

## Frequency Changes during Large System Disturbances Workgroup Meeting 9 19 August 2013 at Midland Hotel, Manchester

### Attendees

<b>Name</b>	<b>Initials</b>	<b>Company</b>
Mike Kay	MK	Chairman
Robyn Jenkins	RJ	Technical Secretary
Martin Lee	ML	SSEPD
Graham Stein	GS	National Grid
Brian Roberts	BR	National Grid
Jane McArdle	JM	SSE Renewables
Adam Dyśko	AD	Strathclyde University
Joe Duddy	JD	RES
Joe Helm	JH	Northern Powergrid
Alastair Martin	AMar	Flexitricity
Andy Hood	AH	Western Power Distribution
Alan Mason	AMas	REpower
Gareth Evans	GE	Ofgem

### Apologies

<b>Name</b>	<b>Initials</b>	<b>Company</b>
Paul Newton	PN	EON
Julian Wayne	JW	Ofgem
John Turnbull	JT	EDF Energy
Campbell McDonald	CM	SSE Generation
Mick Chowns	MC	RWE
John Knott	JK	SP Energy Networks

### Actions

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

### Feedback from Code Panels

MK fed back that the DCRP took place on the 12 July 2013. At the DCRP there were some questions of clarification and concerns raised on behalf of generators which aligned with the workgroup's expectations. Interested parties were asked to feed their comments into consultation responses. GS added that feedback was received which suggested that the workgroup needs to be clearer on synchronous versus non-synchronous issues.

GS noted that at the GCRP, held on the 17 July 2013, there were questions on whether the Workgroup has done enough to quantify the risks to generators. GS added that at both panel meetings the discussions and slides presented explored the NGET Balancing Service costs in more detail than was included in the original Workgroup Report, the Consultation was updated to reflect this. The general consensus, from the GCRP, was that the Workgroup was taking the right steps to explore the necessary solutions and should continue with the second phase.

JD asked whether anyone raised any concerns that the Workgroup had not covered something. GS expressed his view that that no new concerns were raised, but noted that a wide range of issues were under consideration and highlighted discussion about who pays for the work synchronous generators will have to do.

ML suggested that there seemed to be a lack of clarity in people's minds between protection setting changes and withstand. MK recommended making this clearer at the workshops. GS commented that when presenting at workshops or Panel meetings, there is a tendency to start with a presumption that the audience will know the background, at these workshops we need to be conscious of the need to cover what has been done so far.

AMas queried whether there is any interaction with the frequency response work? GS noted that there is an interaction which National Grid is factoring into its work for presentation to the industry.

## **Workshops**

RJ directed the group to consider the draft agenda that had been circulated. The Workgroup agreed that AD should present his findings, GS should present the background and how to respond to the consultation and MK/ML will chair and present the next steps.

MK asked to what extent was it necessary to recreate the May workshops as it is important to not omit relevant background. GE asked who attended the May workshops. RJ agreed to circulate the attendee list but noted that it was a combination of generators, manufacturers, consultants and DNO representatives. GE stated the importance of trying to reach as many people as possible. MK added that the DNOs will be writing to all generators informing them of the consultation and inviting them to the workshops. RJ noted that a template letter for DNOs to use was circulated. The DNO representatives at the meeting agreed to send the letter as soon as possible, RJ added that she is able to provide support if necessary. GE asked who would discuss this with the DNOs not present at the meeting. MK said he would talk to the DNOs but he could not confirm at this stage whether they would all send the letter. GE asked to be informed if there is any resistance from any of the DNOs.

ML suggested that, as well as generators already connected, any connecting in the next 6 months should also receive a letter. The Workgroup agreed that this was a good idea.

GS noted that during the background session he does not plan to go into as much detail about Europe as in May, but will cover the necessary aspects during the phase 2 description. GE noted that the workshops seem like a good opportunity to prepare people for European changes especially because the start of RfG implementation is imminent. ML noted that Frequency Ride Through in RfG covers all categories, including category A, and as this will be covered in phase 2 it seems appropriate to talk about it here. MK added that there have not been many discussions in Europe about Frequency Settings, so the workgroup should assume RfG will be implemented as drafted in these areas. The workgroup agreed that any presentation material for the Workshops would be sent to RJ the end of 30 August and a telecon will be arranged for the relevant people the week after that.

GS questioned whether generators are likely to ask who they can talk to about how the network they are connected to is configured and whether thinking needs to be done on this in advance. JH queried whether they could get information from the long

term development statement. MK added that they those connected at 33kV could but possibly not for 11kV. ML suggested that if generators want to know they will have to ask their DNO and there will have to be a mechanism in place, but DNOs may not have the resources to deal with this.

