

22 November 2007

Jenny Walton
Electricity Commission
Level 7, ASB Bank Tower
2 Hunter Street
PO Box 10041
Wellington

By email: info@electricitycommission.govt.nz

SUBMISSION ON THE PROPOSED CONNECTION CODE AND OUTAGE PROTOCOL

- 1 Orion welcomes the opportunity to submit on the paper recently released by the Electricity Commission (the *Commission*) on the *proposed connection code and outage protocol* (the *paper*).
- 2 Our submission is in four parts:
 - 2.1 general comments on the paper;
 - 2.2 Comments on the proposed power factor requirements;
 - 2.3 our response to the specific questions raised in the paper, which we set out in the schedule to this letter; and
 - 2.4 a proposed version of the connection code (the *code*).

General Comments

Connection Code

- 3 We consider that the proposed code does not reflect a fair and reasonable balance between the requirements of designated transmission customers and the legitimate interests of Transpower.
- 4 We consider that in its present form the code it is seriously flawed and if implemented:

- 4.1 will result in designated transmission customers having to breach the rules.
 - 4.2 will result in designated transmission customers having conflicting requirements placed on them by the system operator and the grid owner.
 - 4.3 will result in conflicting requirements between the rules and the connection code.
- 5 We consider that the proposed code requires Transpower to provide approvals on matters that are rightly and properly the domain of the distribution customer.
- 6 The most significant problem is the interpretation of the definitions in the code. While we assume that this problem is one of drafting and not deliberate, we do not consider that the code as currently drafted is acceptable as a document that will form part of a legally binding contract.

For example a literal interpretation of:

clause 2 of the code would require us to obtain written approval from Transpower before commissioning any of our assets (arguably down to the 400 Volt level). This is unwarranted and impractical;

clause 3 would require that we must ensure that our equipment is designed, tested and commissioned as approved by Transpower. Transpower's expertise is not in the design, testing or commissioning of distribution assets. Again this is inappropriate and is impractical.

Clearly if the code is interpreted in a literal manner it does not reflect a fair and reasonable balance between the requirements of designated transmission customers and the legitimate interests of Transpower

We recommend that the definition of 'Equipment' in section 1.2 be modified to limit the scope of the code and other clauses be examined to ensure that obligations on designated transmission customers are relevant.

- 7 Other parts of the code of concern to us do not appear to be drafting errors. For example clause 5 of the code refers to table B1 Appendix B of the code which provides for minimum and maximum voltage ranges for 33kV, 22kV and 11kV that are $\pm 10\%$ above and below the nominal voltage. These proposed voltage ranges are unacceptable to us.

If implemented, these may result in distributors being unable to comply with regulation 53 Voltage of the Electricity Regulations 1997¹ which require that voltages at customers' points of connection be maintained within $\pm 6\%$.

- 8 We note that paragraph 4.4.23 to 4.4.25 of the paper indicates that Transpower considers that the standards in clause 5.1 are required to ensure that equipment is operated in a way that is safe, legal and does not adversely affect the grid. Neither Transpower nor the Commission appear to have considered that this will adversely affect the connected designated transmission customers and may result in their failure to comply with their legal obligations. In fact clause 5.1 (f) specifically requires customers to ensure that their Equipment "*does not cause Transpower to breach any legislation*" yet no reference is made to ensuring that 'the operational performance of Transpower Equipment' does not cause designated transmission customers to breach any legislation.
- 9 We consider that is just another example that the code does not reflect a fair and reasonable balance between the requirements of designated transmission customers and the legitimate interests of Transpower. In addition it fails to reflect the interests of end use customers as required by the Benchmark principles.
- 10 We accept that there may be cases where, in the interests of end use customers, Transpower or dedicated transmission customers may require a wider voltage range. Any change to the voltage range should be a result

¹ 53 Voltage

1) *The supply of electricity to electrical installations operating at a voltage of 200 volts ac or more but not exceeding 250 volts ac (calculated at the point of supply)—*

(a) *Must be at standard low voltage; and*

(b) *Except for momentary fluctuations, must be kept within 6% of that voltage*

(2) *The supply of electricity to electrical installations operating at other than standard low voltage (calculated at the point of supply)—*

(a) *Must be at a voltage agreed between the electricity retailer and the customer; and*

(b) *Unless otherwise agreed between the electricity retailer and the customer, and except for momentary fluctuations, must be maintained within 5% of the agreed supply voltage.*

of negotiation between the parties and ensure that all legal obligations are considered. Orion and Transpower have already negotiated a wider voltage agreement to cover issues of this type and we expect that this would be rolled into a connection code or some other part of the transmission agreement by negotiation.

- 11 We recommend that voltage range in Table B1 be adjusted for the 33kV nominal voltage to be $\pm 5\%$ and for the 22kV and 11kV nominal voltages to be $\pm 2.5\%$.
- 12 We further recommend that the Commission consider whether Table B3 is more appropriately a common quality issue.

Co-ordination with the Electricity governance rules and the Benchmark agreement

- 13 A further concern is that the connection code strays into areas that are already covered in the electricity governance rules. Part C of the rules and the associated Policy statement deals with Common Quality – that is

*“common quality” means those elements of quality of **electricity** conveyed across the **grid** that cannot be technically or commercially isolated to an identifiable person or group of persons*

- 14 We note that in a number of areas the code strays into areas that are already covered by the rules (this is not an exhaustive list) for example;
 - 14.1 clause 1.5 ‘Customers responsibilities to third parties’ is far more onerous than the requirements of Part C section III.

This clause places obligations on the designated transmission customer and any third party with generating units or motors with a combined capacity of more than 1MW whether or not they may have an adverse impact on the grid.

We consider that this obligation is unnecessary because:

- Part C of the Rules provides information for the management of the grid to the System Operator.
- We believe the intention of this clause is to enable Transpower to better understand the electrical characteristics of the connected load being presented at the grid interface but consider that there are more cost effective ways to achieve this result.

- We consider it would be more cost effective for Transpower to install power quality monitoring equipment at the grid interface. We consider this will provide a far greater level of modelling accuracy by monitoring load response during grid contingencies.
- The proposal will incur a high level of administration cost with a low level of accuracy. As a consequence of regulatory changes over the years we no longer maintain information of the type requested by Transpower.

