










Modification	At what stage is this document in the process?
<p>DCRP/MP/19/01/Report to Authority G98/G99 and G59/G83 Minor Technical Modifications and Editorial Corrections</p> <p>Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019.</p>	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="border: 1px solid green; padding: 2px; margin-bottom: 2px;">01 Modification</div> <div style="border: 1px solid blue; padding: 2px; margin-bottom: 2px;">02 DCRP report</div> <div style="border: 1px solid purple; padding: 2px; margin-bottom: 2px;">03 Public Consultation</div> <div style="border: 1px solid orange; padding: 2px; margin-bottom: 2px;">04 Final Modification Report</div> </div>
<p>The purpose of this document is to assist the Authority in its decision to implement the proposed modification to Engineering Recommendations G98 and G99. The proposed modification addresses a number of minor technical and housekeeping issues that have come to light as stakeholders start to apply G98 and G99 in advance of the compliance date of 27 April 2019. There are also a very small number of consequential changes to G59 and G83.</p> <p>Date of publication: 12 April 2019</p>	
<p>Recommendation</p> <p>The DNOs recommend that the proposed modifications are made to Engineering Recommendations G59, G83, G98, G99 and the Distribution Code.</p>	
	<p>The DNOs and DCRP recommend that this modification should be: Submitted to the Authority for approval</p>
	<p>High Impact: None</p>
	<p>Medium Impact: None</p>
	<p>Low Impact: Manufacturers, developers and owners of embedded power generating modules</p>

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Timetable		
1 st Draft Modification Report issued for consultation	26 October 2018	
Consultation Closed	23 November 2018	
2 nd Draft Modification Report issued for consultation	08 February 2019	
Consultation Closed	01 March 2019	
Final Modification Report available for Panel	09 April 2019	
Final Modification Report submitted to Authority	12 April 2019	

1. Purpose of the Modification

Ofgem approved the implementation of the EU Network Code “Requirements for Generators” (RfG) on 15 May 2018 (with compliance required from 27 April 2019). The implementation consisted of parallel changes to the Grid and Distribution Codes, and the introduction of ERECs G98 and G99.

G98 and G99 were submitted to Ofgem in February 2018. After that date and throughout the rest of 2018 a number of familiarization and implementation workshops and meetings were held with stakeholders. DNOs and stakeholders have become progressively more familiar with the documents over recent months. Through this familiarization, a number of issues have come to light that stakeholders generally would like to see addressed. These were subject to a public consultation between 26 October and 23 November 2018. Seven responses to that consultation were received. As a result of that feedback from stakeholders, and a small number of other points that the DNOs have themselves raised, a few further modifications were proposed. These additional points were formally consulted on between 08 February and 01 March 2019. Four responses were received to the second consultation.

2. Details of the Proposal

There are a large number of minor details forming this modification. These were all explained in the two consultation papers. A consolidated explanation from the two consultation papers, together with any further comments is attached as Appendix 1.

The responses to the first consultation are included as Appendix 2 and to the second consultation as Appendix 3.

The resulting changes to the documents are included as follows:

Appendix 4 – Changes to G83

Appendix 5 – Changes to G59

Appendix 6 – Changes to G98

Appendix 7 – Changes to G99

3. Impacts on Total System and the DNOs’ Systems

There is no impact on the Total System nor on DNOs’ systems. Implementing these proposed modifications should remove ambiguity and ease the compliance process for both DNOs and users.

4. Impacts on the Users of DNOs’ Systems

There are no new impacts on Users of DNOs’ systems.

5. Assessment against Distribution Code Objectives

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

The proposal has a positive impact on this objective by reducing uncertainty and ambiguity.

(ii) To facilitate competition in the generation and supply of electricity

The proposal has a positive impact on this objective as it makes it more straightforward for new generation to demonstrate compliance.

(iii) Efficiently discharge the obligations imposed upon DNOs by the Distribution Licence and comply with the Regulation (where Regulation has the meaning defined in the Distribution Licence) and any relevant legally binding decision of the European Commission and/or Agency for the Co-operation of Energy Regulators.

The proposal has a positive impact on this objective by reducing uncertainty and ambiguity.

