nationalgrid

Minutes

Meeting name	Fault Ride Through Workshop
Meeting number	Workshop 2
Date of meeting	7th November 2012
Time	10:00am – 2:00pm
Location	Hilton Metropole, Birmingham Airport

Attendees

Name	Initials	Company
Graham Stein	GS	Chair
Nick Sargent	NS	Technical Secretary
Antony Johnson	AJ	National Grid
Ben Marshall	BM	National Grid
Balasingham	Bala	National Grid
Peter Thomas	PT	Consultant acting on behalf of Nordex
Herve Meljac	HM	EDF Energy
Paul Newton	PN	EoN
Alan Mason	AM	Repower
Mustafa Kayikci	MK	TNEI

Apologies

Name	Initials	Company
John Morris	JM	EDF

1 Introductions

1. GS welcomed everyone to the meeting and informed the attendees that its aim was to agree which fault ride through options could be discounted and which could be taken forward for further consideration.

2 Overview of Workshop

2. AJ set the scene for the workshop. He advised that the workshop had originally been established in response to John Morris's paper (reference PP12/04) which proposed a site specific voltage duration curve. At the last meeting held in September, AJ advised that presentations had been given on the background to fault ride through, why it is necessary, developments in Europe (including other solutions over and above those raised in paper reference PP12/04), Compliance issues, System Design issues and the Fault Ride Through issue from a Generators perspective. AJ summarised that the issue largely appeared to be associated with the fault ride through aspects associated with synchronous generation and proposed that this meeting should consider how the issues could be addressed via a number of options. He suggested that of the options proposed / discussed, those which were worthy of further development should be considered further while those which did not address the issue should be discounted.

3. AJ also advised awareness of other Grid Code Working Groups and that any related issues raised in this workshop should be shared as necessary.

3 Minutes of the Last Meeting/Actions

4. AJ summarised the minutes and actions of the previous meeting. He noted at the last meeting that one option would be the early adoption of the Fault Ride Through Requirements detailed in the ENTSO-E Requirements for Generators (RfG). He also advised that the RfG document was soon to be submitted to the comitology phase and as such there could be further changes although it was acknowledged that this would be unlikely as it was expected to concentrate on process rather than detailed technical requirements.

5. In terms of the ENTSO-E Requirements for Generators itself, AJ advised that interpretation of the Fault Ride Through requirements was far from clear and the FAQ document had generated more questions than answers. PN suggested that the RfG can be interpreted in different ways and it is not easy to draw a direct comparison between the ENTSO-E Fault Ride Through Requirements and those in the GB Grid Code.

6. GS was comfortable with the need for a FRT capability but agreed that the ENTSO-E European requirements need to be carefully considered and understood.

7. BM added that as we look towards greater concentrations of offshore wind generation (2020), (particularly centred around key connection points), there could be a lot of other generation affected within the vicinity of the Connection Point due to the oscillations that result following a disturbance. This issue poses a considerable network design challenge, not least the potential rate of change of frequency issues that can result.

8. Bala advised that during a fault, active power generated should be proportional to voltage. He noted that the Grid Code specifies the requirement for a Generating Unit or Power Park Module to be able to inject maximum reactive current during the period of the fault and 90% of the pre-fault Active Power should be restored within 0.5 seconds of fault clearance for Mode A faults.

9. AJ noted that the modern generation of wind turbines had the ability to control the proportion of real and reactive power injected under fault conditions so long as the rating of the converter was not exceeded. He advised that with a synchronous machine, the ability to control the

proportion of real and reactive power was more limited. HM queried the delivery of Active Power in proportion to voltage. He noted a Synchronous Machine will have oscillations and not be able to stay above the Active Power curve all of the time. As such, it will not be possible for this type of machine to comply and compliance may have been interpreted as an average. It was noted that under the current Grid Code there is a clause relating to the delivery of energy following fault clearance rather than the delivery of Active Power.