- 14.2 Clause 2.1 *Requirements for asset capability statement*, is just a duplication of the information required by the system operator under Part C Schedule C3 Technical Code A. This part of the EGRs also covers the disclosure of this and other information.
- 14.3 Clauses 2.5 to 2.11 provide the requirements relating to commissioning and testing of equipment.
- 14.4 5.1 (b) - *operation within the maximum system voltage*. Rule 3.1.3 of Part C Section III requires distributors to ensure that its local network is capable of being operated over the range of voltages set out in rule 3.1.1.
- 15 We consider that the code should not deal with any issues that are more appropriately dealt with in the rules.
- 16 We note that the proposed voltage ranges in Table B1 are inconsistent with the “Voltage Range objective” definition contained in Part C clause 35 of the Benchmark Agreement.
- 17 Further concerns with the code are dealt with in more detail in our answers to the Commission’s specific questions.

Outage protocol

- 18 We do not have the same major concerns with the outage protocol as we have about the connection code. However we consider that clarification is needed in respect to the outages resulting from the operation of Transpower’s circuit breakers that are under the operational control of a distributor, where the resulting outage affects only that designated transmission customer.
- 19 We consider that in this case there is no need to include these outages in the outage plan as this could place unnecessary constraints on the

customer and lead to frequent recourse to the 'short term connection asset variations' provided in clause 4.3 of the protocol.

Proposed Power factor correction requirements

- 20 The paper suggests that it would be cost effective to correct the power factor of the distributor's sub-transmission system to 0.99. While we consider that there may be a case for this in some instances we do not consider that it can be applied universally to all Grid exit Points (GXPs)
- 21 To test the Commission's preliminary analysis we have carried power factor correction studies at an urban GXP Bromley 66kV (BRY0661) and a rural GXP Springston 66kV (SPN 0661).

Inputs

- 22 We have used the Commission's inputs but note the following:
- 22.1 Recent prices for high voltage grid connected capacitance seem to be higher than \$16,480/MVAr. We consider that a price more like \$20,000 to \$25,000/MVAr including connection costs would be more appropriate.
- 22.2 The cost of 11kV capacitance and installation may be less than \$34,690/MVAr but varies significantly depending on the size of each installation and the associated switchgear alterations.
- 22.3 A 10% capital funding assumption is fairly low for return on and of capital.
- 22.4 We consider that the Commission's estimation of energy costs at \$100/MWh may be a little high.
- 22.5 In the case of our rural network, there is potential for subtransmission network deferral to add value to 11kV power factor correction which, without the grid benefits, is uneconomic.

Urban results

- 23 The results of our urban example indicate that Orion's urban low loss underground 66kV sub-transmission network from Bromley GXP to the local zone substations does not support the economic case of 11kV bus power factor correction beyond 0.95 power factor.

- 24 The loss reduction on the sub-transmission network with a typical 40MW urban zone substation by improving power factor from 0.95 to 1.0 on the 11kV bus is approximately 22kW. The increased cost of 11kV power factor correction versus 66kV GXP capacity is not justified by a 22kW loss reduction. The same is true for 0.95 to 0.96, etc.
- 25 We note that in the case of Bromley GXP, Transpower chose to install grid capacitance on the tertiary 11kV winding of the BRY 220/66/11kV supply banks. Using Orion's analysis it would have been more economic to install grid capacitors at the 66kV level unless Transpower had additional reasons for installing the capacitors on the 11kV.
- 26 In this particular case given that Transpower, for whatever reason, decided to install grid capacitance at the 11kV level it would have been marginally more cost effective (22kW loss saving) to have connected this at an 11kV distribution network zone substation..

Rural results

- 27 Our rural case compares 11kV zone substation power factor correction with SPN 66kV bus power factor correction. The results indicate that correcting from 0.95 to 0.99 power factor is marginally economic.
- 28 With a peak load of 52.5MW at Springston GXP, the reduction in losses is 110kW at peak for 0.95 to 0.99 power factor correction and the high load loss factor of 0.376 produces loss savings of 363MWh per annum. Springston GXP power factor is currently 0.98 at peak so the actual benefits would be less than the example.

Capacitors as a transmission alternative

- 29 The Commission should ensure that grid capacitance is not installed by Transpower without first consulting with distributors as to whether providing network capacitors would be a suitable transmission alternative.
- 30 In the rural case above, installing 11kV distributed capacitance could be considered a transmission alternative. The cost of installing and maintaining the 11kV plant would be passed onto Transpower with Commission approval.

Recommendation

- 31 Given the significant variance in sub-transmission/distribution network characteristics, we do not believe that it is appropriate to mandate power

factor correction to a specific value. Transpower should consider the use of network connected capacitors as a transmission alternative.

Process

- 32 We are concerned about the timing of the process for consultation in relation to the connection code. Orion is currently in the position of having to concurrently consider the draft default transmission agreement including a number of the other schedules while the Commission is still consulting on the code.
- 33 We consider that the code will require considerable modification to be fit for purpose and that a second round of consultation on a modified code will be required.
- 34 We understand the time constraints that the Commission is faced with and would recommend that to ensure that the overall process is not delayed and to ensure adequate consultation, the Commission should adopt a minimal code initially which can, if necessary, be added to later following further consultation. Prior to further consultation, the Commission may wish to consider the formation of an industry technical working group to provide relevant discussion and enhancement to the connection code.
- 35 We consider that this is far more appropriate approach than to include the proposed code and then trying to fix it later. This will also reduce compliance costs that will result from breaches of the proposed code.
- 36 Thank you for the opportunity to make this submission. If you have any questions, please contact Dennis Jones (Industry Developments Manager) DDI 03 363 9526, email dennis.jones@oriongroup.co.nz or Glenn Coates (Planning Manager) DDI 03 363 9819, email glenn.coates@oriongroup.co.nz .