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

The proposal has a neutral impact on this objective.

6. Impact on other Industry documents

There are no impacts on other industry documents.

7. Environmental Impact Assessment

There are no environmental impacts associated with this proposed modification.

8. Distribution Code Review Panel Recommendation

The responses to the consultation were discussed at the DCRP meeting on 11 April 2019 and the Panel agreed that the changes should be submitted to Ofgem.

9. Recommendation

The Licenced Distribution Network Operators and the DCRP 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 and associated documents are published. This date is recommended as 27 May 2018 or such other date as the Authority directs.

10. Appendices

Appendix 1 – Consolidated explanation of the proposed changes.

Appendix 2 – Responses to the first consultation

Appendix 3 – Responses to the second consultation

Appendix 4 – Changes to G83

Appendix 5 – Changes to G59

Appendix 6 – Changes to G98

Appendix 7 – Changes to G99

Appendix 1 – Consolidated explanation of the proposed changes

1 Changes with definite implications for some stakeholders

Interface Protection testing values

The interface protection requirements for Type A generators are based on the various requirements of G83 and G59, and as a result the minor differences between the historical approaches have been carried forward in G98 and G99. As it possible that type-tested and non-type-tested interface protection will co-exist in future, even possibly in the same installation, it makes sense to align the testing values to avoid confusion. The differences between the values are immaterial.

	G99 Form A2-4 Value (proposed for all Forms)	G99 Form A2-3 and G98 Form B Values (to be replaced)
U/F Stage 1 stability test	47.7 Hz; 30 s 47.2 Hz; 19.5 s	47.7 Hz; 25 s 47.2 Hz; 19.98 s
U/F Stage 2 stability test	46.8 Hz; 0.45 s	46.8 Hz; 0.48 Hz
O/F Stability test	51.8 Hz; 120 s 52.2 Hz; 0.45 s	51.8 Hz; 89.98 s 52.2 Hz; 0.48 s
U/V stability test	188 V; 5.0 s 180 V; 2.45 s	188V; 3.5 s 180V; 2.48 s
O/V Stage 1 stability test	258.2 V; 5.0 s 269.7 V; 0.95 s	258.2 V; 2.0 s 269.7 V; 0.98 s
O/V Stage 2 stability test	277.7 V; 0.45 s	277.7 V; 0.48 s

The values in form A2-4 are also used in forms B2-2 and C2-2, thus all stability tests for all sizes of power generating modules would be identical.

As these changes in value are immaterial to the correct functioning of the interface protection there is no value in causing manufacturers to repeat type tests on existing equipment. To cover this off a new clause 2.14 has been added to G99 to extend the validity of type tests under previous issues of G99. Similarly a new clause has been added as 2.17 in G98.

Tests to ensure RoCoF protection correctly discriminates during high RoCoF

During discussions with stakeholders in May 2018 regarding testing and type testing, it was noted that as far as testing RoCoF protection devices in G99 was concerned the existing tests were marginal around the setting values; ie there were no tests that applied a high level of RoCoF to check both for correct operation (ie within the required time window) or restraint (for a high value of RoCoF that did not persist for more than 0.5 s). It was agreed that such tests had merit and should be incorporated and chosen at a

value that was easily accomplished with the majority of protection test sets in common use. For simplicity a high RoCoF value of 3.0 Hzs^{-1} is proposed to be used for both a tripping accuracy test and a stability test, depending on its duration. These tests have been added to Forms A2-4, B2-2 and C2-2.

Stakeholders raised several points in respect of the proposed text about RoCoF stability tests. Following discussion with stakeholders the RoCoF stability test ranges, test frequency and test durations have been revised and clarified in the Site compliance and commissioning test forms (A2-4, B2-2 and C2-2).

Tests to prove RoCoF withstand

Tests have been added to Form A2-2 and A2-3 in G99 for Type A PPMs to demonstrate RoCoF withstand. The frequency test requirements in the Type B PGMD, Form B2-2, have been clarified in respect of RoCoF withstand. Similar frequency test requirements have been added to the Type C PGMD.

