Modification	At what stage is this document in the process?
# DCRP/MP/19/03 - Final Modification Report ## 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*	01 Modification 02 DCRP report 03 Public Consultation 04 Final Modification Report

The purpose of this document is to assist the Authority in its decision to implement the proposed modifications to EREC G5 and the minor consequential changes to the Distribution Code. The proposed modifications were subject to industry consultation between March 13 and April 26 2019 which included the hosting of 2 stakeholder consultation dissemination events in London (01 April 2019) and Glasgow (10 April 2019).

Date of publication: 09 August 2019

Recommendation

The Distribution Code Review Panel (DCRP) and distribution network licensees recommend that the proposed modifications are made to Engineering Recommendation (EREC) G5 and the consequential changes to the Distribution Code.

	The DCRP and distribution network licensees recommends that this modification should be: Submitted to the Authority for approval.
	High Impact: *Transmission and distribution licensees, network operators, generators, rail network operators, industrial and domestic loads*
	Medium Impact: *None*
	Low Impact: *None*

Contents

Timetable

Workgroup Report presented to Panel	7th February 2019
Draft Modification Report issued for consultation	13th March 2019
Consultation Closed	26th April 2019
Draft Final Modification Report available for Working Group	1st August 2019
Draft Final Modification Report available for Panel	5th August 2019
Final Modification Report available for Panel	8th September 2019
Final Modification Report submitted to Authority	TBC

Any questions?

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1. Purpose of the Modification

ENA Engineering Recommendation (EREC) G5 is an Annex 1 document to the Distribution Code which defines planning levels and compatibility levels for the assessment of voltage distortion from network User's equipment and installations with harmonic emission to be connected to transmission systems and distribution networks in the United Kingdom.

In June 2010 National Grid initiated a review of the existing ER G5/4-1 standard under Distribution Code Review Panel (DCRP) paper DCRP_10_02_07 (Appendix 1). The key drivers National Grid highlighted for requiring review of EREC G5 were:

- A significant increase in the number of polluting loads that are connecting to the transmission/distribution system;
- Interactions between these connections i.e. connecting at same/proximate nodes and in similar timescales; and
- Concerns raised by some Users that the principle of allocating rights to emit on a 'first-come, first-served' basis may not be appropriate.

In response to the issues raised, the DCRP agreed to the establishment of a joint DCRP/GCRP Working Group which was formally kicked off in October 2010 under GC0036. The Terms of Reference of the original GC0036 working group is detailed in Appendix 2. In 2017, the Grid Code Review Panel (GCRP) governance procedures were revised. A decision was taken by the working group to continue the review work under a DCRP governed Working Group DC0036. The revised Terms of Reference and the Working Group membership are detailed in Appendices 3 and 4 respectively.

The proposed modification of EREC G5 has been written in response to the review work undertaken by the Working Group. The main issues the revision Working Group considered were:

- The implcations of an increase in the number of non-linear connections
- Whether there are international standards that could be adopted or referenced (e.g. IEC 61000-3-6) in anticipation of the implementation of EU Network Codes.
- Whether there was a need for a general review of the technical processes used to calculate allocated harmonic emission levels
- The roles and responsibilities of the different stakeholders in the process (e.g. Transmission Owners, Offshore Transmission Owners, Distribution Network Owners and Users connected to these systems)
- Whether the harmonic levels in the current version of G5/4 were adequate or acceptable.
- Whether harmonics levels above the 50th harmonic be included within G5/4.
- How to progress with harmonic assessments where a new substation needs to be built i.e. how is the background level at the new substation estimated?
- The process used to allocate the limits described in G5/4 between different users in similar areas including:
    - Whether 'first-come, first-served' is the appropriate way of allocating limits

- How ‘competing’ applications are dealt with, and how changes to customers requirements may impact on their right to emit harmonics

- Clarification on the process used to measure and predict the applicable level of background distortion to be used in an assessment
- Whether there are ‘non-technical’ changes that need to be introduced into other codes (e.g. CUSC, DCUSA).

2. Details of the Proposal

In the modification proposal and EREC G5 Issue 5, Network Owner/Operator (NO) is a generic term embracing transmission network owner and/or operator companies and distribution network owner and/or operator companies. The terms network owner, network operator and system operator in this EREC are intended to apply to owners and operators of transmission systems and distribution networks in so far as the requirements are applicable to their statutory and regulatory duties and responsibilities.