Yours sincerely



Dennis Jones
Industry Developments Manager

Schedule 1 – Answers to the Commission’s specific questions

Question	Comment
<p>Q4.1 Do submitters consider that the proposed Connection Code reflects a fair and reasonable balance between the requirements of designated transmission customers and the legitimate interests of Transpower? If not why not?</p>	<p>No. Orion <u>does not</u> consider that the proposed connection code reflects a <i>fair and reasonable balance between the requirements of designated transmission customers and the legitimate interests of Transpower</i></p> <p>We consider that in its present form the code is seriously flawed. We consider that:</p> <ul style="list-style-type: none"> • it will result in designated transmission customers having to breach the rules. • it has the potential to result in designated transmission customers having conflicting requirements placed on them by the system operator and the grid owner. • there are conflicts between the rules and the connection code • it transgresses into common quality issues that are appropriately dealt with under the rules. <p>The paper notes that the connection code must give effect to the principles set out in rule 3.3.4 of section II. We have considered the code against these principles and consider that the code does not meet these principles (for further detail see our response to question 4.9 below</p> <p>We consider that neither Orion or Transpower would be able to comply with a literal reading of the connection code. We believe that if the Commission accepts the current drafting of the connection code then it will be putting into place rules that designated transmission customers will have no choice but to breach.</p> <p>For example we consider that the requirements of clause 2 and 3 are totally unacceptable and unworkable. A literal interpretation of:</p> <p style="padding-left: 40px;">clause 2 would require Orion to obtain written approval from Transpower before commissioning any of our assets. This is totally unwarranted and impractical;</p> <p style="padding-left: 40px;">clause 3 would require that we must ensure that our equipment is designed, tested and commissioned as approved by Transpower.</p> <p>Clearly these do <u>not</u> reflect a <i>fair and reasonable balance between the requirements of designated transmission customers and the legitimate interests of Transpower</i></p> <p>To maintain any reasonable level of service to our customers we would have to ignore this requirement and breach the rules. The alternative is that Transpower gives such a broad and general agreement to non compliance under clause 1.4 as to make these rules redundant.</p> <p>We note that the code does not place on Transpower any time requirements to provide their written approval, and that the Commission is interested in feedback on this issue.</p>
<p>Q4.2 Do submitters have any particular views as to whether the non-compliance procedure set out in the proposed Connection Code should</p>	<p>Orion considers that the rules 5.1 to 5.4 of Part F are not appropriate in relation to non-compliance agreements under clause 1.4. These rules are more concerned with variations to the benchmark agreement that will affect the levels of services and reliability, which are more appropriately covered in the agreed service levels. We consider that if the code is limited to the matters that the code must provide for, as set out in rule 3.3.3 section II of Part F, then it should have a material effect on service and reliability to end use customers. We consider that unless the code is modified, the connection requirements set out in clause 2, when considered with the current definition of 'Equipment', will require Orion to breach the connection code. We do not consider that it is appropriate to rely on Transpower's discretion</p>

<p><i>be subject to rules 5.1 to 5.4 of section II of part F which take account of the interests of third parties?</i></p>	<p>under clause 1.4 to circumvent the code's requirement. We consider that the code should be corrected to a workable form.</p>
<p><i>Q4.3 Do submitters consider there to be other technical requirements of connection that need to be specified in the Connection Code? If so, why?</i></p>	<p>No</p>
<p><i>Q4.4 Do submitters consider that the net benefits of a generic approach are greater than including detailed technical requirements and standards for a range of connection configurations that provide for 'automatic' approval and using the agreement covering non-compliance to cover the exceptions? If not, why not?</i></p>	<p>No. In the case of distributor customers a large proportion of all grid connections could be covered by a handful of template based forms. To clarify Transpower's intentions for the quantity and level of information required for compliance we believe that the connection code should include a selection of templates to be completed by the customer for connection approval (not automatic approval). From the customers' perspective these forms would be optional and thereby facilitate non standard innovative solutions when required.</p>
<p><i>Q4.5 Do submitters</i></p>	<p>Yes. Paragraph 4.2.5 indicatest only a few timeframes governing the approval requirements set out in the connection code. It goes on to indicate that Transpower considers that, where no timeframe has been proposed, it is not practical to impose one, given the complexity of the matters the code deals with.</p>

<p><i>consider that there should be more timeframes specifying within which Transpower and designated transmission customers should provide information and complete assessments? If so, why?</i></p>	<p>The Commission has proposed that <i>“the reasonably practical alternative is to include more timeframes specifying within which Transpower and designated transmission customers should provide information and complete assessments. The timeframes would be commensurate with the complexity and size of connection”</i>².</p> <p>We agree with the Commission that this is a practical alternative. We recommend that the Commission consider Part 2 of the Electricity Governance (Connection of Distributed Generation) Regulations as an example of an application process and timeframes within which new connections should be processed as an initial starting point for consideration.</p> <p>These Regulations provide distributors with a set of times within which to respond to distributed generators that wish to connect to distribution networks. These times vary depending on the size of the generator that wishes to connect and also provide for extensions of time by agreement. We have reproduced clause 19 (below) of these regulations to provide the Commission with an indication of the timings.</p> <p>19 Time within which distributor must decide final applications</p> <p>(1) <i>The written notice required by clause 18 must be provided within---</i></p> <p>a) <i>45 business days after the date of receipt of the final application, in the case of an application for distributed generation that is not capable of generating electricity at a rate of at least 1 MW; or</i></p> <p>b) <i>60 business days after the date of receipt of the final application, in the case of an application for distributed generation that is capable of generating electricity at a rate of at least 1 MW but is not capable of generating electricity at a rate of at least 5 MW; or</i></p> <p>c) <i>80 business days after the date of receipt of the final application, in the case of an application for distributed generation that is capable of generating electricity at a rate of at least 5 MW or above.</i></p> <p>(2) <i>The distributor may seek 1 or more extensions of the time specified in subclause (1).</i></p> <p>(3) <i>The distributor must do this by notice in writing to the generator specifying the reasons for the extension.</i></p> <p>(4) <i>The generator may grant an extension of up to 40 business days and must not unreasonably withhold consent to an extension.</i></p> <p>We provide this only as an example. It may be appropriate to have additional time frames for connections above 5MW. Longer extensions to the time frames would also be appropriate via agreement between Transpower and the customer.</p> <p>We consider that it is essential that Transpower must be required to meet set performance requirements in relation to this issue in order to provide a level of certainty to designated transmission customers.</p>
---	---

² Para 4.6.11 Consultation paper: Proposed Connection Code and Outage protocol 19 October 2007