10. HM mentioned that a large synchronous Generator would be capable of fault ride through, by use of fast valving, however Bala pointed out that this would have implications in terms of the Active Power Recovery. It was however acknowledged that there would be no reason why a fast valving facility could not be fitted so long as the active power recovery could be restored to 90% of the pre fault value within half a second of fault clearance.

11. Whilst it was acknowledged that fault ride through simulation studies where not required for synchronous plant, HM said that CP.A..5.1 did not make it clear when the voltage dip applies. Bala advised that due to this uncertainty, guidance needed to be provided in the Compliance phase.

12. HM went on further to say that the most difficult faults to comply with may not be Type A faults but Type B Type faults which had a lower retained voltage but longer duration times and hence it may be difficult to determine control system settings which cover the full fault ride through operating envelope.

13. AM advised that he had observed this phenomena with different sizes of wind turbine and that the smaller turbines can provide a very different response than larger turbines. GS advised that this appeared to be a fleet issue and it was strange that it was difficult for the full Grid Code requirements to be satisfied depending upon size. However, he noted that if the Grid Code requirement became more site specific, he would have concerns over the ability to treat customers equally and over security of supply issues.

14. BM suggested not changing the Grid Code requirement but clarifying the testing arrangements. PN stated that the current Grid Code requirement had no rationale for setting the pre fault condition of Type B faults at full Active Power and zero Reactive Power, as detailed in CP A 3.5.1.

15. Bala advised that manufacturers have detailed models for both balanced and unbalanced faults, however AM raised a concern that testing and modelling in order to meet the requirements would require significant resource. It was not clear all manufactures shared a capability to provide sufficiently detailed models for the purposes of modelling unbalanced faults. It was questioned as to how accurate a model was until testing and Ireland was quoted as an example where generators are required to have ongoing compliance as faults are numerous.

4 Fault Ride Through Options

16. AJ gave a presentation of the possible FRT options which could be considered to address the issues raised in Grid Code Paper PP12/04.

17. GS said that the ‘do nothing’ option and ‘await implementation’ were effectively the same. BM agreed, saying that by taking the option to do nothing would give a chance for the current approach to compliance testing, together with post-offer stability studies for synchronous plant to be further clarified. AJ also advised that the European Grid Code would be submitted for Comitology later this year with completion expected at the end of 2013. It was thought that the technical requirements would be unlikely to change substantially and that the main alterations would probably be associated with process although AJ advised that further technical changes could not be ruled out.

18. PT enquired as to whether the technology was available now to meet the proposed European Grid Code requirements. AJ advised that it was still not yet fully clear as to how the draft Fault Ride Through requirements under the ENTSO-E RfG should be interpreted. However, he advised that he would check and find out. AJ to determine the interpretation of the current ENTSO-E Fault Ride Through Requirements.

Action: National Grid (AJ)

19. In AJ's presentation, he suggested that one option would be early adoption of the ENTSO-E Fault Ride Through requirements. AM and PT both advised that the current GB Grid Code Fault Ride Through requirements do not present a problem to them and they would not wish to see early adoption of a new set of fault ride through requirements (as it would result in substantial cost and resource implications) which may then subsequently change again (resulting in additional costs) when the European Grid Code is finally approved.

20. It was advised that because the problem lies with synchronous plant, this is the area which needs to be given priority. AJ agreed that leaving the current GB Grid Code Fault Ride Through requirements unchanged until implementation of the ENTSO_E Rfg for asynchronous plant was the correct approach.

21. AJ advised that the current draft ENTSO-E Fault Ride Through requirements included different voltage duration curves between synchronous and asynchronous plant. It was also noted that it would not be appropriate to leave the GB Grid Code requirement as is and simply amend the voltage duration curve for Synchronous Plant. GS noted however that in going forward (and in lieu of the ENTSO-E requirements) NGET was comfortable with having one voltage duration curve for synchronous plant and one for asynchronous plant.

22. PN asked if early adoption of the RfG requirements would solve the problem affecting synchronous plant? GS suggested it may be worth adopting the RfG requirements for synchronous plant to see if this resolved the problem.

