

## Minutes

<b>Meeting name</b>	Frequency changes during large system disturbances workgroup, phase 2 (GC0079)
<b>Meeting number</b>	33
<b>Date</b>	25 August 2015
<b>Time</b>	10.30 – 15.00
<b>Location</b>	The EIC, 89 Albert Embankment, London, SE1 7TP

## Future meeting dates

Meeting Number	Date
34	Tues 22 <sup>nd</sup> September 2015
35	Thurs 22 <sup>nd</sup> October 2015
36	Mon 23 <sup>rd</sup> November 2015
37	Mon 21 <sup>st</sup> December 2015
38	Mon 25 <sup>th</sup> January 2016
39	Wed 24 <sup>th</sup> February 2016
40	Wed 23 <sup>rd</sup> March 2016

## 1) Introduction & apologies

Apologies were received from MK.

GS chaired the meeting in MK's absence and welcomed the group.

## 2) Review of previous minutes from meeting 32

The WG discussed the various comments on the previous meeting minutes and some changes were made. These will be circulated to the WG for final approval in due course. It was also suggested that the distribution list should be reviewed.

**Action SB:** Update the minutes from meeting 32 and circulate to the WG for approval

**Action SB:** Review the GC0079 distribution list

## 3) Terms of Reference (ToRs) Update

The WG went through the updated version of the ToRs circulated by MK in advance of the meeting. There was a detailed discussion and some changes were proposed. These will be applied by GS and circulated to the WG. Key comments made are summarised as follows. CM suggested that FRT is an issue for GC0048 to assign elsewhere and that it would be worth discussing at the GCRP/DCRP. CM

added that it would be worthwhile to identify a list of issues outside of the GC0079 scope for wider consideration to ensure that others are looking at them and they are not missed by industry. CM also noted that the WG need a better dataset to understand the volume of phase 2 generation that would trip if SO RoCoF operational limits were raised to  $0.2\text{Hzs}^{-1}$ . It would also be useful to get an idea of market share for different inverters although this will be hard to establish in practice\*. It was also noted that a CBA should be completed for operating at various RoCoF levels. GS noted he would add some text to cover developing a view of the operating standards for the purpose of the WG assessment. There was a discussion around whether withstand capability should be considered as 'phase 3' but GS noted that it would be better to split into 'phase 2a' for protection settings and 'phase 2b' for withstand. He also noted that the future versus existing withstand capability requirements need to be considered. CM noted that the withstand capability depends on how far we change the settings and the associated health and safety considerations. JD queried whether we need feedback from the SQSS panel re withstand criteria and a general coordination with LFCR<sup>†</sup> requirements, which need to be clarified.

**Action GS:** Update the ToRs following WG comments and circulate prior to taking to GCRP/DCRP in September 2015

**Action GS:** Clarification of the LFCR<sup>†</sup> requirements to devise a RoCoF operating standard

*\*Follow-up information on market share for inverters from JD:*

*I have discovered that IHS produces a quarterly report on inverter market share. Here are related links [restricted access]:*

<https://technology.ihs.com/521168/pv-inverter-market-tracker-q2-2015>

<http://press.ihs.com/press-release/technology/ihs-pv-inverter-rankings-asian-suppliers-take-another-big-leap>

[http://www.pv-magazine.com/services/press-releases/details/beitrag/schneider-electric-ranked-third-in-market-share-for-global-central-inverters\\_100020434/#axzz3k20dc7YS](http://www.pv-magazine.com/services/press-releases/details/beitrag/schneider-electric-ranked-third-in-market-share-for-global-central-inverters_100020434/#axzz3k20dc7YS)

*† Follow-up comment on LFCR from JD:*

*I note from the revised meeting 32 minutes that we should probably be referring to the minimum inertia setting methodology required by the Operational Security Code:*

## 4) Phase 2 update

### 4a) Ecofys Final Report

GS highlighted that the Ecofys final report was available following the addition of some data tables in the appendix and some other minor revisions based on comments received. GS added that the figures will be updated once more prior to publication. GM noted his concern that the report suggests we are comfortable with the findings whilst other research suggests otherwise. However if we publish with a suitable caveat via a footnote then he is happy. GS summarised that the final report will be published with a suitable footnote to close-off the Ecofys phase 2 research.

**Action GS / SB:** Publish Ecofys final report to the WG website

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

AD introduced the UoS work. He advised that IA would present on the PNDC inverter testing and that his colleague Dimitrios Tzelepis (DT) would present on the assessment of the NDZs. AD would then conclude the presentations with a summary of the risk assessment findings. All presentations will be published to the WG website so please refer to these for further information.

### PNDC update and main conclusions

IA ran through a presentation and explained that the PNDC tests had been split into three main test categories: islanding test network, RoCoF test network & vector shift test network.