<p><i>Q4.6 Do submitters have any comments on the results of the preliminary analysis in Appendix 4? Do submitters have any additional analysis that they would like the Commission to consider?</i></p>	<p>We do not consider that it would be appropriate to require designated transmission customers to maintain a power factor of 1.0. We note the following in regard to the inputs values used in the analysis:</p> <ul style="list-style-type: none"> • Recent prices for high voltage grid connected capacitance seem to be higher than \$16,480/MVAR. We consider that a price more like \$20,000 to \$25,000/MVAR including connection costs would be more appropriate. • The cost of 11kV capacitance and installation may be less than \$34,690/MVAR but varies significantly depending on the size of each installation and the associated switchgear alterations. • A 10% capital funding assumption is fairly low for return on and of capital. • We consider that the Commission's estimation of energy costs at \$100/MWh may be a little high. <p>We have carried out a brief power factor correction study at an urban GXP Bromley 66kV (BRY0661) and a rural GXP Springston 66kV (SPN 0661). The results indicate that the urban low loss underground 66kV sub-transmission network does not support the economic case of 11kV bus power factor correction beyond 0.95 power factor. In the rural case the results indicate that correcting to 0.95 to 0.99 power factor is marginally economic.</p> <p>We consider that the installation of 11kV distributed capacitance could be considered a transmission alternative. The Commission should ensure that grid capacitance is not installed by Transpower without first consulting with distributors as to whether providing network capacitors would be a suitable transmission alternative. Please refer also to our general comments above.</p>
<p><i>Q4.7 Do submitters consider there to be other values for leading or lagging power factor that should be set out in the proposed Connection Code that better meet the requirements for the Connection Code? If so, why?</i></p>	<p>We consider that there may be some value of rural 11kV network power factor correction beyond 0.95 when a distributors subtransmission network is constrained and the value of network investment deferral is included with the saving in losses beyond the GXP.</p>
<p><i>Q4.8 Do submitters have any views as to the appropriateness of the common standards</i></p>	<p>We have serious concerns about the appropriateness of the common standards which we have articulated in other areas of our submission and in response to the Commission's other questions.</p>

<p><i>proposed?</i></p>										
<p><i>Q4.9 Do submitters agree that the proposed Connection Code conforms with the purpose and principles set out in rules 3.3.1 and 3.3.4 of section II?</i></p>	<p>No. Orion does not consider the proposed code conforms with the purpose and principles set out in rules 3.3.1 and 3.3.4 of section II Part F</p> <table border="1" data-bbox="383 496 1664 1179"> <thead> <tr> <th data-bbox="383 496 922 564">Principle</th> <th data-bbox="922 496 1664 564">Comment on the codes compliance with the principle</th> </tr> </thead> <tbody> <tr> <td data-bbox="383 564 922 735"> <p><i>(i) reflect a fair and reasonable balance between the requirements of designated transmission customers and the legitimate interests of Transpower as asset owner</i></p> </td> <td data-bbox="922 564 1664 735"> <p>No. The code is clearly biased towards Transpower and intrudes into areas of design that are clearly within the designated customer bailiwick.</p> </td> </tr> <tr> <td data-bbox="383 735 922 975"> <p><i>(ii) reflect the interests of end use customers;</i></p> </td> <td data-bbox="922 735 1664 975"> <p>No. If interpreted literally it will impose significant delays on normal distributor work.</p> <p>The wide voltage limits of 10% above and below nominal in table B1 will have adverse effects on customers supplied from equipment connected to the grid at a nominal voltage of 33kV, 22kV and 11kV.</p> </td> </tr> <tr> <td data-bbox="383 975 922 1179"> <p><i>(iii) reflect the reasonable requirements of designated transmission customers at the grid injection points and grid exit points, and the ability of Transpower to meet those requirements</i></p> </td> <td data-bbox="922 975 1664 1179"> <p>No. The current drafting of the code implies that Transpower is better able to manage the operations of a distribution business than the distributor.</p> <p>We consider it is reasonable to expect to be able to carry out normal daily modifications to our network without notification to, or approval from, Transpower as long as we remain within the contracted capacity and</p> </td> </tr> </tbody> </table>		Principle	Comment on the codes compliance with the principle	<p><i>(i) reflect a fair and reasonable balance between the requirements of designated transmission customers and the legitimate interests of Transpower as asset owner</i></p>	<p>No. The code is clearly biased towards Transpower and intrudes into areas of design that are clearly within the designated customer bailiwick.</p>	<p><i>(ii) reflect the interests of end use customers;</i></p>	<p>No. If interpreted literally it will impose significant delays on normal distributor work.</p> <p>The wide voltage limits of 10% above and below nominal in table B1 will have adverse effects on customers supplied from equipment connected to the grid at a nominal voltage of 33kV, 22kV and 11kV.</p>	<p><i>(iii) reflect the reasonable requirements of designated transmission customers at the grid injection points and grid exit points, and the ability of Transpower to meet those requirements</i></p>	<p>No. The current drafting of the code implies that Transpower is better able to manage the operations of a distribution business than the distributor.</p> <p>We consider it is reasonable to expect to be able to carry out normal daily modifications to our network without notification to, or approval from, Transpower as long as we remain within the contracted capacity and</p>
Principle	Comment on the codes compliance with the principle									
<p><i>(i) reflect a fair and reasonable balance between the requirements of designated transmission customers and the legitimate interests of Transpower as asset owner</i></p>	<p>No. The code is clearly biased towards Transpower and intrudes into areas of design that are clearly within the designated customer bailiwick.</p>									
<p><i>(ii) reflect the interests of end use customers;</i></p>	<p>No. If interpreted literally it will impose significant delays on normal distributor work.</p> <p>The wide voltage limits of 10% above and below nominal in table B1 will have adverse effects on customers supplied from equipment connected to the grid at a nominal voltage of 33kV, 22kV and 11kV.</p>									
<p><i>(iii) reflect the reasonable requirements of designated transmission customers at the grid injection points and grid exit points, and the ability of Transpower to meet those requirements</i></p>	<p>No. The current drafting of the code implies that Transpower is better able to manage the operations of a distribution business than the distributor.</p> <p>We consider it is reasonable to expect to be able to carry out normal daily modifications to our network without notification to, or approval from, Transpower as long as we remain within the contracted capacity and</p>									