Importance of FON

A sentence has been added to the end of Section 6.2, and a little clarifying text to 17.4, 18.4 and 19.4 in G99 to underline that Generators have no rights operate a Type B, C or D Power Generating Module without a valid Final Operational Notification. The opportunity has also been taken to set a suggested maximum time between commissioning and FON receipt of 28 days

Following comments the words added in 17.2.1, as part of the First Consultation about the connection offer have been clarified. Concerns were expressed that in some cases generating units can take a significant time to commission and the new text in respect of the FON in 17.4, 18.4 may prevent the PGM from operating once the connection has been demonstrated to be safe. It is noted that a Type D PGM can operate with an ION prior to receiving a FON. The use of EONs and IONs for Type B and C PGMs was discussed amongst stakeholders during the original drafting of G99 in 2017 and there was a clear consensus that such a process was not desirable for Type B and C PGMs. The intention of the additional paragraphs is to expediate the provision of all the necessary compliance documentation prior to the issue of a FON. The clause has been modified to state that the Generator has no *permanent* rights to operate the PGM until the FON is received. The timing of the PGMD submission has been reviewed with stakeholders and is left at 28 days from first synchronisation for Synchronous PGMs and has been extended to up to 6 months from first synchronisation for PPMs (with the ability to agree otherwise).

The connection process has been reviewed with stakeholders and Paragraphs 17.2.6 – 17.2.10 and 18.2.6- 18.2.10 have been added to assist with clarity. This has resulted in the requirement being removed for the Generator to declare that the PGMD is complete in the Installation and Commissioning form B3 / C3. The B3 / C3 form will be returned with the B2-2 / C2-2 form as necessary at the time of commissioning with the PGMD being signed and returned once the full compliance process is complete.

Diagrams illustrating the Connection Process for Type B / C and Type D PGMs were included in the second consultation. These diagrams will be included in future editions of the DG Connexion Guides which DNOs publish in accordance with their licence.

Paragraph 16.4.3 has been added to G99 to clarify the rights in respect of a Type A PGM on connection.

Regenerative equipment

G99 paragraph 7.1.2 has been added to clarify requirements in respect of regenerative equipment which may act as a short term source of energy. Because it is unlikely any regenerative equipment would support a power island it is unlikely that G99 would need to be applicable. The DNO can advise if any special considerations such as reverse power protection is required on a case by case basis.

Type tested interface protection

There were concerns about the clarity of the modifications which had been proposed to G99 10.1.4 in respect of type tested interface protection. A new paragraph has been added and the original 10.4.1 redrafted in collaboration with stakeholders to add clarity resulting in modified paragraphs 10.4.1, 10.4.2 and 16.4.4.

Reactive capability

Clarification in respect of the interpretation of G99 figure 13.10 for Type B PGMs that are embedded within a Generator's network has been made in paragraph 13.5.1. Clarification in respect of all Type B PGMs when the voltage is outside $\pm 5\%$ has been made in a new paragraph 13.5.3.

The reactive power and excitation capability tests, in Annex B.5 and B.6, for Type B PGMs have been removed as these are not explicitly required. The references to the tests in the Type B PGMD, Form B2-1, have been removed. Paragraph 17.2.3 (d) has been revised to allow the DNO to agree the requirement for excitation system and reactive capability tests with the Generator for Type B PGMs on a case by case basis.

The reactive power operational requirements in Annex C.5.3.4 have been clarified for PPMs connected at 33 kV or less. The capability requirements given in paragraph 13.5.5 mean that the operating point is indeterminate at 1.05 pu voltage for leading power factor and 0.95 pu voltage for lagging power factor. Hence whilst the capability range is defined by the envelope in figure 13.2, paragraph C.5.3.7 considers the PPM design operating limits and uses figure C.5.2 to illustrate the operation that may be achieved at voltage extremes.

The reactive power simulation studies for Type C PGMs, in Annex C.7.3, have been revised to correctly account for the differences between the required capability of synchronous PGMs and PPMs. This requires the studies to be undertaken at 97% and 103% of nominal voltage for PPMs, rather than 95% and 105% which is the requirement for synchronous PGMs.

