

Modification proposal:	<b>Distribution Code:</b> DC0079(Phase 2) <sup>1</sup> - Frequency Changes during Large Disturbances and their Impact on the Total System		
Decision:	The Authority <sup>2</sup> has decided to approve <sup>3</sup> this modification		
Target audience:	Distribution licensees, Distribution Code Review Panel, distribution network users and other interested parties		
Date of publication:	3 May 2018	Implementation date:	1 July 2018

## Background

Electricity Distribution Licence holders are required by Standard Licence Condition (SLC) 20 of their licences to have in force, implement, and comply with the Distribution Code. SLC 21 imposes a duty on licence holders to review and, where appropriate, seek our approval for modification of the Distribution Code so as to better achieve the requirements of SLC 21. The Distribution Network Operators (DNOs) may propose changes to the Distribution Code and initiate work on a review of the Code through the Distribution Code Review Panel (DCRP).

The Energy Networks Association's (ENA) Engineering Recommendations G59 (ER G59) and G83 (ER G83) provide recommendations for the connection of distributed generation connected to distribution electricity networks. ER G59 and ER G83 are referenced in Annex 1 of the Distribution Code and are incorporated within the Distribution Code as part of the Code's technical requirements. Therefore, any change to ER G59 or ER G83 constitutes a change to the Distribution Code and has to be approved by us. The current version of ER G59, ER G59/3-3, came into effect in February 2018. The current version of ER G83, ER G83/2, came into effect in December 2012.<sup>4</sup>

### *Drivers for the proposed changes to ER G59/3-3 and ER G83/2*

In 2014, we issued a decision<sup>5</sup> that Rate of Change of Frequency (RoCoF) settings for existing distributed generation >5MW should be changed. Our subsequent decision in 2017<sup>6</sup> changed the RoCoF settings for all new non-type-tested generators <5MW, bringing them into line with the requirements of the 2014 decision. The 2017 decision also removed Vector Shift (VS) as a suitable form of Loss of Mains (LoM) protection for new non-type-tested generators.

As the 2014 and 2017 changes did not include proposed changes for type-tested generators, the LoM protection currently permitted under ER G59 and ER G83 continues to include VS and RoCoF for type-tested generators. Existing protection settings create a limit on the RoCoF that can be permitted in operating the system. This requires significant System Operator (SO) actions when system inertia is low to avoid breaching this limit, which imposes costs on consumers. Aligning type-tested and non-type-tested generators, by requiring RoCoF settings of type-tested generators to be changed and

<sup>1</sup> We made our decision on DC0079(1) on 15 December 2017: <https://www.ofgem.gov.uk/publications-and-updates/dc0079-frequency-changes-during-large-disturbances-and-their-impact-total-system>

<sup>2</sup> References to the "Authority", "Ofgem", "we" and "our" are used interchangeably in this document. The Authority refers to GEMA, the Gas and Electricity Markets Authority. The Office of Gas and Electricity Markets (Ofgem) supports GEMA in its day to day work. This decision is made by or on behalf of GEMA.

<sup>3</sup> This document is notice of the reasons for this decision as required by section 49A of the Electricity Act 1989.

<sup>4</sup> <http://www.dcode.org.uk/annexes.html>

<sup>5</sup> <https://www.ofgem.gov.uk/publications-and-updates/changes-distribution-code-and-engineering-recommendation-g59-frequency-changes-during-large-disturbances-and-their-impact-total-system>

<sup>6</sup> <https://www.ofgem.gov.uk/publications-and-updates/dc0079-frequency-changes-during-large-disturbances-and-their-impact-total-system>

removing VS as a suitable form of LoM protection for these generators, should enable a reduction in these costs.

The proposed modification was subject to industry consultation with manufacturers of type-tested plant in August 2017 and February 2018. No response to the August 2017 consultation was received from manufacturers of type-tested plant. The DCRP wrote two open letters to manufacturers of type-tested plant as part of an engagement process informing the manufacturers of the proposed changes to the immunity requirement. Following this engagement, a second consultation was held in February 2018. One response from a manufacturer of type-tested plant was received. The manufacturer did not object to the proposal but did propose a delay in implementation date.

