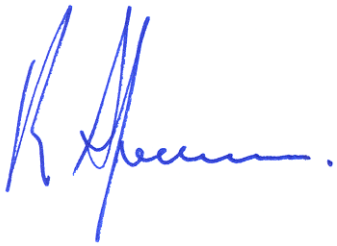
4. Finally TrustPower does not understand the rationale behind the comments in paragraph 4.6.3 of the paper regarding exempting synchronous generation from compliance costs. TrustPower is clearly of the view that all generation technologies need to be treated in an equal manner.

To summarise while TrustPower does not necessarily agree with a number of the assumptions made in the analysis and has issues with a number of points regarding the code change, it does conditionally support the proposal.

TrustPower wishes to thank the System Operator and the Electricity Authority for the extensive work they have done analysing the power system and preparing this proposal, and wish to make ourselves available to answer any further questions you may have.

Please find attached our response to your specific questions.

Yours sincerely



**Richard Spearman**
**OPERATIONS MANAGER**

# Generation Fault Ride Through
# Submission by TrustPower Limited

| | Question | Comment |
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| Question 1 | Do you agree with the System Operator's modelling assumptions and study methodology? | TrustPower agrees with the System Operators reasoning for using the summer peak in assessing the transient under voltage conditions.<br><br>The performance of the system following an HVDC fault appears to be a significant factor in determining the "tail" of the proposed transient under voltage component of the envelopes. This is of particular concern to some manufacturers of Doubly Fed Induction Generator ("DFIG") based equipment. Given that the System Operators study was undertaken in late 2009, early 2010, it is unclear if Pole 3 of the HVDC has been allowed for and, if so, whether the system's performance improves or deteriorates as a result.<br><br>Upon reading the System Operators report it appears as if the transient under voltage performance of the system is expected to deteriorate over the next few years more as a function of load growth than from the displacement of synchronous generation sources or the deterioration in the performance of the generation fleet.<br><br>For the purposes of the study TrustPower agrees with the top down approach adopted by the System Operator. However, given that voltage issues are often localised in various parts of the grid, from an implementation perspective TrustPower sees real merit in the System Operator continuing to undertake location specific fault studies to determine the real impact and use the dispensations process if appropriate. |
| Question 2 | Should the fault ride through standard apply to generating stations smaller than 30 MW? | No.<br><br>TrustPower firmly believes there are numerous reasons why stations less than 30MW should be considered as Excluded Generating Stations. For example:<br><br>1. The cost to connect stations of less than 30MW to the Grid is such that the majority of stations less than 30 MW are, and will continue to be, embedded within distribution networks where it has been identified that the impact of low voltage events is somewhat attenuated. See paragraphs 2.4.8 and 2.4.10.<br><br>2. As this Code change applies to all forms of generation, not only wind powered generation, the EA must be mindful of the impacts this would have on other forms of non-synchronous distributed generation, such as, but not limited to, hydro based induction machines and the like. If stations less than |

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| | | 30MW were subject to the proposed GFRT provisions then paragraph 4.6.3 implies that small hydro based induction machines would face compliance costs.<br>3. The cost of providing GFRT by the provision of STATCOM type devices is not linear. That is the cost per unit of STATCOM based GFRT capability generally reduces as the size of the plant increases.<br>4. The cost of providing GFRT for sites of less than 30 MW would be considered as a definite barrier to entry. |
| Question 3 | Should the fault ride through standard apply to existing synchronous generating plant? | No.<br>However, to avoid possible confusion it should also be made clear that the proposed GFRT standard should not apply to any existing generation plant - as opposed to any existing synchronous generating plant as proposed.<br>Despite it being unrealistic to impose this requirement on existing synchronous machines it is also understood that in general New Zealands existing fleet of synchronous generators perform relatively well during transient under and over voltage type events. This is also reinforced by paragraph 3 of the Executive Summary.<br>The studies undertaken by the WGIP also found that GFRT may become an issue if a significant amount of synchronous generation was "displaced" by wind generation with no GFRT capability. To date what has happened is that wind generation has actually "complemented" as opposed to "displaced" synchronous generation.<br>It should also be noted that the WGIP studies assumed that all new wind generation would be from simple induction generators and therefore have no GFRT capability. In reality, this has proven to be very pessimistic as none of the windfarms greater than 30 MW that have been commissioned in New Zealand since the WGIP study was undertaken have used simple induction generators. In fact all of them have consisted of either, synchronous machines, Doubly fed Induction Generators ("DFIG") with STATCOMS or full scale converter machines. |
| Question 4 | Do you agree that a single composite standard for both the North and South Islands is likely to result in increased compliance costs? | When compared to the status quo, yes. However, when compared to the proposed individual North and South Island standards TrustPower does not expect the costs to be significantly different.<br>On checking with one of the leading suppliers it was determined that the most onerous part of the proposed envelope for them to comply with occurred on the under voltage transient curve approximately 2 seconds after the initiation of the event. As the requirements of the North and South Island curves are identical after 1.3 seconds the impact on this particular supplier would be the same for |

