6 October 2015

Submissions
Electricity Authority
By email: submissions@ea.govt.nz

Generation fault ride through

Meridian welcomes the opportunity to provide feedback on the Electricity Authority's consultation paper 'Generation fault ride through'.

Meridian supports codifying a Fault Ride Through (FRT) standard

We agree there is benefit in specifying an FRT standard in the Electricity Industry Participation Code. This will provide a clear direction for future generation investment and assist with maintaining a stable power system. We note that adopting such a standard is common internationally.

We also support determining compliance with an FRT standard through using power system analysis, as described in clause 8.25A(3) of the proposed Code amendment. This is an important improvement from the February 2011 proposal as it is the only practical way to determine compliance.

Proposed overvoltage FRT standard is overly onerous

Meridian considers the proposed overvoltage aspects of the FRT standard are more onerous than is reasonably required to maintain system stability, and that this will ultimately result in unnecessary costs for the consumer.

Based on the System Operator's (SO) February 2014 report 'Generator fault ride through investigation', it is not clear to us what the rationale is for the FRT standard proposed. The significant changes to overvoltage requirements for the North Island and South Island "no-trip zone" make a previously acceptable requirement unacceptable.

This report appears to model the voltage impacts of a 'worst case scenario' HVDC bi-pole trip, but then adopt a standard which goes well beyond what is required to manage this scenario

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(e.g. as illustrated in Figures 4 and 5 of the SO report). The resulting proposal is one of the most onerous FRT standards in the world. Such a standard will impose additional costs on generators and ultimately consumers while providing little additional security benefit. We believe the standard proposed could even result in synchronous plant being non-compliant (our understanding of the proposal is that it will require all synchronous generation plant to undergo re-assessment, which will be costly in itself).

Proposed standard will increase the costs of new wind generation

The Authority states that wind turbine manufacturers have responded to new FRT standards issued by international regulators by increasing the ability of certain classes of plant to ride through faults. However, New Zealand represents a small market for international wind turbine manufacturers – New Zealand's installed wind capacity is less than 1% of global capacity. In Meridian's experience, manufacturers develop their products to comply with requirements in major markets. There is therefore a risk that turbine manufacturers will not alter the specifications of their plant to comply with New Zealand's proposed standard.

This would limit the availability and choice of wind turbines for installation in New Zealand, and has the potential to significantly impact the economics of new wind farm investment. Where manufacturers are able to comply with the new standard, Meridian considers this will substantially increase capital costs. We consider the 1.25% increase in capital costs estimated by the Authority is low. We believe 2-3% is a more realistic estimate.

We also consider the Authority's assumption that the increased cost will ramp down to zero over 10 years to be unrealistic given, as noted above, the New Zealand market represents a very small component of the global market. There is a risk that wind turbine manufacturers will not adjust the FRT capability of their equipment in response to New Zealand requirements, meaning there will be a significant and ongoing additional cost for wind farm construction.

Next steps

Setting an FRT standard has important ongoing implications for system security and costs. It is critical that such a standard is well considered, with proper regard for the costs and benefits. Meridian considers such a standard needs to be set through a process that takes account of the real-world risks (rather than a hypothetical worst case scenario), considers the full suite of options available to mitigate this risk, and selects an option or combination of options that address this risk at the lowest overall cost.

Possible additional options to consider include:

- A grid investment solution such as installing additional dynamic reactive support at Haywards or Benmore. This would assist the power system in dealing with overvoltage events arising from an HVDC bi-pole trip, and may result in a lower overall cost to the consumer than imposing ongoing requirements on wind farms.

- Setting an FRT standard based on those used in major international markets (likely to be used by turbine manufacturers) and covering any residual system risk through alternative means e.g. extended reserves.

We encourage the Authority to reconsider the current proposal. We think an appropriate standard should be developed through a collaborative process between the Authority, the System Operator, the Grid Owner, affected generators and turbine manufacturers. This will ensure that the full costs and benefits of any new FRT standard are properly considered. We have not proposed a fully developed alternative at this stage as the six-week consultation timeframe is insufficient to properly consider this complex and important technical issue.