Voltage distortion from one and the aggregated impact resulting from several pieces of equipment are covered. The requirements apply to new connections of disturbing equipment to the public electricity supply system as well as changes to existing connections, in so far as they affect voltage distortion.

EREC G5 Issue 5 represents a complete rewrite of the standard. The key modifications to the standard are outlined below:

i. Planning and compatibility levels for individual harmonics have been revised, while keeping the planning and compatibility levels for voltage total harmonic distortion (THD) the same as G5 Issue 4 (G5/4). As a result for some harmonics these levels have increased. No planning or compatibility level has decreased compared to G5 Issue 4.

ii. Defining voltage ranges for which the tables of planning and compatibility levels are applicable. These voltage levels have been adapted to align with typical voltages in use in the UK.

iii. The planning and compatibility levels are now extended to 5 kHz (the 100th harmonic). The measurement and assesment of harmonics above 2.5 kHz is at the discretion of the NO facilitating the connection.

iv. Interharmonics have been clearly defined and interharmonic limits have been revised in accordance with IEC 61000-34-30, IEC 61000-4-7 and IEC 61000-2-2.

v. Limit for voltage notches in terms of the notch depth and duration have been revised.

vi. The three stages of assessment have been revised. EREC G5 Issue 5 retains three stages of connection process. These are:

   a. Stage 1 for connection of equipment at LV,

   b. Stage 2 for connection of equipment which failed Stage 1 and any other connection at voltages below 33 kV, and

   c. Stage 3 for any other connection.

vii. Stage 1 has been completely revised; it is designed for connections at LV. It is designed as a linear process such that assessments are applied in stages and substages. If a substage is passed, then the new equipment can be connected; if the substage is failed, then the next substage of assessment is undertaken. In total there are four substages in Stage 1.

viii. Stage 2 has been completely revised; it is designed for connection at voltages below 33 kV and for new equipment that has failed Stage 1. It has also been designed as a linear process, such that assessments are applied in substages.

ix. A new section has been added to EREC G5 Issue 5 that sets criteria for the connection of resonant plant, such as power factor correction capacitors at LV and voltages up to 11 kV. This ensures that the network background harmonic levels are not amplified excessively.

x. Stage 3 has been completely revised; it is designed for connections at 33 kV and above and for new equiment that has failed Stage 2. The connection process has been clearly outlined.

xi. In Stage 3, the harmonic limits are based on the apportionment of the harmonic headroom. This is a major difference between EREC G5 Issue 5 and Issue 4.

xii. The minimum requirement and format for harmonic specification that NO has to issue to a new user, to ensure consistency have been defined.

xiii. A requirement for a compliance report to be peepared has been included in Issue 5 to ensure consistency.

xiv. EREC G5 Issue 4 did not provide any guidance on the 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. EREC G5 Issue 5 sets the connection process for such cases.

The summary below explores in more detail how these issues have been addressed in the revised standard.

2.1 Revised Planning and Compatibility Levels

Section 5 of EREC G5 Issue 5 contains planning and compatibility levels.

2.1.1 Planning Level, EREC G5 Issue 5, Section 5.2

The values for planning levels in EREC G5 Issue 5 have been changed in two ways from those in EREC G5 Issue 4:

i. The values have been changed to the higher of those in international standards and those in EREC G5 Issue 4.

ii. The voltage ranges have been selected to better align with voltage levels in use on the GB system.

To align with international standards the values of planning levels from EREC G5 Issue 4 and IEC6100-3-6 were considered. Where they were different the higher of the two limits was selected. The justification for this choice is that both standards lead to acceptable level of distortion on the system that they were used in and thus adopting the higher for each frequency would also be acceptable. It is important to note that Voltage Total Harmonic Distortion (THD) planning level was not changed and was retained at the level in EREC G5 Issue 4.

The voltage ranges that the planning levels are stated for have been changed in EREC G5 Issue 5.

In EREC G5 Issue 4 voltage ranges were:

- 400V and below
- 6.6,11,20 kV
- Greater than 20 kV and less than 145 kV
- 275 and 400kV

In EREC G5 Issue 5, these have been changed to:

- 400 V and below
- $0.4\ \text{kV} < V \leq 25\ \text{kV}$
- $25\ \text{kV} < V \leq 66\ \text{kV}$
- $66\ \text{kV} < V \leq 230\ \text{kV}$
- $230\ \text{kV} < V$

The justification for the change was to better align with voltage levels used on the GB system. These were chosen in consultation with network owners on the Working Group.