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| | | both islands. |
| Question 5 | Do you agree that the WGIP wind generation scenarios are appropriate for the NPV analysis? | TrustPower wishes to remind the EA that the WGIP scenarios were developed for the purpose of testing various power system limits and that significant effort was taken to reinforce to those involved in the WGIP process that these scenarios were not to be considered as forecasts. It appears to TrustPower that the EA is now using these scenarios as a proxy forecast.<br><br>As mentioned in TrustPowers response to Question 3 above, the WGIP scenarios also assumed that all new wind generation installed during the next 10 years would consist of simple induction machines. This has proven not to be the case and to the best of our knowledge no significant installations of simple induction machines have taken place in New Zealand since the development of Tararua 2 in the mid 1990's.<br><br>While not directly related to the wind generation scenarios, TrustPower notes that in paragraph 4.6.3 the EA is proposing to waive compliance costs for non-conforming synchronous generators. While TrustPower agrees with this for existing non-conforming synchronous generators and generating stations of less than 30MW it does not agree that new large non-conforming synchronous generation plants should be exempt from costs associated with their lack of compliance. |
| Question 6 | Do you agree with the Authority's input assumptions for the NPV calculations? If not, please provide alternative input values? | While the figures of 437 MW's and 61 MW's for the installed base capacity of North and South Island's appears correct, the purpose and significance of these numbers is not clear to the reader. As discussed in TrustPower's response to Question 3 above it should be stressed that the majority of New Zealands existing wind generating capacity does have GFRT capability.<br><br>The reserves prices associated with the South Island are higher than TrustPower would expect on average – particularly the FIR. This is no doubt due to the inclusion of 2008. We feel it would be more appropriate to determine the average cost over a longer duration.<br><br>The cost of providing GFRT capability by the provision of STATCOM type devices is not linear. That is, the cost per unit of STATCOM based GFRT capability generally reduces as the size of the plant increases. Therefore on small sites containing simple induction machines or DFIG's the cost is expected to be significantly higher than the 1.25% figure assumed in the analysis. A fixed + variable approach of say $2M + 1.25% of the project cost may be a more realistic way of representing the actual cost. TrustPower does also not necessarily agree that all wind turbines will contain full scale converter technology by 2020.<br><br>It is not clear from the information provided what period, or duration, the NVP analysis was carried out over. |

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| | | While TrustPower and the EA may have differing views on the inputs to the NPV analysis we expect that the impact of these differing views is reasonably immaterial in the big picture. For example, when compared to the exorbitant costs associated with the procurement of frequency regulating reserve in New Zealand we consider the financial implications of GFRT to be reasonably minor. |
| Question 7 | Do you agree that there is a moderate to high probability of scenario B wind penetration levels being reached in the next 10 years. | In the North Island, yes. Particularly given that approximately 50% of that figure is already installed in the North Island and a number of other projects are either committed or close to being committed.<br><br>In the South Island we are unsure. While a number of good sites have been consented the economics of developing large scale sites in the South Island is presently hampered by the current HVDC pricing methodology. |
| Question 8 | Do you agree that there would be benefits in proceeding immediately with proposed fault ride through standards or should the effective date of the proposed standards be triggered at a future date by the level of wind generation penetration | As all windfarms greater than 30 MW constructed within New Zealand since the WGIP have contained GFRT capability TrustPower does not expect the introduction of the standards to materially effect windfarms.<br><br>Further to this, from the study undertaken by the System Operator it appears as if the deteriorating performance of the power system is being driven by other factors such as demand growth as opposed to new wind generation displacing existing synchronous generation.<br><br>TrustPower therefore conditionally supports the introduction of the standards immediately. However, given the considerable duration between projects becoming “committed” and “connected” TrustPower would only support the immediate introduction if it applied to plants that were “committed” as opposed to “connected” at the time the standards were put in place and that if grandfathering provisions are put in place for all existing generation stations. |
| Question 9 | Do you agree with the Authority’s overall assessment that the proposal best meets the objective of the proposal? | No, not completely. As discussed in TrustPower’s response to the questions above, TrustPower supports the concept of GFRT standards. However, it does not believe the argument that the requirement is being driven by simple induction based wind generation displacing existing synchronous generation. |
| Proposed Code Changes | Comment on proposed Code changes. | While TrustPower would like the opportunity to discuss the rational behind the proposed Code changes with the EA staff in person it also wishes to make the following comments:<br><br>Given the location specific nature of voltage issues TrustPower feels it appropriate that Asset Owners and the System Operator retain the ability to apply for and grant dispensations where appropriate.<br><br>Clause 8.20C – TrustPower believes that this mechanism should be available to all generating stations as opposed to only wind generating stations as drafted. |

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| | | Recommendation - remove “wind”.<br><br>Clause 8.20C (b) - Like above, TrustPower believes that this mechanism should be available to all generating stations as opposed to only wind generating stations as drafted. Recommendation - remove “wind”.<br><br>Clause 8.20D(1)(b) – Rearrange the clause to allow for units that are “committed for construction” as opposed to “connected” prior to the date in which the clause comes into effect. Recommendation – substitute “connected” with “committed for construction”.<br><br>Clause 8.20D(3) – Add “, 8.20B” after “8.20A” |