

Summary of Meeting and Actions

Meeting Name	Frequency Response Technical Sub Group
Meeting No.	2
Date of Meeting	Friday, 3 rd December 2010
Time	10:00am – 13:00 pm
Venue	National Grid House, Warwick

This note outlines the key action points from the second meeting of the Frequency Response Technical Sub Group.

1) Introductions, Minutes and Apologies

The Chair introduced the meeting, explaining how due to the adverse weather conditions the majority of Technical Sub Group members had not been able to travel and thanked those that had made the journey for their efforts. Consequently, the majority of attendees were dialling in as a teleconference call whilst seven members attended in person, as detailed in the Appendix 1 attendance list.

Apologies were received from Ken Lennon, Martyn Cunningham and William Hung.

Geraldine Bryson (ENW) and Tim Moore (UK Power Networks) had indicated that they would no longer be participating in the Sub Group but would be available to provide DNO input via email.

2) Previous meeting's minutes and actions

The previous meeting's minutes were reviewed for accuracy. Two inaccuracies were identified; The first being that the word "limited" had been left out of the phrase "limited frequency sensitive mode", in the second paragraph of section 4 and lastly, the members from Vestas and First Hydro had been missed out from the Apologies list in the Appendix. Assuming that both corrections were made, the Sub Group agreed the minutes which will be posted on the Sub Group's webpage.

Action: TI

The actions from the previous meeting were discussed and all the actions were complete save one. The outstanding action was for SW to discuss Antony Johnson's previous work on modelling an 1800MW loss and provide a summary to the Sub Group, which will be done before the third meeting.

Action: SW

TI provided a summary of the conversations National Grid have been having with the Irish Transmission System Operators on frequency response and simulated inertia. The Irish have expressed concern that they already had deep penetration of wind on their system and may require the introduction of obligations for Synthetic Inertia, which potentially could be applied retrospectively. There had been a recent instance when over 50% of demand was met by wind generation. TI described how the peak Irish network demand was an order of magnitude lesser than Great Britain and the frequency operation range wider. It was noted that whilst in absolute terms compared to GB, the Irish largest secured loss is smaller but larger as a proportion of peak demand. TI asked what the size of the largest generator on the Irish system was and JD responded that he believed it was 450MW and that it should be noted that the East-West Interconnector will have a capacity of 500MW.

Primary response had to be provided within a shorter timescale (around 1 to 5 seconds) and all plant had to provide some frequency response. National Grid had also discussed the provision of response from the Irish – GB interconnectors. It was understood that the existing link (Moyle) did not currently have response obligations although the future East – West Interconnector may do at the Irish terminal. The Sub Group agreed that TI should contact the relevant Irish stakeholders to discuss ideas.

Action: TI

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A Sub Group member asked National Grid what the current arrangements were for GB – Continental European interconnection. TI informed the group that this topic was currently under industry discussion following implications from the European Third Package. National Grid agreed to provide status updates as appropriate. .

Action: National Grid

SW confirmed that he had circulated two technical, public papers which examined the provision of Synthetic Inertia by wind turbines. SL commented that the papers clearly illustrated that there was potential for a drop in output after the initial inertial boost which was of some concern. SW agreed that this is an inherent feature of taking energy from rotating plant. JD informed the group that there is a lot of information on the GE website on this topic.

DMcC asked how quick wind primary response would have to be, as if a wind turbine provides Synthetic Inertia, there would be a drop in output after this period and therefore it would be extremely challenging to also provide primary response. Some of the Sub Group members thought that the working assumption was that SI would only be required when the plant was in limited frequency sensitive mode and therefore not providing FR. National Grid added that it would be seeking definitive statements from the manufacturers about whether provision of both was technically feasible. That withstanding it was understood that this was a 'chicken and egg' problem in that it depends on the required level of SI which in turn could not be determined unless one knows the amount of plant that is providing response.

National Grid informed the group that PT, of Nordex, has submitted data gathered from commissioned wind farm. The data tested the various, potential df/dt triggers that were discussed at the first meeting. The initial viewing of the information showed that it was hard to produce settings/ criteria which differentiated between local and national events. National Grid agreed to discuss the data further with Nordex and circulate what it could, to inform the group's thinking on algorithms and filtering criteria to ensure the correct trigger.

Action: GS

The group discussed Rate of Change of Frequency (ROCOF) and how there are two elements to this issue; ROCOF protection and whether the introduction of SI obligations alleviates ROCOF problems. The group firstly concluded that ROCOF protection is out of the scope of the group's Terms of Reference although qualitative recommendations could be made in the Frequency Response Working Group's final report. Regarding the latter, it was felt that SI may be too slow lived to practically help mitigate against increases to ROCOF.

SL raised a concern on what effect SI would have on conventional plant's governors. For example the governors are currently stable at Dinorwig but there may be detrimental effect created by a df/dt trigger on other generating plant.

3) Real Operation Data Collection

The group discussed National Grid's initial thoughts on the operational data provided by Nordex. It was felt that there were around one triggered event per day (using the initially proposed criteria of 0.01Hz/ cycle) and there was no substantial difference between northern and southern locations. MCh stated that as frequency events are national any tripping setting that did not provide the same result everywhere was likely to be down to a local effect or a measurement/ filtering error.