JD noted that the Workgroup proposals are about changing RoCoF settings and the current consultation only covers protection, not withstand. MK stated that withstand forms part of phase 2. GS added that this will be covered quite early on in the workshops to make it clear. ML noted that generators can put in protection to preserve their plant and, if they do, DNOs need to know about it so they can tell National Grid. MK suggested that they are obliged to inform their host network owner under their connection agreement. GS noted that at the workshops he can say the Workgroup are moving on to consider withstand capability amongst other things. ML noted that at the first workshop, people in Glasgow were not happy that they would have to potentially put  $1\text{Hzs}^{-1}$  in if they think that  $0.8\text{Hzs}^{-1}$  was better. ML asked if there is process in place if they are not happy to implement the recommendations. MK noted that they would need to seek a derogation and it may be worth stating at the workshops that if this proposal is approved generators have to make the changes otherwise they will be in breach of connection conditions.

GE asked how likely it is that plant will not be able to comply. ML noted that in Ireland there are some generators concerned that they will not be able to comply with the proposed higher ROCOF withstand requirement. JM noted that the concerned generators are bigger transmission connected generators. MK suggested that it should not be as much of an issue here as we are only looking up to 50MW. JD stressed the need to emphasise the 50MW limit.

MK suggested that at the workshops we say these will be applying to all generators but the highest impact will be felt by owners of synchronous generators. The specific risk assessments are for out of synchronism or out of phase reclose. The Workgroup noted that at this point, generators may also be thinking about withstand. MK noted that generators cannot think about what is an appropriate setting without considering withstand.

MK summarised that for plant which cannot comply with any recommendations, they would either; have to seek derogations, and Ofgem may have to consult with interested parties (including National Grid) on what their setting would be; or the DNO or generator would have to change something on network design and/or connection design (i.e. install intertrip). AH noted that, with intertrips, some of the conditions which will create the 1Hz for 500ms would be tripped off on intertrip, so the generator would be protected.

AMar asked whether the Workgroup is prepared to go forward and say this proposal will not make a difference to anti-islanding protection. GS stated that the Workgroup is not prepared to make this statement prior to completion of the consultation exercise. ML added that there will be an increase in risk. GS suggested that, in his view, a network fault will have more impact on a generator than high RoCoF but we can only reach that conclusion if we know precisely which generators are affected, something we hope to learn from the consultation process.

MK noted that for an existing generator, who is subject to an islanding event, the RoCoF is completely unchanged by the group's proposals. What does change is the probability of an out-of synchronism reclosure.

MK suggested that, for clarity, it would be worth emphasising these points in the presentations. BR asked whether Generators are using RoCoF relays to protect the machines, which is different from LoM.

AD suggested that the consultation legal text might need to be reviewed when considered in the context of the original Risk Assessment Report. The consultation states  $1\text{Hzs}^{-1}$  measured over 500ms, rather than protection settings of  $1\text{Hzs}^{-1}$  with a 500ms time delay. ML suggested that this was intended to clarify the requirement that any relay should trip when it is effective. AD suggested that a recommendation for a 500ms measurement period cannot be made as some relays will not be able to do it. MK noted that he was content with the language, but if AD has concerns they should be looked into.

AH suggested that the text could say that under such a condition the relay should trip, meaning the exact setting is left to the owner. MK noted that the Workgroup recognises there are different relays and the proposal is not to specify how to set every relay, but to specify the conditions under which a relay should operate. AD suggested that the consultation wording is a change from G59. MK suggested that this discussion should continue with the relevant parties outside of the Workgroup meeting

AMar, asked what is the least helpful type of relay which could be manufactured based on current G59 settings. ML suggested that a relay could issue a trip setting within 40ms but none do because of nuisance tripping, all relays measure over several cycles.

GS noted that the Workgroup needed to clarify its thinking during the consultation period.

## **Workplan**

MK recapped earlier discussion that the Workgroup needs to think about smaller than 5MW machines, including what is out there and where it is. The Workgroup also needs to start thinking about multi machine islands, and there is a need to understand how machines interact. MK added that the Workgroup has probably reached a natural limit of what can be done via our own direct resources GS has drafted some work proposals and there is also a paper from ML regarding the very small plant on the network which is connecting en masse.

GS noted that within the workgroup report and Industry Consultation there is a plan for further work which has been circulated as a separate document. From the list, two request sfor proposals have been developed but they may not include the questions raised in ML's paper.