		<p>service levels set in the transmission agreement.</p> <p>Should any intended additions or modifications by Orion or third parties connected to our network result in Orion potentially exceeding the contracted capacity and service levels or prevents Transpower from delivering to its agreed service standards, then Orion would notify Transpower to agree on a resolution.</p>	
	<p><i>(iv) reflect the differing needs of different classes of designated transmission customers</i></p>	<p>No. While the code does have a number of specific requirements for generating units this can hardly be considered to <i>reflect the differing needs of different classes of designated transmission customers</i> and direct connect designated transmission customers are not mentioned at all. Nor does the code take any account of the size of a particular grid exit point and the implications that has on the relevance of size of generation or motor loading connected to it.</p>	
	<p><i>(v) be appropriate to the technical requirements of services provided at the point of connection to the grid, but not duplicate requirements that are more appropriately included in the grid reliability standards;</i></p>	<p>No, a literal reading of the code indicates that it goes far beyond any reasonable technical requirements related to the services provided at the grid exit point. It duplicates common quality issues that are appropriately dealt with under Part C of the rules. It requires greater levels of information and approval from Transpower than are required by Part C of the rules for commissioning.</p>	
	<p><i>(vi) establish common standards for a common configuration based on factors such as size of connection and voltage level;</i></p>	<p>No. The only reference to factors such as size of connection is in relation to maximum short circuit power and current limits (table B2) and even this information is caveated with advice that the values are default values and at some sites the levels already exceed the levels shown in the table.</p>	

	<p><i>(vii) encourage efficient and effective processes for enforcement of obligations and dispute resolution.</i></p>	<p>No, this code creates an in-efficient process</p>
	<p><i>b) the desirability of the Connection Code and part C operating in an integrated and consistent manner, where possible;</i></p>	<p>No we do not consider that the connection code and Part C are operating in an integrated manner. There are aspects of the connection code that are more properly common quality issues and should be in part C . For example, the table B1 and B3 with modifications would be more appropriately covered in part C.</p>
	<p><i>(c) the need to ensure that the grid owner can meet all obligations placed on it by the system operator for the purpose of meeting common security and power quality requirements under part C;</i></p>	<p>No, this principle in itself leads to a lack of balance in the code as the designated transmission customers also have to the <i>meet all obligations placed on them by the system operator for the purpose of meeting common security and power quality requirements under part C</i></p>
	<p><i>(d) the need to ensure that the safety of all personnel is maintained; and</i></p>	<p>Yes</p>
	<p><i>(e) the need to ensure that the safety and integrity of equipment is maintained</i></p>	<p>Yes</p>
<p><i>Q4.10 Do submitters agree that the proposed Connection Code is consistent with the Commission's principal</i></p>	<p>No. We consider that the duplication of requirements contained in other sections of the rules (asset capability statement supplied by customers, requirements for commissioning and testing) are inefficient. We consider that the voltage range outlined in Table B1 will lead to breaches of the Electricity Regulations 1997. The code is biased in favour of Transpower and places unnecessary compliance requirements on third party generators and customers with motor loads with a combined capacity over 1MW.</p>	

<p><i>objectives?</i></p>	
<p><i>Q5.9 Do submitters agree that 15 business days is an appropriate cut-off period and the process for managing unplanned outages is acceptable?</i></p>	<p>Yes & No</p> <p>Yes for assets operated by the grid owner but no for assets under operational control of the transmission customer and as long as the outage does not interfere with other planned outages for that asset or other connected parties.</p>

APPENDIX 1 Orion's Proposed Schedule 8

1. INTERPRETATION

1.1. Preliminary

Nothing in this Connection Code limits or derogates from any provision of the Agreement

1.2. Definitions

In this Connection Code unless the context otherwise requires:

Earth Fault Factor

means at a given location of a three-phase electrical power system, and for a given system configuration, the ratio of the highest r.m.s. phase-to-earth power frequency voltage on a healthy phase during a fault to earth affecting one or more phases at any point on the system to the rms voltage of phase to earth power frequency voltage which would be obtained at the given location in the absence of any such fault (IEC 50 (604-03-06)).

Equipment

Means any of:

- a. Assets forming part of a grid
- b. Assets physically connected to the grid which, in the reasonable opinion of Transpower and the Customer, can materially affect the management, security, operating performance characteristics of the grid; or
- c. _____

Deleted: <#>Assets or a network physically connected to the grid

Formatted: Bullets and Numbering

Deleted: or a network

Deleted: or a network not

Deleted: but

Deleted: Other Equipment not physically connected to the grid but which, in the reasonable opinion of Transpower can affect the security or operation of the grid, or power quality connected

Power Factor

Means MW divided by MVA at a point of Service where the MW and MVA are measured

Safety Manual – Electricity Industry (SMI)

Means the Safety Manual – Electricity (SMI-EI) 2004 published by the Electrical Engineers' Association (as may be amended from time to time)

1.3. Interpretation

References to Transpower are references to Transpower in its capacity as grid owner as a party to the agreement. References to the Customer are references to the Customer in its capacity as a party to the agreement.

1.4. Procedure for obtaining Transpower's agreement to non-compliance

Transpower and the Customer may enter into an agreement, as to the manner and extent by which Transpower or the Customer need not comply with this connection code in accordance with the process set out in Appendix A and, if so, Transpower and the Customer must comply with that agreement, (acting reasonably).

Deleted: with the Customer

Deleted: to Transpower's satisfaction

2. CONNECTION REQUIREMENTS

Deleted: <#>Customers responsibilities for third parties¶
The Customer must ensure that any third party who has Equipment directly connected to the Customers Equipment, but not to the grid, that may adversely effect the reliability, availability or integrity of the grid (which shall, in any event include generating units with a combined installed capacity of greater that 1 MW, or motors with a combined installed capacity of greater than 1 MW capacity) complies with the obligations on the Customer as set out in this Connection Code.¶

2.1. Requirements for equipment capability

The Customer must provide to Transpower, in a format agreed between, Transpower and the customer from time to time:

Formatted: Bullets and Numbering

- (a) as and when it must provide an asset capability statement to the system operator under the rules, the information referred to in subclauses 2.2(b), (c) and (d) in respect of that Equipment.
- (b) in respect of its Equipment:
 - (1) the normal and emergency limits within which the Equipment is intended to operate;
 - (2) the information as to the limitations in the operation of the Equipment that Transpower requires (acting reasonably) for the safe and efficient management of the grid;
 - (3) all modelling data in respect of Equipment capability which Transpower requires (acting reasonably) for planning purposes;
- (c) sufficient information concerning the Equipment at the grid interface to verify compliance with this Connection Code and to enable Transpower to approve the connection; and
- (d) details of protection systems, including settings, to ensure the requirements of clause 4.2(f) are met.

