

## Minutes

<b>Meeting name</b>	Frequency changes during large system disturbances workgroup, phase 2 (GC0079)
<b>Meeting number</b>	32
<b>Date</b>	28 July 2015
<b>Time</b>	10.30 – 15.00
<b>Location</b>	National Grid House, Warwick, CV34 6DA (teleconference option also)

## Future meeting dates

Meeting Number	Date
33	25 <sup>th</sup> August 2015

## 1) Introduction & apologies

The workgroup welcomed Richard Woodward (NGET) who will be the new technical secretary, taking over from Scott Bannister from September 2015.

## 2) Review of previous minutes from meeting 31

The workgroup agreed that the minutes could be accepted.

## 3) Phase 1 update

MK provided a brief update. The next quarterly update is due on 28 August 2015 and will be discussed at the September GCRP/DCRP. It was also noted that the 'new' week 24 data has been provided, the significance being that this is the first year in which specific data on sites down to 1MW have been provided to NGET.

After the Phase 1 update, the discussion moved onto operational limits and also touched on the Terms of Reference (ToRs), although it was noted that this would be discussed further down the agenda.

GS explained some projected NGET costs of operating the system to a RoCoF limit of  $0.2\text{Hzs}^{-1}$ . It is estimated to be ~£20m per year. At present, an in-feed loss limit of 800MW allows the SO to limit RoCoF to  $0.125\text{Hzs}^{-1}$ . This in-feed loss limit would rise to ~1200MW if we could move to operating the system to up to  $0.2\text{Hzs}^{-1}$ . The Phase 1 Report to Authority identified 1GW with settings of  $0.125\text{Hzs}^{-1}$  or less and another 1GW which had unknown settings.

Since progress in changing >5MW embedded generator RoCoF protection settings to the new 1.0Hz/s setting has been slow and somewhat uncertain, JD suggested a more targeted approach to changing settings. For example, prioritising the larger sites which have 0.125Hz<sup>-1</sup> settings. MK added that a priority list could be used, possibly by generator type. GS noted that for everything below 5MW, we don't have the data yet. MK noted that in theory we now know for 1-5MW sites but acknowledged there is a data reliability issue. GS asked if all G83 had a mix of 0.125Hz<sup>-1</sup> and 0.2Hz<sup>-1</sup> settings. ML noted that the vast majority of G83 sites do not have RoCoF or Vector Shift and added that he would be fairly confident that the majority of rotating plant would not trip for system RoCoF events of 0.2Hz<sup>-1</sup> or less (based on the fact that prior to 2010 settings of 0.2Hz<sup>-1</sup> to 0.5 Hz<sup>-1</sup> were in common use rather than 0.125Hz<sup>-1</sup> and post 2010 many users had opted for VS rather than RoCoF as the 0.125Hz<sup>-1</sup> setting caused too many nuisance trips).

JD asked if 1-5MW PV sites were inverter protected or had separate relays. ML responded that they mostly had separate relays. MK confirmed that anything connected at 11kV is very likely to have a separate relay and that it was common for a DNO to insist on this. JD suggested we could therefore discount G83 but consider everything else for prioritising changes. ML added that PV less than 50kW can be discounted too. GS asked whether the WG was able to advise on the generating capacity at risk of tripping at rates of 0.2Hz<sup>-1</sup> and below. MK noted that given the aforementioned operational costs it would probably be worth it but acknowledged it is not strictly within its scope. GS felt that using the WG wisdom would be beneficial.

CM enquired about the possible timeframes for moving to operation at 0.2Hz<sup>-1</sup>. GS advised that NGET would like to do so ASAP once it has been confirmed that there is no unnecessary risk. CM was concerned about the governance arrangements for making this change, which he felt needed more data to support the decision. MK noted it was important to identify the appropriate governance, potentially within the SQSS.

CM mentioned the updated 'system RoCoF limits' paper that GS circulated in advance of the meeting. CM didn't feel that the paper addressed the governance issue. JD noted with regards to any existing operational limits on RoCoF, and in the absence of any formal governance (e.g. via SQSS), it is prudent for NGET as SO to make the decision on what limits to operate to. MK added that he couldn't see a problem with operating to 0.2Hz<sup>-1</sup> and noted it has been an accepted setting in G59 for some time.