CH asked if the real data had shown differences between locations, as at the last meeting PL thought that local swings could look like national events. GS stated that it would become clearer with the collation of greater volumes of data although believes genuine variation in the system wide frequency will be clear to identify.

The question was raised as to why df/dt triggers were preferred over absolute frequency settings. National Grid responded that it was desirable that the amount of SI response was proportional to the ROCOF. A simple "one shot" frequency trigger runs the risk of leading to over frequency problems or not providing enough energy. National Grid agreed to examine a number of scenarios for various types of trigger, both df/dt and absolute frequency.

Action: SW

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PT updated the group and provided a summary of the data that he had provided. He felt that the setting of 0.01Hz/cycle produced many false reading as did 0.25Hz/25 cycles. PT also noted that the further into the distribution system the readings were taken, the greater the number of false trigger signals found. It was concluded that 0.015Hz/15 cycles had been quite successful for this exercise, although at this point in the meeting it was felt, by National Grid, that this may produce a delay time which may not be acceptable (discussions later in the meeting, suggested that such a delay time may not be an issue). PT agreed for National Grid to circulate the frequency/ time charts around the group but would like to confirm how to anonymise and present the data first.

Action: National Grid & Peter Thomas

4) Modelling Update

SW presented a slide pack on the progress made by National Grid on modelling, available on the technical sub group webpage.

Slide six showed the assumptions for the studies:

- Demand minimums at 25 GW and 40 GW;
- 1800MW largest loss;
- A single generator providing frequency response (with appropriate head room);
- Non frequency responsive generator (no headroom);
- Wind generation is providing SI – ramp rate of 200ms (zero to full output)
- Different delays to the commencement of SI (no delay, 0.5s, 1.0s)

The studies show a surprising result, namely that even with a 1.0s delay, the minimum frequency is not affected. It was felt this was due to the fact that the same energy was being provided within the critical period. This initially suggests that more sophisticated and accurate filtering could be used to ensure reliability and still manage to produce the energy before the minimum point. JD suggested that if timing of SI commencement is not a fundamental dependent then maybe a SI obligation could be defined as the delivery of a specific quantity of energy within a set timescale. SL stated it would be very interesting not only to see the frequency trace but the impact on the other generators. SW agreed to put a document together to show individual power system elements performance following the event and circulate it round the panel.

Action: SW

SS suggested that it would appear that there is some compromise that could be made here with delay and time to absolute power delivery (still assumed to be 200ms in the studies). SW agreed that this maybe the case but to date studies have only looked at the delay and more time would need to be spent on studies to assess a compromise in delay/absolute delivery of the synthetic inertia contribution.

MCh asked whether the model could be made available or whether it contained confidential data. National Grid agree to check this as well as ensuring that all the assumptions are as accurate as possible. GS also reiterated that when the technical report is written, all the assumptions need to be very clearly stated.

Action: National Grid

The group discussed the proposal that as it is assumed that synchronous plant replaces the energy lost after the provision of Synthetic Inertia by asynchronous plant, if the volume of wind is high, will this significantly lengthen the wind turbine's (and system frequency) recovery period? GS confirmed that we need make sure that the assumed governor action in the model is realistic and that any SI proposals work for all scenarios. National Grid agreed to consider this further.

Slide 11 shows that with an assumed 2 second SI delay and with a wind penetration of 75% that the min frequency is actually reduced below 49.2Hz and therefore this would not be acceptable. .

MCh questioned the 75% wind scenario and whether in this scenario the assumed frequency response came from wind. SW confirmed that the assumption in the model was that a generic

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generator was providing all the response but no assumptions are to be made as to what sort it is. SW informed the panel that for this to be understood fully, a detailed schedule of plant needs to be fed into the studies. An initial assumption is that a wind turbine can not provide both SI and frequency response and so there may be an issue in scheduling such a generation mix in practice. DMCC confirmed that, even if wind turbines can do both, there must be an inherent delay between the two modes for a wind turbine during which the blades are pitching.

5) AOB

Two additional points were raised. Firstly the question of whether demand side options were being examined as part of this exercise. National Grid responded that it was planning to examine this within the planned assessment work, time permitting.

Action: National Grid

A further point was raised reiterating the risks of relying on df/ft controllers.

6) Date of Next Meetings

The next meeting is scheduled for Thursday 13th January at National Grid's Solihull offices.

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Appendix 1 – Working Group Attendance

Members Present:

Tom Ireland	TI	Working Group Chair
Damien McCool	DM	EDP Renewables
Graham Stein	GS	National Grid
Joe Duddy	JD	Renewable Energy Systems
Mick Chowns	MCh	RWE Innogy
Stewart Whyte	SW	National Grid
Simon Lord	SL	First Hydro

Via Teleconference:

Steve Curtis	SC	National Grid
Alan Mason	AM	REpower
Chris Hastings	CH	SSE
Bjorn Andresen	BA	Siemens Wind Power
Francois Luciani	FL	EDF Energy
Tony Lakin	TL	Turbopowersystems
Peter Thomas	PT	Nordex
Sohnke Schierloh	SS	Enercon
Jytte Kaad Jenson	JKD	Vestas
Peter Wibæk Christensen	PWC	Vestas
Alastair Frew	AF	Scottish Power

Apologies:

Ken Lennon	KL	SP Power Systems
Martyn Cunningham	MCu	Scottish Power
William Hung	WH	National Grid