Deleted: As and when the Customer must provide an asset capability statement to the system operator under the rules, the customer must provide the same asset capability statement to Transpower (in the same manner in which it provides the asset capability statement to the system operator) but including information specified in clause 2.2 (b), (c) and (d) management ¶
2.2 Additional requirements

Deleted: specified by

2.3 Special requirements:

If the Customer proposes to connect Equipment to the grid, or to make changes to Equipment connected to the grid, Transpower:

Deleted: or to assets connected to the grid

Deleted: or to assets connected to the grid and

- (a) acting reasonably and after having consulted other customers who may be affected by the connection of the Equipment to the grid, or the changes to the Equipment or otherwise; or is located;

- (b) having regard to the environmental conditions in which the Equipment at the grid interface is located;

identifies special requirements for the Equipment, Transpower may notify the Customer of the special requirements and the Customer must ensure those special requirements are complied with to Transpower’s satisfaction (acting reasonably).

2.4 Pre-commissioning requirements:

- (a) Before the Customer commissions any Equipment to be connected to the grid, or any asset connected to the grid, the Customer must provide Transpower’s with the System operators written approval under Rule 2.2 Part C Schedule C3 Technical code A.

2.5 Requirements for commissioning or testing of equipment:

- (a) as and when the Customer must provide a commissioning or test plan to the system operator under the rules, the Customer will also provide a commissioning or test plan to Transpower.
- (b) as and when Transpower must provide a commissioning or test plan to the system operator under the rules, in relation to assets covered in schedule 1,2 or 4 of the transmission agreement, Transpower will also provide a commissioning or test plan to the Customer, 2.8.

2.11 Co-operation:

The Customer must enter into negotiation with Transpower in respect to any reasonable request by Transpower to change the connection of any Equipment to the grid (or the Equipment itself), if the connection or the Equipment may adversely affect the performance of the grid or the Equipment of other customers.

2.12 New Connections:

Where the Customer wishes Transpower to provide a new connection, it must make a written request to Transpower and Transpower must within 20 Business Days of the Customer’s request provide an initial response in writing to the Customer that sets out the process to be followed by Transpower and the Customer.

[We recommend that the Commission consider Part 2 of the Electricity Governance (Connection of Distributed Generation) Regulations as an example of a application process and appropriate timeframes within which new connections should be processed.]

3. GENERAL REQUIREMENTS

Deleted: obtain

Deleted: (not to be unreasonably withheld):¶

- ... (1) ... to the design and specifications of the Equipment;¶
- ... (2) ... that the requirements of this Connection Code can be met;¶
- ... (3) ... that upon connection of the Equipment, the reliability, availability and integrity of the grid can be maintained; and¶
- ... (4) ... that the proposed connection of the Equipment can be made reliably and safely without any material adverse affect on the management, security or operation of the grid.¶

... (b) ... In considering whether or not to grant approval Transpower may (amongst other things) consider:¶

- ... (1) ... the effect of daily, seasonal, annual and likely long-term variations in supply and demand levels;¶
- ... (2) ... the effect of contingency conditions;¶
- ... (3) ... the effect of any future changes required to the grid, or to other Equipment; and¶
- ... (4) ... any other matter that Transpower reasonably considers to be relevant.

Deleted: that complies with clause 2.6; and

Deleted: if the Equipment is not connected to the grid but is connected to an asset connected to the grid, the Customer must provide to Transpower a commissioning or test plan that complies with clause 2.6.¶

2.6 Requirements of a commissioning or test plan:¶

The commissioning or test plan required under clause 2.5 must:¶

- ... (a) ... include a timetable containing the sequence of events necessary to connect the Equipment and cond... [1]

Deleted: Responsibility following approval:¶

The Customer must ensure that the construction or manufacture of Equipment does not depart from the design or specifications of Equipment approved by (... [2])

Deleted: comply with any reasonable direction

Deleted: of

Deleted: and a proposed timetable for provision of the new connection

3.1 Published requirements:

Transpower and the Customer must each ensure that its Equipment (and, in the case of subclauses (b) and (c) the operation of its Equipment):

- (a) complies with the Safety Manual – Electricity Industry (SM-EI); and
- (b) complies with all relevant legislation.

Deleted: (a) is designed, tested and commissioned as approved by Transpower, acting reasonably, and otherwise in accordance with Good Electricity Industry Practice;

Deleted: b

Deleted: c

4. TECHNICAL REQUIREMENTS

4.1 Instrumentation and control circuits:

The Customer:

- (a) may connect an instrumentation and control circuit to secondary plant at the grid interface provided:
 - (1) the grid is not adversely affected;
 - (2) the safety of the public and any other person is not adversely affected; and
 - (3) the Customer has prior written approval from Transpower (such approval not to be unreasonably withheld).
- (b) must provide a means by which both the Customer and Transpower may disconnect each instrumentation or control circuit connected to the grid; and

Transpower must ensure that each instrumentation and control circuit connected at the grid interface is designed to withstand the hazards of earth potential rise and induced currents and voltages appropriate to the location of the secondary circuit and comply with the requirements of clause 4.2(e).

4.2 Requirements at the grid interface:

- (a) Grid interface switchgear to be provided:

Either Transpower or the Customer must provide for each Point of Connection:

Deleted: T

- (1) a single location where it is practicable, in accordance with Good Electricity Industry Practice, for Transpower and the Customer to operate each Circuit-breaker individually by remote control;

- (2) the operational status of each circuit-breaker to be signalled to the single location in (1) (for Transpower and the Customer) from which the circuit-breaker is controlled; and
- (3) Equipment to isolate and earth each Point of Connection.