JD suggested that we may have been neglecting generators' RoCoF ride through protection. JA noted that some of his station manager colleagues want to change prime mover settings to 0.3Hz<sup>-1</sup> from the current settings of 0.125Hz<sup>-1</sup>. MK asked if this was to avoid nuisance tripping. JA will discuss with his colleagues and report back to the WG. MK noted there is no current GB requirement for RoCoF ride through but ML pointed out that there is a requirement in G83/2 and G59/3 for a stability test at 0.19Hz<sup>-1</sup> which covers all type tested generating units up to 50kW, and effectively requires ride through. JD added that this doesn't give NGET the confidence to operate to a higher RoCoF limit. This was the approach of the Irish TSO view and they will only change from their present operational limit of 0.5Hz/s (corresponds to Grid Code generator RoCoF ride through setting) when sufficient generation has confirmed the higher RoCoF ride through capability. ML raised the point of having a level of margin above the operational limits. JD suggested it would be worth discussing with EirGrid on their approach to changing their operational limit and setting margin levels.

JD asked if NGET consider the vulnerability of plant or the system in determining the operational RoCoF limit. GS responded that both are considered. GS did not feel that there would be any plant issues if the operational limits were moved to  $0.2\text{Hzs}^{-1}$  and asked CM to advise if he had any evidence to suggest there might be problems. GS noted that making the change past  $0.2\text{Hzs}^{-1}$  would require more generator portfolio setting data to provide NGET with confidence that there was no unnecessary risk of large volumes of generator RoCoF tripping. CM felt that it was important to know the criteria for changing settings and operational limits into the future. JD noted that the ToRs for the WG are to investigate G59 protection settings and withstand capability, not NGET operational policy. MK added that the work so far has been looking at total system risk, irrespective of NGET operations.

ML noted that our initial view on the setting change was intended to future proof to 2023 but that the industry is rapidly changing and so it may need to be reviewed.

It was noted that RoCoF was previously unmanaged by NGET until system RoCoF had approached the G59 limits. GS suggested that we don't get the full picture until the withstand issue is considered but that in his opinion up to  $0.2\text{Hzs}^{-1}$  the industry's concerns relate to protection settings and above that is a withstand issue. GS suggested that we first focus on protection settings and then look at withstand capability. CM agreed and felt that the obstacles that NGET need to overcome to operate at  $0.2\text{Hzs}^{-1}$  should be stated.

CM felt that there was a need to address what the system is operated to. MK noted that this was not part of the WG ToRs but agreed that someone should investigate this and develop clear and transparent policy. Everyone agreed that RoCoF operational limits and RoCoF protection / withstand limits are a 'chicken and egg' situation and that one would be used to inform the other. ML felt that once we've set these protection setting limits, NGET should be able to calculate a projected profile of raised operational limits out to 2023.

GS added that there is currently no explicit obligation for NGET to operate the system to  $0.125\text{Hzs}^{-1}$  but that it's the prudent approach. He noted that we need a mechanism to change this in the future and that NGET would not make changes without first consulting.

There was a discussion around the LFCR code and the methodology within it for setting inertia. MK noted that LFCR will force us to have governance over RoCoF and inertia limits. GS added that if LFCR is too far away then we can always make changes in the interim through other governance routes. CM was happy with that approach as long as we capture our assumptions.

**Action JA:** Discuss with RWE colleagues regarding GT prime mover settings

**Action GS:** Contact EirGrid re operational RoCoF limits and how these are determined

## 4) Phase 2 update

### 4a) Ecofys

The final Ecofys report was circulated to the WG shortly before the meeting. It was therefore acknowledged that there had been little time to review. GS suggested that, for now, we assume all comments and changes have been applied as per our discussions with KB and MD at the previous meeting. GS added that we will need to ensure the dataset used in submitting proposals is amended accordingly to ensure it is the most recent and accurate dataset available.

CM asked if the report would be published on the external WG website. GS advised that the Ecofys contract stated it would be used publically and therefore it would be added to the website once the WG have reviewed for a final time and are happy for the final report to be published.