By changing the voltage ranges, the 4 groups from EREC G5 Issue 4 are replace with 5 in EREC G5 Issue 5. The values for planning levels for these groups were mapped across from the EREC G5 Issue 4 with the same values using the mapping:

- 400 V → 400 V
- 6.6,11,20 kV → Greater than 400 V and less than or equal 25 kV
- Greater than 20kV and less than 145kV → Greater than 66 kV and less than or equal 230 kV
- 275 and 400kV → above 230 kV

For the new group, greater than 25 kV and less than or equal 66 kV, the values of planning levels were linearly interpolated from the values for voltage levels either side. This is to allow grading of planning levels across voltage levels from 22 kV to 132 kV.

2.1.2 Compatibility Level, EREC G5 Issue 5 Section 5.3

The values for compatibility levels in EREC G5 Issue 5 have been change from those in EREC G5 Issue 4 using the same method and justification as used to change the planning levels, as described in Section 2.1.1.

2.2 Harmonic above 50th

The values for planning levels and compatibility levels in EREC G5 Issue 5 have been changed from those in EREC G5 Issue 4 to extend the frequency range. The limits now go up to 5 kHz (100th harmonic) rather than the old limits ending at 2.5 kHz (50th harmonic).

The justification for this change is due to polluting equipment increasingly emitting at frequency above the 2.5 kHz range. A report has been produced to justify this change which considers the equipment being connected, simulation of higher order harmonics and measurement of the higher order harmonics on the system.

The Sub-Working Group report on harmonics above 50th order is given in Appendix 11.

Consideration of harmonics above 50th order in planning is recommended, due to the growth of equipment with emission at higher order harmonics in the network and the adverse effect of such harmonics. However EREC G5 Issue 5 leaves this consideration to the discretion of the NO facilitating the new connection. The Inclusion of harmonics above 50th order in assessments requires reliable measurement through voltage transducer with suitable bandwidth.

2.3 Limits for Interharmonics

Limits for interharmonics within EREC G5 Issue 4 have been revised. Based on IEC 61000-4-30 and IEC 61000-4-7, clear definition for measurement of interharmonics is given in EREC G5 Issue 5. According to the aforementioned standards, interharmonic components between two integer harmonics are grouped and summated using the square root of squares rule. Each group consisting of seven interharmonic components. The limits provided in EREC G5 Issue 5 apply to individual interharmonics or to the group of interharmonics depending on the frequency range.

2.4 Limits for Voltage Notches

Limits for voltage notches have been revised in EREC G5 Issue 5 to add an additional requirement on the area of the notch on the voltage waveform. The equation used in this limit was derived to align with international standards (IEEE 519).

The justification for this change was to align with international standards and capture the effect of notching as an area of the waveform, which is related to the duration of the notch, in addittion to the depth of the notch.

2.5 Stage 1 and Stage 2

One of the main differences of the Stage 1 and Stage 2 assesment process is in the presentation of the processes compared to that in EREC G5 Issue 4. EREC G5 Issue 5 includes distinct flowcharts for each substage with clear connections to the previous and subsequent substages. The failure and pass conditions and data requirements for each substage are clearly illustrated. **Error! Reference source not found.** of Appendix 6 describes the Stage 1 and Stage 2 process with worked examles.

The main technical modifications in EREC G5 Issue 5 are summarised below:

- Stages 1 and 2 are split into distinct sub-stages for improved clarity.
- Unconditional connection of equipment compliant with the EMC harmonic emission standard IEC 61000-3-2 irrespective of aggregate rating is permitted.
- Design to meet minimum short-circuit power requirements for equipment that is compliant with IEC 61000-3-12 to control voltage distortion.
- Updated tables of permitted aggregate equipment rated power by converter technology type to cater for new technology and established harmonic current emission profiles are included.
- New sub-stage which provides for scaling the tabled values of permitted aggregate equipment rated power according to harmonic 'headroom'.
- Removal of current emission tables in response to manufacturer request to prevent misuse in contracts.
- Extension of full Stage 2 prediction to all harmonic orders.
- Refined full Stage 2 calculations which account for skin effect and total harmonic distortion; this enables higher harmonic current emission are included.