Voltage control tests

G99 paragraph 18.1.5 has been added in respect of the initial 20% limit on connection of Type C PPMs until voltage control tests have been completed. This is a duplicate of the intent of paragraph 19.3.9 associated with the ION for Type D PPMs and was erroneously omitted from the original G99 draft.

Minor defects in original drafting

Phased installations

Although G99 was drafted to allow for some larger installations to be progressively commissioned, the paperwork did not always lend itself to support this easily. Modifications have been made to Form A3-1 Part 2, A3-3 Part 2, Form B3 Part 2 and Form C3 Part 2 to facilitate progressive commissioning.

Submission of Compliance Document for Type A

Modifications to G99 Section 16.2, primarily 16.2.2 and 16.2.4, to make the timings of submission clearer.

Reconnection Times

The tests in G98 Form C and G99 Forms A.2-1, A.2-3 for reconnection times have a mistake and have a stability test value of 196.1 V instead of the correct 180.0 V. Although manufacturers should correct for this and test using the correct value in future, this is not a material issue. There is no need to repeat type testing to recertify for this, as per the accommodation in 0 above.

Missing LMSF-O test steps

Form A2-3 in G99 was missing the final two frequency steps in Section 9 of the form which have been added.

Duplication of non-standard voltage settings

The issues of nominal voltage different from the statutory LV voltages is covered twice, in G99 Section 10.6.14 and Appendix A6. Appendix 6 has been deleted.

Monitoring of tripping and auxiliary supplies

The longstanding requirement from G59 that tripping etc supplies should be monitored, or lead to lock out on their failure, was correctly included in G99 for Type A PGMs, but was missed for Type B, C and D PGMs. This requirement has now been added to Forms B3 and C3.

Published fault levels

In G99 12.3.1.7(c) and 13.3.1.11(c) it is stated that DNOs will publish maximum and minimum fault levels in their Long Term Development Statements. This is incorrect; the specification for the LTDS does not include minimum fault levels and it is not believed that this information is required for the purposes of fault ride through. The word "minimum" is therefore deleted in both locations.

Timing of PGMD submission for Type D PGMs

In G99 a few words have been added to 19.2.1 to clarify when Generators should look to first submit the PGMD.

Manufacturers' Information

It has been clarified in G99 21.2 that Manufacturers' Information includes both type-tested information, as well as other information that manufacturers might need to provide for any particular installation.

Type B simulation studies for reactive power

Section B.4.2 and B.4.3 in Annex B.4 in G99 overspecified the requirements applicable to Type B PGMs (compared to that mandated in the RfG). The overspecified reactive power requirements have been removed.

Type B simulation studies for frequency response

Section B.4.5 in Annex B.4 in G99 overspecified the requirements applicable to Type B PGMs (compared to that mandated in the RfG). The overspecified simulation study requirements have been removed.

Power Factor Control

Section C.5.7 in G99 contained an erroneous obligation for the DNO to agree aspects of power factor control with National Grid. This has now been removed.

Governor/Control specification

G99 13.2.6.1 included a redundant requirement to notify the DNO of the specification of the governor/controller. This has been removed.

Replace Minimum Generation with Minimum Stable Operating Level

In the drafting of G99 the older defined term Minimum Generation was used, instead of the equivalent Minimum Stable Operating Level. For consistency with the Grid Code it is proposed to use Minimum Stable Operating Level. The specifics of the definition have not changed. Note that there are still some consistency problems with these terms and a separate joint GCRP/DCRP housekeeping modification is expected soon to address the remaining issues.

Clarification that the PGMD shall be submitted 28 days before synchronization

Minor amendments have been made to Forms B2-1 and C2-1 in G99 to clarify that the PGMD should be submitted (albeit not yet fully complete) to the DNO at least 28 days before synchronization is first required, and a reference to Sections 17.2.2 and 18.2.2 is added which specify which parts of the PGMD must be complete at this time.

Inclusion of Witnessing and Commissioning paragraph for Type D

The Witnessing and Commissioning paragraphs used for Type B and Type C PGMs in G99 had been omitted for Type D. These paragraphs have been included in Section 19.4. The subsequent paragraphs in Section 19 and their cross references have been renumbered.