**Action ALL:** Read final Ecofys report to ensure all previous workgroup comments and suggestions have been applied [within 10days]

### 4b) PNDC / University of Strathclyde (UoS)

Ibrahim Abdulhadi provided a brief update in advance, via e-mail, in lieu of AD.

“A quick update since the previous meeting:

- We've had detailed discussions with Martin Lee on the event to be created with the Motor Generator set to emulate a grid disturbance. Further testing will be conducted in August 2015 to close off this part.
- The manufacturer has been contacted to enquire about inverter behaviour during RoCoF ramps and we are awaiting their response.
- Final PNDC testing report is being prepared.”

ML noted that he and AD had discussed the definition of ride through since the last meeting but couldn't agree. It was noted that this would be covered in the ToR agenda item. ML noted that the main blocker for AD was the definition of frequency over a long period of time. There is also a need to decide how we define ride through.

There was a discussion around RfG interaction, the different types of generator category in RfG and their associated frequency response requirements.

GS advised the group that AD has recognised there are still areas to be clarified but he hopes to have some results in August, just before the next WG meeting.

IK asked if we know if AD has considered the SPD data in identifying the dominant groups for his research. It was felt that AD had done so and that he was happy with the data as is but IK will speak to AD separately.

**Action IK:** Discuss the SPD dataset with AD

## 5) Terms of Reference (ToR) Discussion

MK circulated a modified version of the ToRs in advance of the meeting to encourage discussion. There were two key changes.

The first proposed change was whether to make the RoCoF withstand criteria for 'new generation only'. JD noted that RfG requires a withstand level to be set which can be retrospective if a CBA is conducted. This triggered a WG discussion on whether retrospective changes would be appropriate. ML noted that the network code allows the definition of new and retrospective changes but GS was keen to avoid setting a retrospective withstand requirement if possible. Any retrospective change would require a CBA to be conducted, which would require data that we don't have, although the Ecofys data is a useful start. It was agreed that we would need to engage with more people (AMPS, larger generators, owners, manufacturers) and GS suggested that the work on withstand capability for new sites would inform whether any retrospective changes were required. MK highlighted the need to be clear either way and advise the GCRP of our thinking on this issue. ML noted that it was possible to force sites to retire if they couldn't apply the retrospective changes, or seek a derogation, and that it was about the best cost option for the consumer via the CBA. JD suggested that NGET need to understand the withstand capability to set operational limits and added that a minimum withstand capability limit could be valuable. CM suggested that the WG could look at RoCoF withstand capability as 'phase 3' and look for new members. MK felt that this should be covered in phase 2 otherwise we would risk delaying our work. MK added that we would ideally want to be consulting by Christmas 2015. It was noted that there has not yet been a detailed discussion between the RfG and RoCoF workgroups (GC0048 & GC0079). RW noted that a code mapping process has begun within NGET to determine which existing or new workgroups and subgroups will capture the various RfG requirements. JD asked what the objectives for this WG were in eyes of the GCRP. MK responded that he felt our focus was on dealing with the protection setting risk for DG. MK added that there is no historic withstand requirement and that the RfG requirement was added at a fairly late stage. GS felt that we couldn't avoid mentioning the RfG and that ride through is really a Voltage issue. He cited the formal title of the WG; "frequency changes during large system disturbances". JD queried whether that was still the case if (as the Irish TSOs have studied) a low voltage ride through event could induce a frequency change. GS wasn't sure which were being progressed through the RfG WG (GC0048) and which were under other sub-groups.

ML felt that NGET as SO should set a RoCoF operating limit for each year so that the generators can make an assessment for when they will need to make changes. CM agreed subject to the proviso that this is done through a governance process. MK was not convinced that would work and that it didn't consider non-secured events. GS noted that this RoCoF trajectory is almost implicitly required in the LFCR. It was noted that publishing figures might make it harder to change again as the generation mix changes from our expectations. GS added that our figures could prove to be wrong and MK suggested that a generic withstand capability might be the more appropriate. JD queried whether we need to coordinate LFCR inertia policy and system limits work. GS confirmed this but noted the LFCR work has not really begun and that LFCR will merge with other operational codes as one guideline. MK queried whether we should consider the LFCR requirements in this WG but GS felt

that we were not able to do that yet. MK suggested that we make the ToRs more restrictive and take to GCRP.