2.5.1 Stage 1 connection process

Stage 1 has been completely revised. The revised document has also been written in more accessible way such that the process of connection should be more understandable for those with limited experience in using standard.

Stage 1 is designed for connection at LV. It is designed in a linear process such that assessments are applied in stages and substages. If a sub-stage is passed the new equipment can be connected, if the sub-stage is failed the next sub-stage of assessment is undertaken. In total there are four sub-stages in Stage 1.

The substages are designed such that earlier substages require less data from the network User but use conservative assumptions. As the connection progresses through the substages more data is required but by having more data the pass criteria can be relaxed by applying less conservative assumptions.

The first substage of Stage 1 – Stage 1A – also allows for self-certification, in accordance with IEC 61000-3-2. If a new user connects equipment compliant with the relevant international product standard, then they may connect with no assessment or referral to the NO.

The second substage of Stage 1 – Stage 1B – uses manufacturer statements concerning compliance with the relevant international product standard as the basis of assessment. In this stage, equipment rating as well as the short circuit power at the Point of Common Coupling (PCC) are required. The PCC is defined as a point in the public supply system, electrically nearest to a new user's installation, at which other network users' loads are, or may be, connected. Note that supply system is considered as being public in relation to its use and not its ownership

The third substage of Stage 1, Stage 1C, is based on equipment technology type, rated power and short-circuit power level.

Under Stage 1 the final substage is Stage 1D; this is a refined version of Stage 1C that takes into account the actual background harmonic level, which may be determined by measurement by the relevant NO.

The benefits of this approach are that it will facilitate straightforward connection for new equipment, as there are fewer requirements on Users to provide data, which may be difficult for smaller parties.

2.5.2 Stage 2 connection process

Stage 2 is designed for connection at PCC voltage levels below 33 kV and those assessments that have failed Stage 1. It is also designed in a linear process such that assessments are applied in substages..

Stage 2 includes three substages: Stage 2A and Stage 2B follow the same concept and have the same benefits as Stage 1C and Stage 1D. Those connection assessments which fail at Stage 1 may be assessed under Stage 2C. If a connection assessment fails at Stage 2, then assessment under Stage 3 will be carried out unless the PCC is LV, in which case, no connection is possible without mitigation.

For a Stage 2 connection assessment, small converter loads may be connected on the basis of equipment technology type, rated power and short-circuit power level under the Stage 2A assessment procedure. For loads where a more-detailed assessment is required, Stage 2B – a refined version of Stage 2A – is provided, which takes into account the actual background harmonic levels.

Under Stage 2, the final substage of assessment is Stage 2C, where a prediction of the harmonic voltage distortion post-connection is derived and compared with planning levels. This calculation is based on a simple reactance model for the source with a multiplying factor to allow for any low-order harmonic resonance. The frequency dependency of network resistance is also considered.

Where the assessment has indicated that mitigation measures may be necessary, a conditional connection may be made if the extent of the assessment's non-compliance with the limits is considered to be within the margin of uncertainty of the assessment process.

2.6 Resonant Plant connection process

There have been several incidences where connection of power factor correction capacitor banks at LV and interaction with existing harmonic levels in the network has caused capacitor failures or other equipment malfunction. In order to manage such situations, the assessment of resonant plant has been included in EREC G5 Issue 5. This is a new section compared to EREC G5 Issue 4. Resonant plant is defined as an item of new user plant or equipment (such as power factor correction capacitors, cables or active-front-end converters/inverters) that may modify the background harmonic level as a result of interaction with the rest of the network, without emitting any harmonic current or voltage.

A resonant plant assessment is applicable to connection of any user's resonant plant and equipment, such as power factor correction capacitors, long cables or any other plant or equipment that can be considered predominately capacitive at any range of harmonic frequencies. This is due to their potential to magnify background harmonic levels beyond the planning levels. This type of plant needs to be assessed for harmonic distortion compliance whether it is emitting harmonics or not.

For the assessment of resonant plant for connection at LV and voltages below 33 kV, a simple assessment methodology is followed based on conservative approaches with an assumption for the background harmonic levels and fault levels.

All resonant plant connection at 33 kV or above is subject to a Stage 3 assessment.

