

Modification proposal:	<b>Distribution Code: DCRP/MP/19/03 Revision of Engineering Recommendation (EREC) G5 – Harmonic voltage distortion and the connection of non-linear and resonant plant and equipment to transmission systems and distribution networks in the United Kingdom.</b>		
Decision:	The Authority <sup>1</sup> has decided to approve <sup>2</sup> this modification		
Target audience:	Distribution licensees, Distribution Code Review Panel, distribution network users and other interested parties		
Date of publication:	17 December 2019	Implementation date:	17 June 2020

## Background

Modification proposal DCRP/MP/19/03 (“the modification proposal”), proposes a complete technical revision of Engineering Recommendation (EREC) G5, (“EREC G5”). The modification proposal also updates references in the Distribution Code to EREC G5.

EREC G5 defines planning and compatibility levels for the assessment of voltage distortion from Users<sup>3</sup> equipment and installations with harmonic emission to be connected to transmission systems and distribution networks in the United Kingdom. It forms part of Annex 1, “Qualifying Standards,” of the Distribution Code<sup>4</sup> which outlines distribution network technical requirements.

The basis for the modification proposal is a review of the Qualifying Standards set out in EREC 5. The key drivers for the review were:

- an increase in the number of loads connecting to the electricity network;
- interactions between these connections; and
- concerns raised by some Users regarding the “first come first serve” principle of allocating emission rights.

A joint Distribution Code Review Panel (DCRP) and Grid Code Review Panel (GCRP) Working Group was formed to conduct a review of the Qualifying Standards. As a result of that review, EREC G5 and the Qualifying Standards are being updated. The updates will result in a new version of EREC G5 being published, EREC G5 issue 5 (EREC G5/5).

The Distribution Code references EREC G5 in several places. The current references in the Distribution Code are to EREC G5 issue 4 (EREC G5/4)<sup>5</sup> and do not reflect the updates that will be made to EREC G5 and contained in EREC G5/5. The modification proposal seeks to align the references in the Distribution Code with EREC G5/5.

<sup>1</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>2</sup> This document is notice of the reasons for this decision as required by section 49A of the Electricity Act 1989.

<sup>3</sup> The Grid Code defines “User” as “persons using the national electricity transmission system.” This definition varies in each section of the Grid Code but can mean “any person to whom the Grid Code applies.”

<sup>4</sup> [http://www.dcode.org.uk/assets/files/dcode-pdfs/DCode\\_v43\\_14112019.pdf](http://www.dcode.org.uk/assets/files/dcode-pdfs/DCode_v43_14112019.pdf)

<sup>5</sup> [http://www.dcode.org.uk/assets/uploads/ENA\\_ER\\_G5\\_Issue\\_4\\_Amendment\\_1\\_\\_2005\\_.pdf](http://www.dcode.org.uk/assets/uploads/ENA_ER_G5_Issue_4_Amendment_1__2005_.pdf)

EREC G5 is also referenced in the Grid Code. Those references refer to EREC G5/4 and will also require updating to refer to and reflect the changes that will be contained in EREC G5/5. A separate modification proposal, Grid Code GC0129,<sup>6</sup> has been submitted to the Authority to effect the changes to the Grid Code. It is proposed that the changes to the Distribution Code and the Grid Code will be implemented concurrently.

### **The modification proposal**

The modification proposal was raised by the DCRP and was subject to public consultation from 13 March 2019 to 26 April 2019. The consultation responses were supportive overall and only recommended minor technical clarifications to EREC G5/5.

A number of stakeholders did, however, raise concern over the consideration of harmonics higher than the 50<sup>th</sup> order; while another stakeholder objected to the revised approach to the apportionment of harmonic headroom. The Working Group considered those comments but concluded that the modification proposal aligns with the Distribution Code objectives. Specifically, the DCRP consider that the changes detailed in the modification proposal better facilitate Distribution Code objective (a).

The Authority agrees with the conclusion of the Working Group for the reasons set out in the DCRP's Final Modification Report dated 29 November 2019 ("the FMR").<sup>7</sup> The Authority also considers, however, that the modification proposal will better facilitate Distribution Code objectives (a), (b), and (d). We have set out our reasons for this below in "Reasons for our decision."

The modification proposal updates the planning and compatibility levels for individual harmonics while keeping the planning and compatibility levels for voltage total harmonic distortion (THD) the same as in EREC G5/4. As a result, the planning and compatibility levels for some harmonics have increased from those contained in EREC G5/4 but none of them have decreased.

The modifications to EREC G5 are outlined below:

- Align the voltage ranges to which the planning and compatibility levels are applicable to typical voltages in use in the UK
- Extend the planning and compatibility levels to 5kHz (the 100<sup>th</sup> harmonic). Above 2.5kHz, the measurement of harmonics is at the discretion of the network operator/owner (NO) facilitating the connection. It is also recommended to leave the assessment of these harmonics to the discretion of the NO.
- Clearly define interharmonics and revise interharmonic limits in accordance with International Electrotechnical Commission (IEC) standards.
- Revise voltage notch limit in terms of notch depth and duration.
- Define the minimum requirement and format for harmonic specification that a NO has to issue to a new user.
- Ensure consistency by requiring a report demonstrating compliance with the harmonic limits set by the NO.