Additional space for insertion of Manufacturers' Information reference numbers

In G99 the table cells on Forms A2-2; A2-3 have been enlarged to aid the adding of manufacturers references into these cells.

Use of Type Tested in G98

As only Fully Type Tested micro-generators can connect under G98 the use of the defined term "Type Tested" has been reviewed and removed or replaced. "Fully Type Tested" or reference to the "Type Test Verification Report" are used throughout.

Voltage Management Units in G98

A paragraph has been added to G98 to clarify that any Micro-generator shall be connected to the Connection Point side of any Voltage Management Unit installed in a Customers' Installation.

Multiple Premises Connection Procedure in G98

Clarity has been added to the procedure for multiple premises connection by moving paragraph 8.1.2 to the Section 5 which details connection procedures.

Consistency of G59 and G83

Both G59 and G83 do not mention the existence of G98 and G99. A sentence has been added to both to make it clear that new installations connected on or after 27 April 2019 need to comply with G98 and G99 as appropriate.

Clarification of applicability of version of G99

Paragraph 2.14 has been modified to clarify that the version of G99 current at the time of type testing or ordering plant and / or apparatus is the version that will be applicable to the PGM for the purpose of compliance demonstration.

Compliance and Commissioning forms

Several changes have been made to improve the coverage and clarity of the compliance and commissioning forms:

- A check for as installed data added to Type A Installation Document Form A3-1.
- Logic interface port and wiring check anomalies have been corrected in Form A2-2 and A2-4.
- A note has been added to Form A2-2, Voltage fluctuations and flicker to state that measurements can be recorded as in form A2-1.
- A requirement for the Site Responsibility Schedule to be complete prior to energisation has been added to the Type B and Type C PGMD (Forms B2 and C2).

Modification to Annex A.4.3 in respect of Infrequent Short Term Parallel Operation

Apart from the RfG exclusions the specificity of short term paralleling is dealt with in G99 Section 7.3 (this text is from G59). Hence the exclusion of parts of Section 9 and Section 10 from the infrequent short term paralleling requirements has been determined as being incorrect and has been removed.

Clarification of droop for LFSM-O

Figures 11.2 and 12.2 have been modified to show the range of droops that a Generator may choose to implement for LFSM-O.

“Must” replaced with “Shall”

To align with other ENA documents, and also with the legal style of international standards and the EU Network Codes, the word “shall” has been used in instances where “must” has been used hitherto.

Unnecessary dated references in G59 and G83

In accordance with the good practice established in G98 and G99, unnecessary dated references to IEC and other standards have been removed in G59 and G83. These are shown in Appendices 3 and 4.

Incorrect start frequency in G59 and G99

In the response to the second consultation DeepSea Electronics noticed that there was a discrepancy between the starting frequency for frequency tripping tests between the text and the tables in both G59 and G99. This is clearly a longstanding minor drafting error in both documents, has been corrected in Section 12.4.1(b)(ii) in G59 and 15.4.1(b) in G99.

Applicability of Type Test in G98

In response to the second consultation it was noticed by Northern Powergrid that the applicability of Annex A as explained in A1.1 was confusing. This has now been clarified.

Minor errors, typographical errors etc

Labelling of forms

The labelling of all forms in G99 has been standardized as “Form X-M (Annex X.M)”

Other minor corrections

- G99 A.7 para 1 corrected reference from Annex 3 to Annex 2.
- In G99 PGF Owner has been replaced, where it occurs, with Generator.
- Two instances of User have been replaced with Generator.
- G98 Annex A2 Power Quality heading should be numbered A2.3
- G98 10.1.2 – Distribution Code is not a defined term, so the bold is removed
- Minor wording changes for clarity in G99: 1.2; 3.4; 9.7.2; 10.2.2; 10.4.1; 10.4.14; 14.4.1(a); 14.5.7; 15.3.3; 16.1.3; 17.1.2; 18.1.2; A.2-1 1; A2-2 1
- Bold for defined terms applied carefully to include the defined term, but not, for example, its plural ‘s’.
- DNO’s system corrected to DNO’s Distribution Network throughout
- In G99 C.8.3.1 the phrase “may be used” is repeated erroneously. The second instance is deleted.