(b) **Insulation co-ordination:**

Transpower and the Customer must each ensure:

- (1) the insulation of equipment at the grid interface is co-ordinated with the insulation of Equipment to which it is to be connected:
- (2) that transient, dynamic, continuous and any other over-voltages are calculated, analysed and taken into account in accordance with Good Electricity Industry Practice and that the recommendations of IEC 71 Insulation Co-ordination are complied with; and
- (3) that the rated insulation level and rated short duration power frequency withstand voltage meets the levels specified in Appendix B Table B3.

(c) **Fault levels:**

Transpower and the Customer must each:

- (1) for any connection of Equipment to the grid at a voltage of 220 kV; and
- (2) for each Point of Connection

maintain an Earth Fault Factor of not more than 1.4.

For the purposes of this clause 4.2(c), if the grid operates at a nominal voltage of less than 220 kV, it must be treated as having an Earth Fault Factor of greater than 1.4. Any connection of Equipment to the grid must not increase the Earth Fault Factor nor lead to over-voltage which has an adverse effect on the management or operation of the grid.

(d) **Rating of equipment at the grid interface:**

Transpower and the Customer must each ensure that:

- (1) the normal current ratings of Equipment at the grid interface are sufficient to carry currents at all reasonably foreseeable ratings;
- (2) neither the short-circuit current ratings nor the effects of the earthing of the Equipment interfere with, or adversely affect, the management or operation of the grid; and

- (3) it modifies, replaces or changes the configuration of the Equipment before any of the short-circuit current ratings of the Equipment are exceeded.

(e) **Earthing of the grid interface:**

Transpower and the Customer must ensure that:

- (1) the earthing arrangements for the grid interface do not adversely affect the safety of any person;
- (2) the earthing arrangements for the grid interface allow the efficient management of protection systems;
- (3) the Equipment has an earthing arrangement that keeps hazards within limits required by Good Electricity Industry Practice.

Deleted: without requiring bonding to the earthing systems of any other customer;

- (5) earthing of the Equipment at the grid interface is sufficient to withstand earth fault currents (including the contribution from the grid) up to the limits specified in Appendix B Table B2 for at least 3 seconds.

Deleted: (4) without derogating from the foregoing, where bonding to the earthing systems of any other customer is beneficial, undertake the bonding to the earthing system of that other customer; and

(f) **Protection of equipment and the grid:**

Transpower and the Customer must each ensure that the Equipment is designed and maintained so that, for fault impedances of less than one ohm on either the grid or at the grid interface, the following applies:

- (1) the fault will be cleared by main protection systems within the design fault clearance time specified in Appendix B table B4;
- (2) the fault clearance time for back up protection systems, including high impedance faults, is as short as reasonably practicable and does not adversely affect other Equipment, or is longer than the final fault clearance time in Appendix B table B4.
- (3) no fault on the grid assets or on the grid interface persists for longer than the final fault clearance time stated in Appendix B table B4.

(g) **Common and shared facilities and equipment:**

If Transpower and the Customer share facilities or Equipment, each shall:

- (1) physically secure the facilities or the Equipment against unauthorised access or operation by a third party;

- (2) provide electrically safe Equipment in accordance with Good Electricity Industry Practice; and
- (3) provide facilities and Equipment that comply with AS/NZS 1170 Structural design actions.

(h) **Expected maximum fault levels:**

Transpower must publish annually a 10 year forecast of the expected maximum fault level of each Point of Service.

4.3 Specific requirements for generating units:

If the Customer is a generator, the Customer must ensure that the connection at the point of connection of its generating units has an Earth Fault Factor complying with the requirements of clause 4.2(c) and the earthing of the generating unit and associated Equipment ensures the reliable operation of protection systems and safe management of the grid. This requirement also applies in respect to the grid interface for any network to which a generating unit is connected and may affect the management of the grid.

4.4 Minimum power factor:

The Customer must ensure that its Equipment does not unreasonably draw on the reactive power resources of the grid at peak demand times. If electricity is being drawn off the grid, the Power Factor at any Point of Service must not be less than 0.95 lagging at peak demand times.

4.5 Provision for effects of disconnection:

The Customer must ensure that it manages the consequences of an unplanned disconnection of any of its Equipment from the grid assets in accordance with Good Electricity Industry Practice.

4.6 Maintenance:

Transpower and the Customer must each maintain its Equipment so that it always complies with this Connection Code.

5. OPEARATING REQUIREMENTS:

5.1 Operational performance of equipment:

Transpower and the Customer must each ensure that its Equipment:

- (a) has no adverse effect on the grid or the ability of Transpower to manage the grid;

- (b) is operated within the maximum system voltage set out in Appendix B, Table B1, or as otherwise agreed;
- (c) has no adverse effect on other customers or their ability to manage their Equipment;
- (d) is designed and installed so that maintenance can be carried out;
- (e) does not present a safety hazard to Transpower or other customers (or their respective employees and agents) or the general public;
- (f) does not cause Transpower or the Customer to breach any legislation;
- (g) performs its intended function to the standard required by this Connection Code at the maximum and minimum short-circuit currents resulting from any reasonably foreseeable configuration of the New Zealand electricity system;
- (h) does not cause the maximum short circuit power and current limits specified in Appendix B, Table B2 to be exceeded on or nearby to the grid;
- (i) is capable of being operated and operates within the limits stated in the asset capability statement and other information provided under clauses 2.1 and 2.2 respectively;
- (j) complies with this Connection Code; and
- (k) meets any other requirements imposed by Transpower in writing acting in accordance with Good Electricity Industry Practice.

6. MONITORING REQUIREMENTS

6.1 Monitoring requirements:

Transpower and the Customer must each monitor the performance of its Equipment in accordance with Good Electricity Industry Practice.

7. INFORMATION REQUIREMENTS

7.1 For approval of the grid interface:

In addition to information provided in the asset capability statement and the other information provided under clauses 2.2 and 3.3 respectively, the Customer must provide Transpower as and when requested by Transpower (acting reasonably) with:

- (a) sufficient information concerning the grid interface to verify compliance with this Connection Code and to enable Transpower to approve the connection at the grid interface; and

- (b) details of protection systems, including settings, to ensure the requirements of clause 4.2(f) are met.

7.2 For revisions to information previously supplied:

Whenever revised information as to the performance of Equipment is obtained by the Customer, the Customer must provide to Transpower a revised asset capability statement and any revisions to the other information required under clauses 2.2 and 2.3 respectively, as soon as reasonably practicable.