2.7 Stage 3 Connection Process

The revision of Stage 3 assessment was one of the main objectives of the revision of EREC G5 Issue 4.

The Stage 3 assessment in EREC G5 Issue 4 was based on emission data from the new user's equipment. This data was used by the NO to assess the impact of the new equipment and subsequently issue harmonic limits. The allocation of limits was based on a first come-first served methodology, meaning that the first new user in the connection queue would receive the whole of the harmonic headroom, if it was needed, based on the emission data and assessment. The harmonic headroom was calculated using the measured background harmonic level and the planning level.

In the cases where multiple connections were expected to connect within similar timescales, the order of allocating limits and issuing the harmonic specification was determined by the date at which the connection offer was signed by the new user. This feature of Issue 4 is retained in Issue 5.

Allocation of the whole headroom used in Stage 3 assessment in EREC G5 Issue 4 caused concerns for many new users as well as the NOs as, for example, a small new user could receive the whole of the headroom if it was first in the queue and the next in the line, which may be a large size new user, would receive a very small limit. Alternatively, the second new user could wait for the first to become part of the network, i.e. fully commissioned and operational, and then receive their harmonic specification after new background measurement was carried out. This in turn could introduce long delays in the second new user's project.

An increase in the number of connections of non-linear equipment at LV, HV and EHV voltage levels has led to a need to revise Stage 3 assessment in EREC G5 Issue 4 to allow fairer allocation of harmonic headroom and avoid delays in the issuing the harmonic specification.

EREC G5 Issue 5 Stage 3 uses apportionment of harmonic headroom to set the limits for each connection. For connection to distribution networks, the apportionment is fixed where half (50%) of the harmonic headroom is allocated to the first new user in the connection queue. For the transmission network, the apportionment is carried out in relation to the size of the connection. Appendix C of the DCRP/19/03/PC Public Consultation document (Appendix 5) presents a worked example for typical connections at 400 kV.

EREC G5 Issue 5 is the same as Issue 4 for the consideration of the impact of the new user on the remote nodes. Remote nodes surrounding the PCC are to be included in the assessment to ensure that the remote nodes remain compliant.

2.7.1 Stage 3 Connection Process- harmonic specification

EREC G5 Issue 4 provided no guidance on what data the NO should provide to the new user when the NO set limits as part of the Stage 3 process.

EREC G5 Issue 5 clearly outlines the minimum requirement for the harmonic specification. It is clearly stated that it is responsibility of the NO providing connection at the PCC to issue the harmonic specification. EREC G5 Issue 5 provides guidance on the minimum requirement for data to be provided by the NO such that a new user can design to meet their limits. The limits are issued in the form of a harmonic specification. EREC G5 Issue 5 also provides an example format in which this data may be presented.

The justification for this change is to achieve consistency in the data and format that the new user receives.

2.7.2 Requirement for compliance

EREC G5 Issue 5 adds a new section with guidance on how the new user can demonstrate compliance with the limits set by the NO. The compliance process has been defined in EREC G5 Issue 5, where the new user submits a report confirming compliance with the harmonic specification issued by the NO responsible for the connection.

NOs have always required new users to demonstrate compliance with the harmonic limits. However, EREC G5 Issue 4 offered no guidance on how this could be achieved. EREC G5 Issue 5 provides guidance to the new user on what is needed, as a minimum, in a compliance report to demonstrate compliance with the harmonic limits and guidance to NO on compliance verification.

The justification for this addition is to provide transparency and consistency to NO and new user about how compliance with this standard will be assessed. The NO has responsibility to carry out measurement before, during and after commissioning.

2.7.3 Concurrent connections

EREC G5 Issue 5 adds a new section providing guidance on how to set limits for concurrent connections; where multiple new users seek to connect to the same node at the same or to electrically close nodes at the same time.

EREC G5 Issue 4 provided no explicit guidance on how to set limits for concurrent connections. The common interpretation of the standard was that the first new user had to fully complete their design and become part of the network before a second new user could be set limits. This resulted in delays for the second new user. This was becoming more material as the number of new users has been increasing over the last few years.

