Frequency Changes during large System Disturbances Workgroup Meeting 5
18th March 2013

Attendees

Name	Initials	Company
Mike Kay	MK	Chairman
Robyn Jenkins	RJ	Technical Secretary
Joe Helm	JH	Northern Powergrid
Martin Lee	ML	SSEPD
William Hung	WH	National Grid
Graham Stein	GS	National Grid
Geoff Ray	GR	National Grid
Jane McArdle	JM	SSE Renewables
John Knott	JK	SP Energy Networks
Adam Dysko	AD	Strathclyde University
Julian Wayne	JW	Ofgem

Apologies

Paul Newton	PN	EON
Gareth Evans	GE	Ofgem
John Turnbull	JT	EDF Energy
Campbell McDonald	CM	SSE Generation
Mick Chowns	MC	RWE
Joe Duddy	JD	RES

Actions

The Workgroup discussed the ongoing actions; details of these discussions are captured in the action log or on the meeting agenda.

Review of ToRs

MK ran through the existing ToRs noting that there is a need to consider the conclusions of the Frequency Response Technical Subgroup.

The workgroup agreed there was value in updating ToRs needed updating to improve clarity and reflect the direction the workgroup has taken.

MK suggested the ToR are redrafted to illustrate the phased approach the workgroup is taking concentrating on the greater than 5MW plant. "Phase 1" being the greater than 5MW plant, with a further phase, "Phase 2" looking at inverter based technology and perhaps "Phase 3" investigating islands with multiple generators.

GS indicated that National Grid was comfortable with this approach which would allow the workgroup to address a large volume of the affected distributed generation as quickly and efficiently as possible. However, there was a need to ensure that the next tranche of plant was addressed appropriately and that the way forward needed to be identified within the ToRs along with agreed timescales.

Review of International practices.

The workgroup noted that the experiences of Ireland, Spain and Germany have discussed, however more can be done in this area. MK suggested that the National Grid representatives could do some of this work with support from the ENA.

Strathclyde study

AD outlined the scope of his work explaining that he will use of RTDS real-time model of a 30MVA machine connected at 33kV, a 3MVA machine may also be used for spot checks. The hardware will be tested using a commercial relay with 8 setting options (mix of 0.5Hz/s and 1Hz/s RoCoF with options for time delay and/or deadband). Load modelling as fixed impedance and fixed power. AD explained that he will enable all types of protection (voltage/frequency/RoCoF) to see what trips occur and where.

GS noted that he wouldn't expect small generators to operate on automatic governor control mode. AD noted that P/v may be better than f/v then.

AD showed the workgroup the network diagram and RTDS model control panel.

AD described the second stage of his work. The Generation range considered is 5MW – 50MW, and the assessment will use UK data, including DG generation statistics, load profiles from the DNOs and island formation configurations and statistics, this should provide the overall risk of undetected islanding condition persisting longer than an acceptable limit. The workgroup suggested that the limit should be 3s. MK noted that most auto-reclose setting are longer than 3s. ML suggested that, as per G59, a 0.5s limit should also be tested then compared to the 3s results to determine whether there is a significant difference.

AD explained his methodology including highlighting the island formation options;

1) 33kV primary busbar, loss of circuit breakers.
2) Generator on 11kV
3) Generator on 11kV – Radial connection to primary
4) Teed to a passing 33Kv
5) Fifth from JK

AD explained the probability of load/generation matching. Where the generation profile is steady at a level either greater than or less than the load profile, then there is a low probability of an undetected island occurring. Where the generation profile sits in the middle of the load profile there is an increased probability of an undetected island occurring.

AD explained the process for randomising generator size.

The workgroup discussed the data which AD has requested from the workgroup, AD noted that statistics for number of primary losses would be useful adding that if he uses loss of primary statistics, then he doesn't need to

know cable length. AD added that further load profiles, particularly sub 1 second granularity. MK agreed to ask the other DNOs for further load profiles.

AD highlighted the progress to date, noting that samples of load profiles and DG statistics have been obtained, RTDS modelling has commenced, UK frequency analysis has been undertaken to assess the effectiveness of the proposed frequency deadband.
AD noted that the first stage of this work is due for completion by the end of May 2013.

GS noted that, in the study results, it would be good to see a distinction between too little and too much generation.

The workgroup discussed the second work phase, which will look at smaller generators, particularly those with inverters. MK noted that small generation is clustered to some degree (though housing associations etc). ML added that there are some areas where PV may be net exporters, the Isle of Wight, Devon and Cornwall etc.

ML suggested that the workgroup needs to move quickly and make some decisions, otherwise we will run the risk of losing bigger chunks because of under frequency load shedding. WH noted that it is time efficient in the first phase to deal with some major components (ie Category I above) and we also need to look at some of the smaller plant (Category II) but making sure the progress on Phase I is not affected.

MK suggested that these issues could be addressed in a report, which is then consulted on, to gauge wider industry views before making any decisions.

ML suggested that most small generators have one of two types of protection, either RoCoF or vector shift, but noted concerns that vector shift may cause more customers to be lost. If the workgroup were to propose a change of this type then and understanding of the impact of changing from a RoCoF system to vector shift is necessary. MK noted that, given the lack of knowledge regarding protection types, in G59 should we state that DNOs need to know what protection type is fitted. He questioned whether there was merit in intercepting the G59 consultation before it is published to add that in? GS noted that the Grid Code Workgroup, Information for Small Embedded Power Stations may come up with a proposal to ask for the same information, providing two drivers for it. GS proposed responding to the consultation to that effect.

MK questioned whether phase two will include other technology types in this size range, or smaller sizes as well? ML suggested that "phase 2" includes other technologies which include discreet relays then "phase 3" could be all other types.

AD suggested that his impression of "phase 2" would include addressing smaller generators and PV but this could be split into two different parts and also include groups of generators (different technologies in 1 island)

ML noted that it would be the same as "phase 1" but with other technologies and "phase 3" would include inverter connected technologies .

MK noted that when RfG comes in, it will be a National Grid exercise to determine what the RoCoF withstand will be. ML suggested that, from the Irish information, the vast majority of machines can withstand 1Hz/s, however it was noted that this was from a KEMA desktop study which used generic generator types and no conclusions can be drawn without doing site specific studies.

GS noted that in terms of inverter behaviour, the workgroup need to settle a retrospectivity question and that more information needs to be gathered to do this effectively.

GS stated that it was important that the group examined at inverter technology, which allows the workgroup to say as soon as possible what future PV has to do. This information was required in any case to perform the multiple in feed assessment.

MK suggested writing into ToR what we are doing now, next and what someone else needs to do.

GS noted that the workgroup will formally look at governance of the work in flight at the next meeting.

DNO Information Gathering

GS noted that the letter to the DNOs and the accompanying survey have been drafted and circulated. He thanked JH for Northern Power Grids input into the letter. GS noted that he has asked for a realistic completion date for the project and requested that workgroup members chase this.

Arrangements for Seminars

RJ noted that the dates for the seminars have now been chosen, the first will be on the 28th April 2013 and the second will be the 8th May 2013. The workgroup recommended that the first of these is in Scotland and the second is in London.

RJ noted that, so far, not many responses have been received and the workgroup suggested using trade bodies for to advertise the event. RJ requested that anyone with specific contacts forward them to her.

The workgroup discussed potential agenda items for the seminar and agreed to develop via circulation. MK suggested that any seminar material is brought to the next meeting for discussion.