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<sup>6</sup> <https://www.nationalgrideso.com/codes/grid-code/modifications/gc0129-updating-grid-code-use-engineering-recommendation-g55>

<sup>7</sup> <http://www.dcode.org.uk/dcode-modifications/2019-modifications/>

- Set out the connection process for concurrent connections, when two or more new users apply to connect to the network in the vicinity of each other in a short time window.
- Update the three stages of the connection process assessment.

The proposer argues that these modifications will provide clarity and consistency in the connection process. In addition, the proposer considers that the modifications facilitate the allocation of harmonic headroom in a more transparent and fair manner.

### **Distribution Code Review Panel (DCRP)<sup>8</sup> comments and licensee recommendation**

At the DCRP meeting on 10 September 2019, a majority of the DCRP considered that the modification proposal would better facilitate Distribution Code objective (a) and recommended its approval.

### **Our decision**

We have considered the issues raised by the modification proposal and contained in the FMR. We have also taken into account the responses to the consultation(s) on the modification proposal and which are set out in detail in the FMR.<sup>9</sup> We have concluded that:

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

### **Reasons for our decision**

We consider the modification proposal will better facilitate Distribution Code objectives (a), (b), and (d).

The majority of stakeholders agree that the modification proposal better facilitates the Distribution Code objectives. Some stakeholders, however, disagree that the revised allocation of headroom approach better facilitates objectives (a), (b), and (d). We have addressed that concern under the relevant Distribution Code objective headings below.

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

The proposed modification clarifies the connection process for users at various voltage levels, thereby ensuring the network is developed in a more transparent and coordinated

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

<sup>9</sup> Distribution Code proposals, final 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.

way. This is achieved by updating the assessment process for the three connection stages and setting out the connection process for concurrent connections.

The proposed modification also revises the method for allocating harmonic headroom. Some stakeholders disagree that the revised method will better facilitate this Distribution Code objective. They argue that there is a lack of evidence that the modified methodology is more economic for consumers.

The Working Group addressed these concerns in its report<sup>12</sup> analysing the merits of different headroom apportionment methodologies. The Authority has considered that analysis and agrees with the conclusion of the Working Group that the revised methodology provides the best solution for network users and promotes network efficiency.

For the reasons set out above, we consider that this modification proposal will better facilitate Distribution Code objective (a).

***(b) facilitate competition in the generation and supply of electricity***

The modification proposal aligns the harmonic standards utilised with the relevant IEC standards. This facilitates more competition in the GB market and promotes competition in users connecting to the network. In addition, the revised approach for allocating harmonic headroom will allow for more concurrent connection and, accordingly, increase competition in connections.

Some stakeholders disagree that the revised method for allocating headroom will better facilitate this Distribution Code objective. They argue that this significant change to the Distribution Code will make the guidelines for connections signed before the implementation date of EREC G5/5 unclear. The Working Group addressed these concerns in the FMR by clarifying how EREC G5/5 will be applied for contracts signed before its implementation date in the foreword of this document.<sup>13</sup> We agree with the Working Group's reasoning and conclusion in the FMR that EREC G5/5 makes it clear when these guidelines will be applied to new connections.

For the reasons set out above, we consider that this modification proposal will better facilitate Distribution Code objective (b).

***(d) promote efficiency in the implementation and administration of the Distribution Code.***

The modification proposal clarifies the connection process for users at the three connection stages, and provides consistency regarding how users demonstrate compliance with the NO's harmonic limits through the requirements for a compliance report. This promotes efficiency in how the Distribution Code is implemented.

The modification proposal also revises the method for allocating harmonic headroom. Some stakeholders disagree that the revised method will better facilitate this Distribution

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<sup>12</sup> Report by Stage 3 Assessment Sub-Workgroup, "Summary of sub-workgroup discussions on apportionment of harmonic headroom in EREC G5 issue 5."

<sup>13</sup> EREC G5 Issue 5 2020, "Harmonic voltage distortion and the connection of harmonic sources and/or resonant plant to transmission systems and distribution networks in the United Kingdom."

Code objective. These stakeholders argue that the lack of clarity in this methodology will create uncertainty for new connections.

The Working Group addressed this concern in its report on the apportionment of harmonic headroom. It evaluated the different headroom allocation approaches against a series of desired criteria, including increased efficiency in the management of harmonics. It concluded that the revised methodology best meets the outlined criteria. We agree with the Working Group's conclusion that, on balance, the modification proposal recommends the best method of headroom allocation.

For the reasons set out above, we consider that this modification proposal will better facilitate Distribution Code objective (d).

### **Decision notice**

In accordance with SLC 21.11 of the Electricity Distribution Licence, the Authority hereby directs that the modification to the Distribution Code set out in the Final Report to the Authority of 28 November 2019 be made.

**Martin Queen**

**Principal Engineer, Systems and Networks**

Signed on behalf of the Authority and authorised for that purpose