Our responses to the Authority's specific consultation questions are attached as Appendix A.

Please contact me if you have any questions relating to this submission. We would also be happy to meet with the Authority to discuss our concerns further.

Yours sincerely,

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Appendix A Responses to consultation questions

	Question	Response
1	Do you agree the issues the Authority has identified are worthy of attention?	Meridian agrees there is benefit in specifying an FRT standard in the Code. We do not support the FRT standard the Authority has proposed.
2	Do you agree with the objectives of the proposed amendment? If not, why not?	We agree with the objectives of the proposal. We do not support the FRT standard the Authority has proposed.
3	Do you agree the benefits of the proposed amendment outweigh its costs?	No. Meridian considers the costs of the proposal will outweigh the benefits, given the particular FRT standard proposed: • The assumption that wind turbine costs will increase by 1.25% of installed capital costs to meet the FRT standard is overly conservative. We consider the cost impact is more likely in the range of 2-3%. • We do not agree with the assumption that this additional cost will ramp down to 0% over 10 years. As discussed in our cover letter, we consider international turbine manufacturers may not respond to the New Zealand standard given the relative size of the New Zealand market. As such, additional costs may well be ongoing indefinitely.
4	Do you have any suggested market-based options that would be easier to implement than option A?	We agree that option A would be overly complex. We do not have any other market-based approaches to suggest.
5	Do you agree that the proposal does not preclude a move to market-based arrangements in the future?	Yes.
6	Do you agree the Authority's proposed amendment complies with section 32(1) of the Act?	Meridian does not agree that the proposal complies with section 32(1) of the Act. In particular, the proposal will not contribute to the efficient operation of the electricity industry as it will impose substantial additional costs on existing wind farm operations and new wind farm investment. These costs will ultimately be borne by the consumer.
7	Do you have any comments on the drafting of the proposed amendment?	Notwithstanding Meridian's opposition to the FRT standard proposed, our comments on the drafting of the Code amendment are as follows: • 8.25(A) – the term "connected to the grid at 110kV or

		220kV" implies that this obligation does not apply to embedded generation. Is this the Authority's intention? • 8.25(A)(1) – the reference to "6 seconds" is unnecessary given Figures 8.1 and 8.2 specify the duration of the no-trip zone. We consider this term creates confusion and should be removed. • 8.25(A)(2) – this clause suggests that all generators will need to be tested against this obligation, rather than just generators that are close to Haywards and Benmore. Meridian considers this is unnecessary and will increase compliance costs. • 8.25(A)(3) – Meridian supports generator compliance being determined by power systems analysis. This is an important improvement on previous proposals. • 8.25(A)(6) – Meridian considers this clause is written in a way that is unnecessarily complicated and could be mis-interpreted. We question whether a percentage-based approach would be clearer and more consistent with other descriptions of voltage requirements within the Code. • 8.25(B)(1): o The wording of this clause implies that the generating unit will, in all circumstances, supply maximum reactive current for 6 seconds from the commencement of the fault (regardless of the length or severity of the fault). This does not relate to normal, stable automatic voltage regulator (AVR) action. This may be clarified by amending that "…generating units <u>are capable of</u> generating at least…", but that normal AVR action should prevail. o The reference to the "fault on the grid described in clause 8.25A(1)" is confusing, because clause 8.25A(1) relates to the definition of a "no-trip zone". o Furthermore, the 6 second period would not appear to add value to any assessment of compliance against this clause; the protection

		clearance time will be much less than this. Meridian is unclear what is intended with the reference to 6 seconds in this clause. o It is not clear how quickly the generating unit is expected to reach the maximum reactive current; this clause implies instantaneous response. Again, normal stable AVR action should prevail. o The ability of Meridian's shunt-connected static excitation systems to comply with this clause cannot be assessed until clarifications are given. • 8.25(B)(2) - The relevance of the reference to 6 seconds in this clause is not clear.