



Meeting Note

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| Meeting name | GC0062: Fault-ride-through |
| Meeting number | 6 |
| Date of meeting | 21 st November 2014 |
| Time | 10:00 – 14:00 |
| Location | National Grid House, Warwick. |

Attendees

| Name | Initials | Company |
|------------------------------|-----------------|-------------------------------------|
| Graham Stein | GS | National Grid (Chair) |
| Richard Ierna | RI | National Grid |
| Tony Johnson | AJ | National Grid |
| Paul Wakeley | PW | National Grid (Technical Secretary) |
| Richard Woodward | RJW | National Grid (Technical Secretary) |
| Philip Belben | PB | Horizon Nuclear Power |
| Dave Draper | DD | Horizon Nuclear Power |
| Hervé Meljac | HM | EDF Energy |
| Pierre Josz | PJ | Tractebel |
| Campbell McDonald [by phone] | CMD | SSE Generation |
| Julian Wayne | JW | Ofgem |

1 Introductions

- 1.1 GS welcomed representatives to the meeting and thanked them for attending. The purpose of the workgroup meeting was to review the existing voltage against time curve proposals from National Grid (discussed at the previous meeting) and check its conformity with the Requirements for Generators (RfG) European Network Code.

2 Minutes of previous meeting

- 2.1 No comments had been received from work group members. GS advised participants to re-read the minutes and provide any feedback if necessary. No comment would be assumed to mean there are no issues. Indicatively no one present raised any concerns with the minutes, but agreed to review just in case.

3 Update on Actions

- 3.1 TJ advised that following further analysis the range of voltage against time parameters in the draft RfG Code (Table 7.1). results in certain 'dead-zones', which prevents the TSO from selecting specific values between RfG Max and RfG Min as originally presented to the Work Group earlier in the year. TJ also advised that the voltage against This issue has been raised to ENTSOE-E by NGET at a meeting on Tuesday 19th November in Brussels.
- 3.2 TJ and RI discussed the modelling exercises for the NuGen, Horizon and EDF projects applied to the model presented at the last meeting. They would like to present their findings individually to the respective work group organisation representatives. RI discussed how missing parameters or incorrect assumptions may have skewed results. HM confirmed to the group that EDF had already done this work with NGET, but they could repeat it with support from colleagues in France. DD confirmed Horizon have been undertaking some modelling work and would be happy to work with NGET. .
- 3.3 CM raised the issue of new capacity market participants in 2018 (particularly large-scale). FRT parameters need to be able to be complied with, and the work group need to consider those contracting plant items etc. (not just nuclear). TJ confirmed that the 500-660MW range of units ("medium sized") were included within the analysis work initially undertaken and quoted the examples of Drax and Seabank. He advised that sensitivities had been investigated including the effect of variations in System strength and excitation performance. RI advised that very large generators had also been modelled, but more work was needed on Embedded plant. GS stated that the proposed solutions for directly connected plant at 400kV and 275 kV should ensure new entrants would not be affect as the requirements are less onerous than the current GB drafting.
- 3.4 In relation to the dead-zone issue, PB raised the merits of a voltage against time curve (RfG) as compared with a voltage duration curve (as per GB Grid Code). HM confirmed the dead-zone is an issue for EDF, but acknowledged code redrafting would be difficult, citing numerous discussions on FRT at ENTSOE-E level. JW stated the issue is not just for GB; it's also a manufacturer's issue. He continued that the commission are more likely to respond to comments if issues are EU-centric, so GB concerns need to be presented in the right way. TJ said he believed other regions may have gone with less onerous requirement from RFG (so there may be no issue). TJ also noted the RfG requirements only apply to secured faults whereas the GB requirements cover both secured and non-secured events.
- 3.5 To aid compliance, RI suggested the proposed that amendments should be included within the GB code to clearly identify the studies that need to be run to demonstrate compliance. HM stated that the Grid Code doesn't currently specify requirement for simulation, so this needs tidying up. GS confirmed NGET would like generators to demonstrate compliance through simulation studies
- 3.6 The conversation moved on to discuss Mode A (secured faults) and Mode B (unsecured faults). TJ noted that RFG only seeks requirements for secured faults not unsecured faults. HM commented that the European Codes may have been left deliberately vague to allow TSOs to keep historic applications? RFG doesn't appear to preclude TSO's from having additional requirements – PB agreed this could be a solution to the dead-zone issue for secured faults.

- 3.7 TJ took an action to check GB interpretation (regarding allowable parameters for 'Mode A' and 'Mode B' faults) with ENTSOE-E, via a paper which will be circulated to the work group. TJ would also check for any overlapping requirements in the Emergency Restoration Code. CM suggested this was included in the Report to the Authority but was also captured through the RfG Implementation Work Group. PB reiterated the need to model Mode A faults using a voltage against time curve (ie consistent with RfG) and a voltage duration curve (as per current GB Grid Code terminology) for Mode B faults. The study work completed earlier in the year would then form the basis of the Mode B faults which it is believed overcomes the issues identified in the Workgroup's Terms of Reference.
- 3.8 PW + JW stated that RFG needs to be set first (i.e. final version) before starting to try and align for compliance solutions.
- 3.9 It was agreed that membership of the Work Group would need to be changed when the requirements applicable to Embedded Generation was considered. It was noted that some members who only have interest in large-scale synchronous plant may not wish to attend the second phase of the work which would consider the requirements applicable to Embedded Generation.

