THE DISTRIBUTION CODE OF LICENSED DISTRIBUTION NETWORK OPERATORS OF GREAT BRITAIN

ANNEX 1

GC0079 Frequency Changes during Large Disturbances and their impact on the Total System.
TERMS OF REFERENCE
23 May 2017

Governance

1. The Frequency Changes during Large Disturbances and their impact on the Total System Workgroup was established by Grid Code Review Panel (GCRP) at the May 2012 GCRP meeting.

2. The Workgroup shall formally report to the DCRP and the GCRP.

Membership

3. The Workgroup shall comprise a suitable and appropriate cross-section of experience and expertise from across the industry, which shall include

Name	Role	Representing
Mike Kay	Chair	Energy Networks Association
TBA	Technical Secretary	National Grid
Graham Stein	Member	National Grid
Martin Queen	Authority Representative	Ofgem
Adam Dyśko	Technical Expert	University of Strathclyde
Sam Turner	Member	Northern Power Grid (DNO)
Martin Lee	Member	SSEPD (DNO)
Ioannis Koutsokeras	Member	SP Energy Networks (DNO)
Andrew Hood	Member	Western Power Distribution (DNO)
Tim Moore	Member	UK Power Networks (DNO)
Damian Jackman	Member	SSE (Generator)
Joe Duddy	Member	RES (Generator)
Jacob Allinson	Member	RWE (Generator)
Greg Middleton	Member	Deep Sea Electronics
John Ruddock	Member	Deep Sea Electronics
Jonny Pollock	Member	NIE

Meeting Administration

4. The frequency of Workgroup meetings shall be defined as necessary by the Workgroup chair to meet the scope and objectives of the work being undertaken at that time.

5. National Grid will provide technical secretary resource to the Workgroup and handle administrative arrangements such as venue, agenda and minutes.

6. The Workgroup will have a dedicated section on the Distribution Code and National Grid websites to enable information such as minutes, papers and presentations to be available to a wider audience.

7. The workgroup will investigate extending the first stage of work (Phase 1 underGC0035) to cover all distributed generation as Phase 2.

8. The workgroup will undertake Phase 2 of the work. The context for Phase 2 includes the following considerations:

   a) There is a convergence of technical considerations when transmission system faults give rise to both voltage and frequency phenomena. GC0079 is concerned primarily with the frequency effects on the Total System, or on DNO power islands.

   b) It is recognized that National Grid will have to develop a formal operating standard in line with the European Codes defining the maximum RoCoF that the total system is secured against. This is an expected consequential requirement of implementing the EU Network Code currently titled “Network Code on Operational Security” in the GB frameworks.

   c) There are a number of factors that will prevent generating plant riding through frequency changes. These include both the physical capabilities of electrical and mechanical components, the capability of control systems, and the effects of protection.

   d) Generating equipment connected to distribution networks will generally have protection that fulfils two discrete functions. The first is to protect the generating equipment and ancillaries. The second is to provide the required network interface protection, ie as currently required by G59 or G83.

   e) The focus of Phase 2 is to address the risks of unwanted tripping initiated by the network interface protection, but includes considering mitigation of any additional frequency resilience risks arising from generating equipment protection and control.

   f) Phase 2 will investigate the suitability of VS shift protection as an alternative to RoCoF, taking into account its possible unsuitability for transmission fault ride through requirements.

9. Phase 2 will therefore include the following activities:

   a) Monitoring the implementation of the protection changes recommended under phase 1.

   b) Researching the characteristics (numbers/types etc.) of existing embedded generation of less than 5MW rated capacity including their likely RoCoF withstand capabilities;

   c) Researching the characteristics of existing embedded generation of all sizes where the embedded generation is fitted with VS anti-islanding protection.

   d) Investigate the likely effect of transmission faults on VS protection techniques, and determine the risk of wide spread DG tripping from VS protection being inappropriately sensitive to transmission faults.

e) Investigating the characteristics of popular/likely inverter technology deployed, particularly in relation to RoCoF withstand capability and island stability;

f) Investigating the characteristics of popular/likely inverter technology deployed in relation to its behaviour in the presence of the voltage phenomena associated with transmission faults;

g) Assessing or modelling the interaction of multiple generators in a DNO power island;

h) 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;

i) Analysing the merit of retrospective application of RoCoF criteria to existing embedded generation of less than 5MW (including comparison with similar programmes in Europe);

j) Considering any other relevant issues in relation to the resilience of the total system in respect of the operating characteristics of small generation;

k) Consider, if appropriate, revised VS protection settings, including any supporting risk assessment analysis;

l) To the extent that revised settings are proposed, create detailed specifications for the application of those revised settings;

m) Consider any other adverse effect on total system operability that existing G59 and G83 requirements may present, given the changed context since G59 and G83 were originally introduced, and include any such issues and their mitigation in the drafting and consultation (for example the current and future implications of Black Start on the existing over and under frequency settings);

n) Developing proposals for consultation on any proposed changes to RoCoF and VS protection drawing out the costs, benefits and risk of such a change to present to the GCRP and DCRP. Proposals should include a recommendation of where implementation costs should fall and the most appropriate workgroup for this issue to sit with;

o) Initiating consideration by DNOs of the future management of out-of-phase reclose risk; and

p) Engaging with the Health and Safety Executive (HSE) and all affected parties considering the different stakeholders that will be affected by any proposed changes. iv)

10. Phase 2 will deliver proposals concerning RoCoF based protection on embedded generators of rated capacity of less than 5MW and concerning VS protection for all embedded generation.