

Summary of Meeting and Actions

Meeting Name	E3C Small Embedded Generation Frequency Obligations Working Group
Meeting No.	6
Date of Meeting	Thursday 3rd September 2009
Time	10:00am – 3:30pm
Venue	Gas Meeting Room 1&2, National Grid House, Warwick

This note outlines the key issues and actions from the sixth meeting of the E3C Small Embedded Generation Frequency Obligations Working Group.

1) Apologies for Absence

Apologies were received from Ham Hamzah, Andrew Hood, Claire Maxim, Hamish Dallachy, Chris Riach and Barbara Vest

2) Previous Meetings

Upon the suggestion of the Working Group the minutes for meeting 4 (penultimate but one) had been edited to reduce the reference to previous meeting discussions. The revised minutes were accepted by the Working Group.

The minutes for meeting 5, held on the 9th July 2009, were discussed and several minor comments made. An updated version of the minutes is to be circulated within the Working Group for final approval.

3) Actions outstanding

All actions outstanding had been completed or were covered during the Working Group meeting.

4) Way Forward and Terms of Reference

The Terms of Reference were reviewed by the Working Group to ensure they were all on course to be met.

The Chairman highlighted how the Working Group had to bring proposals to the GCRP and the DCRP for November 2009 and therefore final proposals must be agreed and an implementation plan taken forward. AC stated that if agreement of Working Group recommendations is required from the E3C, then longer timescales are required and submission to the November 2009 panel will not be possible. A Working Group member suggested that in order to facilitate faster and more positive responses from Embedded Generation, an online based tool (i.e. a questionnaire) should be established and the request for information sent out directly from National Grid.

A Working Group member believed that initial feedback from Embedded Generation relating to a) what their current protection settings are and b) how easily the low and high frequency settings could be changed needs to be received before final recommendations on protection settings can be recommended. Another member agreed, stating that the Working Group needs to be able to see what can feasibly be achieved before asking embedded generator to change any settings. KH reminded the group that doing nothing was not a feasible option as a substantial and credible risk has been identified.

The Authority Representative confirmed that there are powers under the generation licence that allow for derogation from Grid and Distribution Code requirements to be granted. However as with other licences, any derogation request would need to be justified by the licensee. MP discussed that there was uncertainty between the

Summary of Meeting and Actions

governance interactions between the GCRP, DCRP and the E3C committee and took an action to seek clarification.

Action: MP

It was stated that the Working Group has not fully confirmed that the May Incident was down to the operation of Low Frequency protection. WH reported that the incident investigation with DNOs confirmed that there was a large volume of generation in the Small Power Station category was disconnected by low frequency protection relays prior to the time of automatic demand disconnection. This had put additional pressure on the system during the low frequency incident.

It was suggested that more formal arrangements for data collection from embedded generation may be required. DR said that historically generator/ DNO communication has been fit for purpose and appropriate, although WH believes in the future more may be required. RN agreed to look at the current requirement for operational data from embedded generators and consider what would be the most value to the System Operator in addition.

Action: RN

5) E.ON Discussion Paper

A paper produced by E.On was discussed (available from the Working Group section of the Grid Code website). The paper reviews the current generator frequency obligations under the Grid and Distribution Codes. The obligations across a number of European countries are also compared to those within the Grid Code in the UK. A number of options were considered that introduced aspects such as a generator's active power profile throughout its obligated frequency range.

Given the continual increase of small embedded plant, GN commented that G83 needs to be considered in the solution. An alternative suggestion, yet to be considered is to lower the threshold level of 'Small Power Stations' in England and Wales, although the Working Group believed this may alter many other consequential obligations. Paragraph 6 of the paper described the frequency obligations for generators under the very first version of the Grid Code (Issue 1, version1) although the Working Group was unclear on how such a clause was interpreted at the time. MP agreed to clarify this and to assess whether this was relevant to the amendment.

Action: WH/ MP

6) Duration of Plant Operation Outside Frequency Statutory Limits

PN questioned why the generator's performance standards outside statutory limits had to be continuous and can't be time bound. WH responded that as Grid Operator, NGET would try to restore the system frequency within its statutory limits as quickly as possible. However, the time required for such restoration can not be guaranteed depending on the severity of the incident including possible cascade generation tripping events. Therefore it will be potentially catastrophic if generation begins to trip just because of an arbitrary time limit is reached.

WH reported that after a government review on black start, he attended a presentation given by a government representative who stressed the best strategy for black start is to avoid any blackout in the first place as restoring supply to the system is an extremely complex process. As Grid Operator, NGET seeks to improve system resilience to avoid any system blackouts.

In practice, if a Generator is able to continue running for 90 minute under a low frequency scenario, it should be able to run much longer without further issues. In fact, a marginal reduction of output could help to mitigate the problem. On the other hand, any vibration problems would limit the operation to within minutes. Therefore, debating on whether it should be continuous or limited to 60, 90 or 120 minutes is irrelevant.

Summary of Meeting and Actions

NGET believes to schedule sufficient response/reserve to limit any excursion period beyond statutory limits to a minimum but not to relax our requirements or lower our guard against unpredictable and unfavourable cascade events without justifications.

The immediate increase of the high frequency protection settings, were possible, was thought to be an acceptable interim measure to mitigate the existing risk to the system.

7) Risk of Large and Sustained Frequency Excursions – Cost Implications

WH gave a presentation outlining the frequency and financial implications of sustained frequency excursions. There have been 42 frequency excursions outside statutory limits within the last 20 years, the majority of which were between 49.0 and 49.5 Hz with only one high frequency event. The duration of the events are short, typically less than three minutes. NGET believes that in the future the frequency of such excursions could increase due to increased level of generation loss and various uncertainties as detailed in the presentation.