EREC G5 Issue 5 adds guidance on how harmonic limits can be set for a second new user before the first new user's design has been finalised. The method assumes that the first new user uses all the distortion headroom allowable under its harmonic specification. This is likely to give a lower limit to the second new user than if they were to wait until the first new user becomes part of the background. However the new method will allow the second new user to connect earlier than under the method in EREC G5 Issue 4. Therefore the new method gives the new user with option of connecting earlier than under the method in EREC G5 Issue 4 or waiting and potentially having more relaxed limits.

The justification for this change is to facilitate the increase in the number of connections. Defining a clear process for managing concurrent connection will stop the setting of harmonic limit from being a limitation in the connection of a new new user.

3. Impacts and Other Considerations

Impacts on Users of The Distribution Code

The revised document provides clarity and consistency in the connection processes. The harmonic headroom available in the network are allocated to users in a transparent, fairer and consistent way, thus optimising the timeline for harmonic assessment and managing the cost of potential requirement for harmonic mitigation efficiently.

Impacts on Total System and the DNOs System

The revised document allows the system to be used more efficiently and harmonic levels to be managed effectively.

Environmental Impact Assessment

None.

4. Impact on other Industry documents

The Grid Code Review Panel (GCRP) are aware of the changes to EREC G5 and are currently developing a Grid Code modification proposal GC0129. Any consequential changes arising from the implementation of EREC G5 will be progressed in accordance with the GCode governance arrangements. The implementation dates of GC0129 and DCRP/MP/19/03 are expected to align as per section 7 of this proposal.

5. Assessment against Distribution Code Objectives

The proposed amendments better facilitate the Distribution Code objective (i):

(i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the distribution of electricity;

The workgroup considers that the revised document would better facilitate the Distribution Code objectives through:

I. The setting of simple and well defined methodologies for connection process and the network is developed in a more transparent and coordinated way.

II. Overall customers are connected more efficiently and economically by the allocation of harmonic headroom, though there is an acknowledgement the first user in the queue may be faced with increased harmonic mitigation measures to meet the new requirements.

III. The setting of simple and well defined methodologies for connection process and therefore development of network permits maintenance and operation of an efficient, coordinated and economical system for the distribution of electricity.

(ii) to facilitate competition in the generation and supply of electricity(and without limiting the foregoing, to facilitate the electricity distribution systems being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity).

The proposal has a positive impact on this objective. The harmonic standards utilised have been revised in line with the relevant IEC standards which facilitates more competition in the GB market and promotes more competition in generation and supply connecting to the networks. The revised approach of allocating harmonic headroom will also allow for more concurrent connections increasing competition in connections.

(iii) to efficiently discharge the obligations imposed upon distribution licensees by the distribution licences and comply with the Regulation and any relevant legally binding decision of the European Commission and/or the Agency for the Co-operation of Energy Regulators; and

The proposal has a positive impact on this objective.

(iv) to promote efficiency in the implementation and administration of the Distribution Code.

The proposal has a positive impact on this objective. Through clarity and consistency of the harmonic assessment for Stage 1, 2, or 3 this promotes users' efficiency in implementing the requirements in practice.

6. Workgroup Recommendations

On 01 August 2019 the DCRP DC0036 G5 Working Group formally approved the proposed draft of EREC G5 Issue 5 to be recommended to the DCRP to proceed to a RTA. The Working Group agreed to allow drafters to make any other editorial corrections identified as the document is finalised for publication.

The DCRP DC0036 G5 workgroup recommends that the changes proposed in the new EREC G5 Issue 5 and the changes to the Distribution Code as outlined in section 7 of this report should be implemented.

7. Implementation

The proposed modification would be implemented 6 months from the time of Approval by the Authority or 01 March 2020 whichever is later. The feedback received from Stakeholders was to provide an extended implementation window to allow industry to adjust to the new requirements in the standard.

Appendix 6, the draft of the new version of the DCode, is based on the current, version 42, of the DCode and is track changed to show the material changes to the DCode text and content.

If other modification proposals are approved before the implementation of this modification proposal which result in change to the current version of the DCode, the tracked changes will be applied to the version of the DCode that is current on the proposed implementation date.

There are no costs attributed to Users as a result of this proposed modification.

8. Consultation

On 13th March 2019 the DCRP formally opened up a public consultation DCRP/PC/19/03 on the proposed draft of EREC G5 Issue 5. The deadline for responses was 19th March 2019. Due to the Easter holiday period, the consultation closure was extended to 26th April 2019. The consultation material is presented in Appendix 5.