### **The modification proposal**

This modification proposal is the third from a long-standing workgroup (WG). Originally founded to progress GC0035, the first WG meeting was on 14 June 2013. The WG has not yet fully discharged its terms of reference and further modification proposals are expected.

DC0079 was initially raised as Grid Code modification (GC)0079.<sup>7</sup> However, on 1 October 2017 this modification was superseded by DC0079.

The modification proposes changing the RoCoF settings for all new type-tested generators <5MW, bringing them into line with the existing requirements for all non-type-tested generators <5MW. This modification also proposes to remove VS as a suitable form of LoM protection for all new type-tested generators <5MW.

The modification also proposes that all new type-tested generators should be able to demonstrate immunity against a rate of change of frequency that is marginally less than  $1\text{Hzs}^{-1}$  with a 500ms time delay and a vector shift of up to  $50^\circ$ .

A summary of the proposal is as follows:

- RoCoF settings changed to  $1\text{Hzs}^{-1}$  with a definite time delay of 500ms for all new type-tested generators. Generators commissioned on or after 1 July 2018 would be required to commission with the new setting.
- All type-tested generators commissioned on or after 1 July 2018 will not be allowed to use VS.
- All new type-tested generators as part of their LoM technique should demonstrate stability for appropriate RoCoF and VS disturbances, including immunity to  $\pm 50^\circ$  VS events.

### **DCRP<sup>8</sup> comments and licensee recommendation**

As the next scheduled meeting of the DCRP was not until 5 April 2018 and there was a desire to meet 1 July 2018 implementation date, the Code Administrator sought agreement on the proposed modifications from the DCRP by circulating a formal request via email. The DCRP did not object to the changes contained in modification report that was circulated, and as such these have been recommended by the DNOs to the Authority.

---

<sup>7</sup> Please see <http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Grid-code/Modifications/GC0035-GC0079/>

<sup>8</sup> The DCRP is established in accordance with SLC 21 of the Electricity Distribution Licence.

We note that in that modification report the WG consider that implementation of the modification proposal will better facilitate Distribution Code Objective (a) and has a neutral impact on the other applicable objectives.

## **Our decision**

We have considered the issues raised by the modification proposal and in the Final Modification Report dated 28 March 2018. We have considered and taken into account the response to the consultations on the modification proposal, which is included in the Final Modification Report.<sup>9</sup> We have concluded that:

- implementation of the modification proposal will better facilitate the achievement of the applicable objective of the Distribution Code;<sup>10</sup> and
- approving the modification proposal is consistent with our principal objective and statutory duties.<sup>11</sup>

## **Reasons for our decision**

We consider this modification proposal will better facilitate Distribution Code objective (a) and has a neutral impact on the other applicable objectives.

### ***(a) permit the development, maintenance, and operation of an efficient, co-ordinated, and economical system for the distribution of electricity***

This modification is the third in a series that addresses the issues of RoCoF and LoM protection more generally. We consider that changes to the RoCoF settings for all new type-tested generators covered by ER G59 and ER G83, bringing them into line with both of our previous decisions (2014 and 2017), will increase the stability and robustness of the electricity system. Having a stable and robust overall system is a prerequisite for an efficient, co-ordinated and economical distribution system. The modification will reduce the risk of RoCoF LoM protection inadvertently shutting down distributed generation, benefitting the operation of the distribution and total system. We consider that system RoCoF is likely to continue to increase and therefore increased resilience to this, where more economic options are not available, is beneficial.

The WG has previously shown that VS is not effective at detecting islanding and is more likely than RoCoF to trip in the event of a transmission fault. More effective means of protection, such as RoCoF, are available to generators to use, where appropriate. The modification proposal arrests the rise in the number of generators at risk of VS LoM protection inadvertently tripping, thus the risk to system operation will be no greater than that that the SO has managed to date.