4 Feedback from generators on impact study on station auxiliaries

- 4.1 There were no concerns with the presentation. TJ needs to check what material can be circulated from RWE. HM commented that plant auxiliaries (i.e. motors and fans) are likely to behave similarly across different technologies/capacities but GS suggested otherwise. TJ said that equivalent models could be provided to allow Generators to assess the effect on their auxiliaries.

5 Issues for inclusion in work group report (& legal text)

- 5.1 HM noted that for Mode B faults, the short circuit level needs to be quoted separately from Mode A faults. It was noted that for a Mode A fault, the Generator would see the full effect of a System fault in which the pre-fault short circuit level would be fundamentally different from the post fault short circuit level once the various System elements (eg lines, transformers and busbars) had been taken out of service. It has been noted in previous meetings that the RfG document does require the TSO to provide the pre and post fault short circuit level. In contrast HM advised that for Mode B faults, the pre and post fault short circuit levels seen by a Generator for a Mode B fault would be very different to that of a Mode A fault as there should in practice be little difference between the pre and post fault short circuit level due to the remote nature of the fault. As RfG only covers secured faults (Mode A), there should be no reason why such a variations could not be included in the GB Code to cover Mode B faults which strictly fall outside of the RfG
- 5.2 CM queried whether the next step was to draft modified voltage against time curves for embedded generators. Moreover it was noted that RfG defines HV connections of 110kV or above. CM has concern at the applicability for lower voltage connections if HV (400/275KV) for directly connected is agreed first and then applied. PB suggested that NGET needs to double check that RfG allows multiple parameters for the same band of Generator. For example, should the fault ride through parameters of a 1800MW directly connected Type D Generator be the same as a 30MW Type D Generator connected at 110kV?
- 5.3 CM queried whether the next step was to draft modified voltage against time curves for embedded generators. Moreover it was noted that RfG defines HV connections of 110kV or above. CM has concern at the applicability for lower voltage connections if HV (400/275KV) for directly connected is agreed first and then applied. PB suggested that NGET needs to double check that RfG allows multiple parameters for the different Generator banding types [B-D].

6 Actions and Next Steps

- 6.3 GS recommended two more meetings (provisionally February and April). The next meeting would review the work group report (draft by RJW and TJ) and bottom out any issues from the modelling work. The group should aim to present their findings to the May GCRP.
- 6.4 PW confirmed that this would be his last meeting as Technical Secretary, passing on to RJW from next meeting onwards. GS and meeting attendees thanked PW for his support on this work group to date.

| ID | Actions | Captured | Owner | Status |
|----|--|----------|-----------------|--------|
| 7 | NGET to provide details of the single-machine model to workgroup members, to allow them to run their own studies | WG 4 | NGET | Closed |
| 8 | Confirm protection operating times with NGET protection specialist and ensure that studies are representative of actual operating points. | WG 4 | NGET | Closed |
| 9 | NGET and industry parties to consider further study work as outlined in paragraph Error! Reference source not found.. | WG 4 | NGET / Industry | Closed |
| 10 | NGET to identify if green voltage against time curve has presented in meeting No 4 had been forwarded to Generator manufacturers | WG5 | NGET | Closed |
| 11 | Industry parties to request further parameters / details from NGET if they are unable to access the PowerFactory single machine model. | WG 5 | Industry | Closed |
| 12 | For the next meeting, NGET to prepare: <ul style="list-style-type: none"> • A summary of the workgroup findings and proposal, as a slide pack, for discussion. • Consider the impact of the proposals on the large nuclear Generating fleet • Consider further the requirement of specifying the fault-level at either a local or global level. | WG 5 | NGET | Closed |
| 13 | Superimpose the orange voltage against time curve on top of the RfG requirement | WG 5 | NGET | Closed |
| 14 | Change the date in the terms of Reference to March 2015 instead of March 2014. | WG 5 | NGET | Closed |
| 15 | For the next meeting, Industry parties are asked to consider: <ul style="list-style-type: none"> • The stability of their station auxiliaries against the proposed curve • Where possible, to undertake some further analysis – particularly of large plant – against the proposed GB curve. | WG 5 | Industry | Closed |
| 16 | Industry are invited to engage with NGET to ensure National Grid are appropriately modelling the new large nuclear fleet in System studies (Extended at WG 6) | WG 5/6 | Industry / NGET | Open |
| 17 | NGET to check GB interpretation of RFG to allow 'Mode A' (Secured) and 'Mode B' (Unsecured) faults with ENTSOE-E | WG 6 | NGET | Open |
| 18 | Review Emergency Restoration Code for overlapping requirements with FRT and RFG | WG 6 | NGET | Open |
| 19 | Work group report to be prepared reflecting interim position pre-final RFG draft. | WK 6 | NGET | Open |