The cost implications from a high frequency event, leading to a blackout, were considered and estimated to be £60m pa. The cost of holding extra high frequency response was estimated at £150m pa, which could partially mitigate the risk of such an event. NGET proposed that the one off cost of adjusting the frequency relay settings would be insignificant in comparison to such annual costs.

8) Frequency Protection Setting Options

Given the concern raised in PN's paper on continuous plant operation outside frequency statutory limits, WH proposed two frequency protection setting options for considerations.

Option 1 is in line with the proposed Distribution Code settings as recommended by the G59/G75 Review Working Group which is preferred by NGET and was supported by manufacturers at the information exchange meeting arranged by the Working Group.

Option 2 was introduced to reduce operational time requirement to 90 minutes when the frequency is outside 48.5 and 51 Hz but within 47.5 and 51.5 Hz. The major drawback of Option 2 is its requirement of a 3-stage relay protection which is more complex and is not considered to be acceptable for DNOs. In addition, a generation representative disagreed to the continuous operation down to 48.5 Hz proposed in Option 2. He suggested to raise it to 49.0 Hz and National Grid believes this will be unacceptable on system security ground. Option 2 was therefore not acceptable to all parties.

9) Network Protection Vs Plant Performance Requirements

A Working Group member requested clarification whether both options were protection settings or performance standards? WH explained that the objectives of the options are to ensure the requirements of the DNO and NGET are met with the expectation that the plant is designed to operate within this range without tripping, accepting that some plant may have to marginally reduce its output from its rated level to maintain continuous operation during a sustained low frequency event.

Some members suggested the Distribution Code should include a generator MW output performance profile against frequency deviations as that adopted in the Grid Code CC6.3.3. WH does not believe this is a way forward for the current Distribution Code change as it will complicate the plant and its protection and control design leading to objections from developers and manufacturers. He reported that the CC 6.3.3 profile was introduced to minimise the impact of CCGT plant on system security as its output could fall significantly on low frequency incidents. The firing control of this type of plant was modified to meet the Grid Code requirements. This falling frequency/ falling power phenomenon is not a major issue for the Transmission System or most other plant types. For this reason, he suggested this performance requirement should not be included, at least at this stage, in the Distribution Code change.

Summary of Meeting and Actions

To address the plant frequency operating range capability, he suggested a statement along the line of “for avoidance of doubt, generators are required to remain connected to the system unless the frequency is outside these required settings” could be included in the Distribution Code.

He confirmed that as long as the protection settings are as required, the plant will be disconnected at or beyond those settings and hence both DNO network protection criteria and Grid Code system security are met. For sites where G59 protections are duplicated upstream, discrimination could be achieved by slightly longer time delay on the upstream frequency protection relays. This practice is already adopted by some DNOs.

AC said the options may be missing the point as distribution protection settings are for protecting the distribution network. In addition there was concern that altering the protection settings could lead to damage to the machines through gradual, physical failure mechanisms. WH reiterated that this concern has been discussed with the manufacturers here and they do not believe the frequency range required will be a major issue but of course there are exceptions. His view was that generating plant has necessary protections to avoid the plant being damaged. In some cases, if an extreme low frequency persists leading to generator overheating, it will be detected by generator overload protection. Depending on plant design, an extreme high frequency may result in turbine blade vibration but this will be detected by vibration protection. He explained that the risk of tripping is low as marginal reduction of plant output could relieve the generator overloading problem.

The intention of the Distribution Code change is not to remove the right of Generators protecting their plant for genuine technical reasons but to avoid generating plant being disconnected unnecessarily (e.g. at 50.5 Hz) to jeopardise system security. WH noted that with the current wording in the proposed Distribution Code, there is flexibility to permit more sensitive settings in exceptional circumstances.

10) Draft DNO letter

The Working Group debated what the initial letter, to be sent to all embedded generators between 5 and 50MW in size, should contain. The initial proposal was that it should cover:

- What is your current frequency protection range?
- If your high frequency limit is 50.5Hz, can you immediately increase it to 51.5 or 51.0Hz?
- Can you operate at 47.5Hz continuously and if not what would have to be done.

The required timescale for such a response was thought to be in the order of one or two months. It was identified that the DNOs will be required to check the protection settings on their protection assets and that this should be discussed at the next DCRP.

Action: TI

PN argued that National Grid had to justify the application of Grid Code standards for embedded generation and that it should not just be applied. Working Group could not reach agreement on the final settings recommendations for the letter and therefore it was suggested that a draft letter should be circulated and commented upon by Working Group members with a target to publish a final version early October:

Action: MP

GN to determine the implications from the European Grid Code on the Working Group.

Action: GN

11) Next Meeting

Summary of Meeting and Actions

It was agreed that the next meeting of the Working Group would be provisionally scheduled for 19th October 2009.

There are no provisional dates for future Working Group meetings yet.

Summary of Meeting and Actions

Appendix 1 – Working Group Attendance

Members Present:

Mark Perry	MP	Working Group Chairperson
William Hung	WH	National Grid
Tom Ireland	TI	National Grid
Alan Creighton	AC	CE Electric UK
Guy Nicholson (by phone, bad line)	GN	Senergy E.Connect
Dan Randles	DR	Electricity North West
Paul Newton	PN	E.ON
Raj Nagarajan	RN	National Grid
Keith Hodson	KH	Central Networks
Tim Moore	TM	EDF
Bridget Morgan (by phone)	BM	Ofgem

Apologies:

Ham Hamzah	KH	RWE
Andy Hood	AH	Western Power Networks
Claire Maxim	CM	E.ON UK
Hamish Dallachy	HD	Scottish Power
Chris Riach	CR	RWE Npower
Barbara Vest	BV	AEP