IA noted that if the WG is happy with his findings so far, he can continue other inverter tests. IA noted that the inverter that shows a reduction in power output is only in very specific bands (a 1.4Hz change at  $0.7\text{Hz}^{-1}$ ). AD added that this could be deliberately time delayed. GM noted that it would be good to know the market share of this specific inverter but acknowledged it was unlikely we would be able to gather this data. GS noted that Ecofys work suggested this was not going to have a material impact. He added that the results were quite positive and that they suggest it would be possible to change to  $0.5\text{Hz}^{-1}$ . IA summarised the main project conclusions: all inverters under test were able to detect loss of mains and disconnect successfully within 1s; all inverters under test remained synchronised to the grid during  $1\text{Hz}^{-1}$  RoCoF ramps (although one inverter dropped its power output during RoCoF events greater than  $0.7\text{Hz}^{-1}$  within a frequency band of 1.4Hz although this may not be a cause of concern due to the unlikely severity of such event for which other stability concerns may arise); and inverters tested remained stable for a vector shift of  $5.5^\circ$  during a 1Hz frequency drop).

### Risk assessment: NDZs

DT presented on the first part of the risk assessment work; considering generation technologies and groups and looking at NDZs. JD asked if the WG needed to consider the RoCoF measurement method.

### Risk Assessment: Dominant islanding groups

AD presented on the second part of the risk assessment work; establishing dominant islanding groups through DG register analysis. AD summarised his key observations: RoCoF protection becomes very ineffective with the proposed setting option 4 (i.e. generator is disconnected by G59 protection in the majority of islanding situations); when changing to the proposed setting option 4 the risk figures increase approximately by 3 orders of magnitude; figures averaged across all used profiles are lower, approximately by 50%; risk related to accidental electrocution is still low (approximately  $7 \times 10^{-7}$ ); and the expected number of out-of-phase auto-reclose events approaches 100 per annum.

AD noted that these risk figures would still fall within the 'green' area of the HSE triangle to determine acceptable level of risk. AD advised the WG that his next steps were to write up the final report, within ~1 week, for questions and comments.

**Action AD:** Finalise report and circulate to WG for final comments

## 5) 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.

## 6) Future meetings (dates & locations)

SB advised that the next meeting was on 22<sup>nd</sup> September. Meeting dates had been circulated previously going out until March 2016 and as there were no major objections, they can be assumed to be agreed. These can be found in the table at the top of the minutes.

It was agreed that London would be the enduring location for meetings as there are now 4 venue options. The ENA was felt to be the first port of call, followed by The EIC (which is booked through the ENA when they have no rooms available). UKPN kindly offered to host at their offices if required and the Ofgem offices are also a possible option.

## 7) AOB

GM questioned whether we should propose removing RoCoF altogether in light of the ineffectiveness of options 3 and 4. CM added that we should be aligning with the RfG bandings which should be approved shortly, which would set a lower threshold for phase 2. GM added that Ecofys findings suggested most domestic solar PV doesn't have RoCoF protection anyway so could have a lower limit.

All present thanked SB for his work as technical secretary and wished him well in his new role.

## 8) Summary of actions

WG Member	Action No.	Action	Due
SB	135	Update the minutes from meeting 32 and circulate to the WG for approval	22/9/15
SB	136	Review the GC0079 distribution list	22/9/15
GS	137	Update the ToRs following WG comments and circulate prior to taking to GCRP/DCRP in September 2015	10/9/15
GS	138	Clarification of the LFCR requirements to devise a RoCoF	22/9/15

		operating standard	
GS / SB	139	Publish Ecofys final report to the WG website	22/9/15
AD	140	Finalise report and circulate to WG for final comments	10/9/15

Attendees		
Name	Initials	Company
Graham Stein	GS	National Grid (Alternative chair)
Scott Bannister	SB	National Grid (Technical Secretary to 1/9/15)
Gareth Evans	GE	Ofgem
Adam Dyśko / Ibrahim Abdulhadi / Dimitrios Tzepelis	AD / IA / DT	Uni. Strathclyde
Joe Duddy	JD	RES
Miguel Bernardo	MB	UKPN
Jacob Allinson	JA	RWE
Campbell McDonald	CM	SSE Generation
Ioannis Koutsokeras	IK	SP Energy Networks
Sam Turner	ST	Northern Powergrid
Greg Middleton	GM	Deep Sea Electronics
Apologies		
Mike Kay	MK	Chair
Martin Lee	ML	SSEPD
Mick Walbank	MW	Northern Powergrid
John Ruddock	JR	Deep Sea Electronics
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
Kevin Burt	KEB	UKPN