11 responses from the public consultation were received by stakeholders which are summarised in Appendices 6 and 7. The commentary on the draft EREC G5 Issue 5 is addressed in Appendix 7 whilst the stakeholder commentary on the consultation questions has been addressed in Appendix 6. Appendix 9 tracks the changes made to EREC G5 Issue 5 since public consultation.

Overall the responses were supportive of the proposed changes with mainly editorial and minor technical recommendations to be made to the draft EREC G5 Issue 5 to add clarity to users. All changes to EREC G5 Issue 5 since the public consultation are included in Appendix 9 of this RTA.

A number of stakeholders raised concern over the consideration of harmonics higher than the 50th order (Q3 of Stakeholder Consultation – Appendix 6), whilst another significant piece of feedback from one stakeholder was the objection to the revised approach to the apportionment of harmonic headroom (Q13, Q14, and Q17 of Stakeholder Consultation – Appendix 6). The rationale for considering higher order harmonics is detailed in Appendix 10 whilst Appendix 11 details the rationale behind the revised approach for the apportionment method to allocating harmonic headroom. The Working Group are comfortable the revised approaches to these key aspects of the document aligns with the distribution code objectives.

Further detail of this public consultation can be found on the DCode website under DCRP/19/03/PC.

9. Legal Text

Legal text for the changes proposed to the Distribution Code (Appendix 12) and the final draft of EREC G5 Issue 5 have been provided as appendices (Appendix 8 – clean, Appendix 9 – tracked since DCRP19/03/PC Public Consultation) to this Modification Proposal. The version of the Distribution Code provided incorporates the legal text changes required for the implementation of EREC G5 Issue 5.

The Distribution Code version 42 refers to Engineering Recommendation G5 in two instances: on page 24, Qualifying Standards Annex 1, item 1, and; on page 45, Distribution Planning and Connection Code Clause DPC 4.2.3.2(b).

The required change to the Distribution Code is to update these sections to refer to Engineering Recommendation (EREC) G5 Issue 5 - Harmonic voltage distortion and the connection of harmonic sources and/or resonant plant to transmission systems and distribution networks in the United Kingdom.

10. Distribution Code Review Panel Discussion

The Final Modification Report was circulated to DCRP for approval via email on 05 August 2019. At the meeting of the Distribution Code Review Panel (the Panel) held on 08 August 2019, the Panel recommended the Working Group revise the foreword to make it clear when G5 would be effective for connecting parties. The revised Final Modification Report was circulated to the DCRP for approval via email on 08 September 2019. At an extraordinary meeting of the DCRP held 10 September 2019 the Panel agreed that the Final Modification Report was approved for final submission of the Report to Authority for approval. The Panel unanimously agreed to the submission of the Report to Authority as the Panel agreed that the modification proposal better facilitated the objectives of the Distribution Code. The DCRP agreed the extended implementation window was necessary for stakeholders to adjust to the requirements of the new standard.

11. Recommendation

The Distribution Code Review Panel and Licenced Distribution Network Operators recommend that this modification report should:

- be submitted to the Authority for approval; and
- subject to the agreement of the Authority the modification should be implemented from the date the revised Distribution Code is published. This recommended date is to align with the implementation date of 01 March 2020.

12. Appendices

Appendix 1 – DCRP_10_02_07 A proposal for a review by National Grid

Appendix 2 – GC0036 Working Group Terms of Reference

Appendix 3 – DC0036 Working Group Terms of Reference

Appendix 4 – DC0036 Working Group Membership

Appendix 5 – DCRP/19/03/PC – EREC G5 Issue 5 Public Consultation Package

Appendix 6 – DCRP/19/03/PC – Stakeholder Consultation Feedback Summary – Consultation Questions

Appendix 7 – DCRP/19/03/PC – Stakeholder Consultation Feedback Summary – EREC G5-5 Draft

Appendix 8 – ENA Engineering Recommendation EREC G5 Issue 5 – Clean

Appendix 9 - ENA Engineering Recommendation EREC G5 Issue 5 – Tracked (since public consultation)

Appendix 10 – Summary of Sub-Workgroup Discussions on Apportionment of Harmonic Headroom in EREC G5 Issue 5

Appendix 11 – Subgroup Report on Harmonics above 50th

Appendix 12 – Proposed Distribution Code based on current published version v42