GS noted that until Ecofys had raised the issue of the internal protection of generators, he was comfortable that no retrospective withstand capability changes would be required but he is not so sure now. MK had also believed that internal protection didn't exist but KB has shown this might not be the case. GS suggested we could go to the GCRP advising that our focus is on new withstand capability but caveat that we may have to do retrospective changes if data is found to show it's needed. MK noted that internal protection should be in the ToRs. We might not have believed it was used initially but now that the Ecofys work has suggested it does, it should be included. MK added that we've asked AMPS for a formal view on this but no response has been received yet.

Regarding the second proposed amendment from MK to the ToRs (*"Consider any other relevant issues in relation to the resilience of the total system in respect of the operating characteristics of small generation"*), JD noted that there might be a frequency disturbance from another source such as a consequence of low voltage ride through. ML noted the separate WG looking at voltage ride through (GC0062), which GS chairs. GS suggested that we need to keep voltage and frequency requirements separate.

In an attempt to summarise, GS suggested that our ToRs could focus on protection settings and state that we will 'scope out other requirements' which can be broken down into manageable areas. GS proposed that we re-phrase the ToRs to consider four key areas: (1) protection settings; (2.1) withstand capability for new generators and (2.2) a potential view on the existing fleet, proposing a CBA for retrospective changes if required; and (3) system RoCoF limits (expressing a view on dealing with that area). GS and MK took an action to discuss the points raised above, considering the fault ride through work group discussions and report back to this work group with a proposal for updating the ToRs and then taking to the next GCRP for further discussion and clarification.

**Action MK / GS:** Propose updated ToRs (after the FRT meeting on 29/7/15), discuss at next meeting and then aim to take to GCRP/DCRP in September 2015

**Action MK:** Follow up with AMPS chair (Chris Marsland)

## 6) Review of actions (old & new)

SB summarised the new actions that had been captured in the meeting, which can be found below in the 'summary of actions' section.

SB ran through the key actions that had been closed since the last meeting and provided an update on those that were still open. Please see the action log for more information.

## 7) Future meeting arrangements (dates & locations)

SB advised that the next meeting would be held at Ofgem in London on 25<sup>th</sup> August.

## 8) AOB

None

## 9) Summary of actions

<b>WG Member</b>	<b>Action No.</b>	<b>Action</b>	<b>Due</b>
JA	129	Discuss with RWE colleagues regarding GT prime mover settings	25/8/15
GS	130	Contact EirGrid re operational RoCoF limits and how these are determined	25/8/15
ALL	131	Read final Ecofys report to ensure all previous workgroup comments and suggestions have been applied [within 10days]	10/8/15
IK	132	Discuss the SPD dataset with AD	25/8/15
MK / GS	133	Propose updated ToRs (after the FRT meeting on 29/7/15), discuss at next meeting and then aim to take to GCRP/DCRP in September 2015	25/8/15
MK	134	Follow up with AMPS chair (Chris Marsland)	25/8/15

Attendees		
Name	Initials	Company
Mike Kay	MK	Chair
Graham Stein	GS	National Grid (Alternative chair)
Scott Bannister	SB	National Grid (Technical Secretary to 1/9/15)
Richard Woodward	RW	National Grid (Technical Secretary from 1/9/15)
Joe Duddy	JD	RES
Jacob Allinson	JA	RWE
Martin Lee (t-con)	ML	SSEPD
Ioannis Koutsokeras (t-con)	IK	SP Energy Networks
Campbell McDonald (t-con)	CM	SSE Generation
Apologies		
Mick Walbank / Sam Turner	MW / ST	Northern Powergrid
Greg Middleton / John Ruddock	GM / JR	Deep Sea Electronics
Gareth Evans	GE	Ofgem
Alastair Martin	AM	Flexitricity
Paul Newton	PN	EON
John Turnbull	JT	EDF Energy
Ken Morton	KM	HSE
Andy Hood	AH	WPD
Lorna Short / Mick Chowns	LS / MC	RWE
Adam Dyško	AD	Uni. Strathclyde
Karsten Burges / Michael Doering	KB / MD	Ecofys
Kevin Burt / Miguel Bernardo	KEB / MB	UKPN