7.3 Supporting information:

The Customer must maintain up to date manuals or protocols required in accordance with Good Electricity Industry Practice for the operation of its Equipment.

7.4 Equipment records to be kept:

The Customer must in accordance with Good Electricity Industry Practice maintain records for its Equipment that, in its discretion, either:

- (a) record the performance of its Equipment as monitored by the Customer over each consecutive three month period for the purpose of verifying or otherwise that the Equipment meets the requirements of this Connection Code; or
- (b) record any tests undertaken in accordance with Good Electricity Industry Practice that establish that the Equipment meets the requirements of this Connection Code.

7.5 Access to records or equipment:

The Customer must as soon as reasonably practicable following written notice by Transpower, provide to Transpower:

- (a) access to any records of the Customer's monitoring or testing of the performance of any Equipment carried out in accordance with clause 7.4; and
- (b) access to inspect any Equipment;

as Transpower requires (acting reasonably).

7.6 Status of Transpower approval

Any approval by Transpower provided to the Customer does not relieve the Customer from its obligations to meet the requirements of this Connection Code.

8. PERFORMANCE REQUIREMENTS FOR SCADA

The Customer must ensure that the interface between its Equipment and the grid for the exchange of data provided by SCADA must comply with Transpower's policy for the same as published from time to time. Transpower will consult with Customers on any proposed changes to this policy.

APPENDIX A: TRANSPOWER'S AGREEMENT TO NON-COMPLIANCE WITH THE CONNECTION CODE

1. APPLICATION AND SUPPORTING INFORMATION

The Customer may apply in writing to Transpower for Transpower's agreement authorising non-compliance with this Connection Code.

An application shall:

(a) **Specify the non-compliance:**

specify the clauses of the Connection Code for which Transpower's agreement to non-compliance is sought;

(b) **Provide supporting information:**

provide information in support of the application with reasonable particularity (including information as to the capability of the non-compliant Equipment);

(c) **Describe any remedial action to be undertaken:**

describe any remedial action to be undertaken to ensure compliance with this Connection Code;

(d) **Specify required term:**

specify the term of the agreement which is sought; and

(e) **Identify confidential information:**

identify any information for which confidentiality is sought on the ground that it would, if disclosed, unreasonably prejudice the commercial position of the Customer (or other person who is the subject of the information) or on the ground that it is information that is subject to an obligation of confidence, and the period of which confidentiality is sought.

2. TRANSPOWER OBLIGATIONS ON RECEIPT OF APPLICATION

Within 5 business days of receipt of the application made under clause 1 of this appendix, Transpower must provide the Customer with an estimate of the time it will take to consider the application and the costs associated with processing the application:

3. RIGHTS AND OBLIGATIONS DURING THE PROCESSING OF APPLICATIONS

(a) **Reasonable endeavours:**

Transpower will use reasonable endeavours to consider and decide whether or not to agree to the application within the estimated time and costs provided in accordance with clause 2 of this appendix.

(b) Additional information:

Transpower may require the Customer to provide information in support of the application and the Customer shall provide the same in order for the application to be considered.

(c) **Withdrawal of application:**

If the Customer withdraws an application, it must on demand pay the actual and reasonable costs incurred by Transpower up to and including the date of withdrawal of the application in considering the application.

4. OBLIGATION OF THE CUSTOMER TO PAY COSTS

The Customer must on demand pay Transpower's actual and reasonable costs incurred in considering an application under this appendix.

5. AGREEMENT

Transpower will notify the Customer of the outcome of any application by it for Transpower's agreement to non-compliance with this Connection Code but if the application is granted there shall be no legally binding agreement between Transpower and the Customer unless and until they enter into a formal and final supplementary written agreement signed by each of them, which is expressed to be legally binding as between them. Such an agreement shall be supplementary to and form part of the Agreement.

APPENDIX B VOLTAGE AND FAULT LEVELS

Table B1 Maximum and minimum Voltage limits

Nominal Voltage (kV)	Maximum System Voltage (kV)	Minimum System Voltage (kV)
220	242 <u>(+10.0%)</u>	198 <u>(-10.0%)</u>
110	121 <u>(+10.0%)</u>	99 <u>(-10.0%)</u>
66	69.3 <u>(+5.0%)</u>	62.7 <u>(-5.0%)</u>
50	52.5 <u>(+5.0%)</u>	47.5 <u>(-5.0%)</u>

33	34.65 (+5.0%)	31.35 (-5.0%)
22	22.55 (+2.5%)	21.45 (-2.5%)
11	11.275 (+2.5%)	10.725 (-2.5%)

- Deleted: 36
- Deleted: 30
- Deleted: 24
- Deleted: 20
- Deleted: 12
- Deleted: 10

if the Equipment is not connected to the grid but is connected to an asset connected to the grid, the Customer must provide to Transpower a commissioning or test plan that complies with clause 2.6.

2.6 Requirements of a commissioning or test plan:

The commissioning or test plan required under clause 2.5 must:

- (a) include a timetable containing the sequence of events necessary to connect the Equipment and conduct any test;
- (b) contain the protection settings to be applied before livening of the Equipment;
- (c) contain the procedures for commissioning or testing the equipment that safeguards against risk of injury to personnel or damage to any Equipment and to the ability of Transpower to comply with its obligations under the Agreement;
- (d) have been prepared by the Customer in consultation with Transpower, and
- (e) be approved in writing by Transpower (such approval not to be unreasonably withheld).

2.7 Customer to comply with commissioning or test plan:

The Customer in commissioning or undertaking any testing of the Equipment must comply with the commissioning or test plan approved by Transpower in accordance with clause 2.6.

Responsibility following approval:

The Customer must ensure that the construction or manufacture of Equipment does not depart from the design or specifications of Equipment approved by Transpower unless the departure is approved in writing by Transpower.

2.9 Final approval:

On completion of connection of any Equipment to the grid, including to any associated grid interface, the Customer must obtain final approval of such connection in writing from Transpower (such approval not to be unreasonably withheld) before the Equipment commences service.

2.10 **Withdrawal:**

Transpower may withdraw any approval provided by Transpower if the Equipment is not as described in the information provided under clauses 2.2 and 2.3.