The workplan includes 7 points;

1. *Research the characteristics (numbers/types etc) of embedded generation of less than 5MW registered capacity including likely RoCoF withstand capabilities;*
  - a. Review DNO information and survey additional sources as necessary;

2. *Investigating the characteristics of popular/likely inverter technology deployed, particularly in relation to RoCoF withstand capability and island stability;*
  - a. Survey manufacturers and installers and survey additional sources as necessary;
  - b. Assess the requirement to test equipment to verify its characteristics;
3. *Development of RoCoF withstand criteria for use in GB (as will be required by RfG 8.1(b));*
  - a. Workgroup members to develop a view of generation technologies' inherent withstand capability;
  - b. Review the final proposals (post consultation) from the July 2013 recommendations in respect of protection settings and the Total System requirement;
  - c. Identify and assess any gaps in withstand capability;
  - d. Assess the costs, benefits and risks of setting withstand capability requirements for future generators;
  - e. Assess the costs, benefits and risks of setting withstand capability requirements for existing generators;
4. *Assessing or modelling the interaction of multiple generators in a DNO power island;*
  - a. Review existing approaches to multi-machine dynamic simulation;
  - b. Develop new approaches if required;
5. *Investigating and quantifying the risks to DNO networks and Users of desensitising RoCoF based protection on embedded generators of rated capacity of less than 5MW;*
  - a. Assess the costs, benefits and risks of requirements to de-sensitise RoCOF settings for future generators of registered capacity of less than 5MW;
6. *Analyse the merit of retrospective application of RoCoF criteria to existing embedded generation of less than 5MW (including comparison with similar programmes in Europe);*
  - a. Review international experience of large retrospective change programmes;
  - b. Assess the costs, benefits and risks of requirements to de-sensitise RoCoF settings for existing generators of registered capacity of less than 5MW;
7. *Consideration of issues relating to the continuing use of Vector Shift techniques;*
  - a. Review the likely exposure of distributed generation to vector shifts in excess of recommended settings during system disturbances.

GS suggested that this list is probably missing some of ML's key points but the two requests for proposals cover most of these points. AD asked whether there are some

dependencies. MK noted that the second proposal is dependent on completion of the first. MK suggested that most of ML's points are covered by 2b. JD suggested that, as well as a desktop assessment, a practical assessment will be necessary because different manufacturers implement control strategies in different ways. AD suggested that this work is more about stability than the machine, and if they have LoM protection which relies on RoCoF then they will trip off at  $1 \text{ Hzs}^{-1}$ .

MK queried whether National Grid's current problem is knowing what is installed. GS said that this was one issue because once we know what is installed we can then consider where to focus efforts. AH suggested that the first proposal is more than producing a list of existing generators, there is also a need to understand them.

MK noted that it is still appropriate that there remains a multi-stage approach including learning what is there, how do they behave, how do we deal with them "en masse", a withstand specification and learning what is the capability of the plant that is already out there. The work will be a mixture of desktop and field, but mainly desktop MK added that, ideally, the workgroup could do it, but in the necessary timescales they probably cannot, instead the Workgroup should identify avenues to investigate. GS noted that achieving this requires the network companies' participation. MK suggested that the Workgroup needs to be happy with the scope of this work and the network licensees will discuss how to deal with this commercially. MK noted that the Workgroup also needs to be comfortable that the scope of works and any potential supplier were appropriate.

GS stated that these work proposals are intended for presentation to the ENFG on 19 September, as they need support from the network companies there. MK suggested that any feedback from Workgroup members on the proposals should be sent to GS by the end of August 30 and it would be useful if this included a statement of what the work proposals should include to gain your support.

JH questioned whether some of the research in the work proposals would be done through manufacturers rather than the network companies. The Workgroup agreed with this because in general DNOs will not know the manufacturers which are connected.

AMar asked whether capturing what is installed, includes capturing the amount of inertia on the network. AD suggested it would depend on whether generators have the information on the inertia. AMar suggested generators usually have to go and find out, it is not commonly known. AD suggested that this work may not solely be a data gathering exercise, it could require some modelling.

GS questioned whether it would be clearer if the proposal stated that we see this as a desktop exercise. There is evidence from Spain that solar can sustain an island, so the first stage is understanding the volume installed. AD suggested that it would be useful to replicate, in a lab, if the solar situation in Spain is repeatable. MK added that it is repeatable as the Spanish companies have purposely repeated it.

## **AOB**

JM provided an update in the RoCoF work in Ireland. JM noted that the Regulator in the Republic of Ireland, CER, published a consultation on the proposed ROCOF withstand recommendations including a proposal that ROCOF withstand study cost should be born by generators. SSE responded suggesting that the proposals should, rather than apply to all plant, only apply to plant which will be running at high risk

times. The CER consultation has now closed. The Northern Ireland Utility Regulator is also expected to publish a similar consultation before a final decision is made.

AMar asked whether there is a commercial alternative to making generator ROCOF protection setting changes. GS noted that National Grid is developing this anyway as part of the DRIVe tender, and there is still a decision to be made over whether to extend this exercise. However National Grid's view is that the present G59 setting of  $0.125 \text{ Hz s}^{-1}$  is too low to develop efficient market arrangements. MK noted that, eventually, there will be a need to look at how islands are considered overall.

RJ noted that the next Workgroup meeting will be the 26 September; MK added that it will be in the same location.