23. PN advised that a fault of 140 ms at 0.95 p.u. lead is generally a problem for all synchronous plant, and faults of a longer duration are generally a problem for synchronous plant operating at all power factors. BM added that although National Grid does not undertake FRT studies, it does undertake a range of other studies including stability studies over a range of credible operating conditions. These include shorter fault clearance times to reflect the performance of the network under the specific loss conditions being studied. It was noted that at the pre offer stage the bilateral agreement took account of these and other studies in the broad specification of the synchronous generators where minimal AVR and PSS functional capabilities, are assumed. In the post offer and compliance phases, if NGET identified a problem with the results from a more detailed specification arising from the delivery of a given solution, discussions would be initially held with the Generator to identify what solutions could be put in place, rather than to revise the design, context of works, and bilateral conditions supporting that Generators connection via a Modification application process. Provided that the Generator could work within the parameters of the initial specification we would expect in principle FRT would be possible to a set of credible initial conditions that could be reflected in the Generators own single machine studies.

24. HM raised the point that the Generator will have to be compliant with the requirements of the GB Grid Code which in the longer term will have to be fully consistent with the ENTSO_E RfG FRT requirements. He noted however that compliance without proof was not the way forward and studies should be provided by generators. It was noted that undertaking multi-machine studies and then checking compliance makes sense for the TSO but no sense for the Generator. However it was noted that the Generator would still need to undertake local studies and that the equivalent transmission model provided to them by NGET at the connection point was reasonably accurate so there was confidence in the ability of the Generator to comply with the requirements.

25. PN suggested the generator would have to accept that the National Grid model was accurate and advised that our European neighbours have conducted studies against a simplified model of their systems.

26. In summary, PN suggested that early adoption of the ENTSO-E RfG in respect of synchronous generation could solve some of the problems and this seemed to be the best approach going forward, but that clarification of interpretation of the ENTSO-E RfG code in how it is to be applied is required first.

6 Discussion

27. GS summarised the discussion by saying that the workshop had decided to focus on the issues relating to synchronous plant and there was no requirement to consider the asynchronous issues until formal ratification and implementation of the European Grid Code.

28. It was however suggested that the best option going forward would be to consider early adoption of the ENTSO-E RfG Fault Ride Through requirements for synchronous generation only. AJ advised that he would take an action to understand the implications and meaning of the ENTSO-E Fault Ride Through Requirements and summarise them in layman's terms for the next meeting.

Action: National Grid (AJ)

7 Next Steps

29. The next meeting has been provisionally booked for Wednesday 09 January 2013.

8 Summary

30. GS suggested another meeting may be required to look at the questions raised following the ACER response, however asynchronous representatives may wish not to be involved as the focus will be on synchronous Generators. Both PT and AM preferred to stay involved particularly to understand how testing changes may affect them.

31. MK asked if the workshop needed to consider Type B and C generators. AJ advised that the workshop will look at Type D synchronous generators initially as this is where the initial issue was identified.

32. GS wanted to ensure that all parties have been covered within the discussions. MK suggested HVDC. AJ advised that the RfG covers AC connections only and excludes HVDC (including offshore HVDC). BM further advised that the workshop had no Scottish TO representation, and that for the potential scope of change now proposed we should clarify again whether other TOs wished to be involved. BM also queried whether the requirements for large embedded generation would also be addressed which may prompt DNO agreement, given initial conditions and protection clearance assumptions there would be a function of the asset owners network design.

No	Action	Status
1	AJ to understand what RfG compliance means	For next Meeting
2	AJ to explain the RfG in Layman's terms	For next Meeting
3	AJ to confirm definition of Connection Point	For next Meeting

9 Any Other Business

33. PN asked if the workshop should begin looking at the application of parameters to asynchronous plant that has a different profile offshore.

34. PN asked for the RfG definition for a Connection Point. AJ to confirm RfG definition of Connection Point.

Action: National Grid (AJ)