As with our 2017 decision, we note that this modification could increase the risk of energised island networks on the distribution system, the risk of injury to people near distribution equipment and the risk of damage to synchronous plant. The WG engaged Strathclyde University to carry out a study of the risks associated with the proposed modification. The WG agreed with the study conclusion that the risk does increase but it was within the broadly acceptable region of personal risk accepted as consistent with the Health and Safety at Work Act 1974.

---

<sup>9</sup> Distribution Code proposals, final modification reports and representations can be viewed at: <http://www.dcode.org.uk/areas-of-work/> and <http://www.dcode.org.uk/consultations/>

<sup>10</sup> As set out in Standard Condition SLC 21.4 of the Electricity Distribution Licence available at: <https://epr.ofgem.gov.uk//Content/Documents/Electricity%20Distribution%20Consolidated%20Standard%20Licence%20Conditions%20-%20Current%20Version.pdf>

<sup>11</sup> The Authority's statutory duties are wider than matters which the Panel and licensees must take into consideration and are largely provided for in statute, principally in this case the Electricity Act 1989.

The HSE are content with the approach taken in this modification on balancing the electrical risks of islanding against the concomitant risk of loss of infeed to the system.

We note the comments of the manufacturer who responded to the February 2018 consultation suggesting that the implementation date of this proposed modification be delayed until 27 April 2019, to coincide with the compliance date for the European Requirements for Generators Network Code (RfG). It is our view that this proposal could only be the first step towards fulfilling the RfG requirement and does not in any way contradict the RfG requirement and therefore do not consider there is a need to delay implementation of this modification.

We also note the respondent's comment regarding the risk of saturation of 50Hz transformers through increasing the VS immunity level to 50° at nominal voltage. We agree with the view of the WG that this is best explored through the proposed Grid Code expert group looking at general fault ride through requirements for transmission faults.

Taking all of these factors into consideration, we consider that the modification proposal better facilitates objective (a).

### ***Principal objective and other considerations***

We have also considered this modification against our principal objective to protect the interests of existing and future consumers and our statutory duties. This modification should assist in lowering Balancing Services costs, and so lower Balancing Use of System (BSUoS) charges. As BSUoS charges, like other system costs, are ultimately paid for by consumers, we consider that this modification should result in lower costs to consumers. We, therefore, consider that approving this modification is in accordance with our principal objective and statutory duties.

### ***Observations***

We note that further modifications may be raised to consider whether LoM protection changes for smaller generators should have retrospective effect. Given the challenging nature of potentially changing relay settings for thousands of existing generators not captured by this current proposed modification and the previous DC0079 modification, it is our view that network licensees should make robust plans to ensure any proposed changes are carried out in a timely and efficient manner. Any future modification in this space will require accompanying implementation plans covering the following areas to provide confidence that any new requirements will be delivered:

- Overall plans detailing how the modification will be implemented and LoM protection changes carried out.
- Identification of responsible parties for ensuring the modification is implemented.
- Stakeholder engagement proposals for the duration of the process including areas of consistency of approach and fairness to customers.
- Proposals to demonstrate compliance with the modification such that the SO can have confidence in utilising a higher system RoCoF.
- Proposals detailing which parties should pay for any protection changes and how this cost will be recovered, if necessary.
- Proposals to incentivise efficient delivery of the modification.

Should any future modification proposals to change the LoM settings be raised, we will scrutinise closely the costs and benefits to individual generators as well as the whole system cost benefit case along with the implementation plan proposals. We note that this

issue affects many parties. We therefore encourage the WG to engage with the industry going forward to ensure an optimised solution and plan is formulated.

### **Decision notice**

In accordance with SLC 21.11 of the Electricity Distribution Licence, the Authority hereby directs that the modification to the Distribution Code, 'DC0079(Phase 2)- Frequency Changes during Large Disturbances and their Impact on the Total System', set out in the Final Modification Report to the Authority dated 28 March 2018 be made.

**Peter Bingham**

**Chief Engineer**

Signed on behalf of the Authority and authorised for that purpose