

Modification proposal:	Distribution Code: Modification to the Distribution Code to implement a change to Engineering Recommendation G59/2 relating to the limits of DC injection		
Decision:	The Authority directs that this proposal be made ¹		
Target audience:	Parties to the Distribution Code and other interested parties		
Date of publication:	11 April 2011	Implementation Date:	12 April 2011

Background to the change proposal

Electricity Distribution Licence holders² are required by Standard Licence Condition ("SLC") 20 to have in force, implement and comply with the Distribution Code. SLC 21 requires that licensees take all steps within their power to ensure that the Distribution Code in force under the licence at 31 May 2008 remains a code approved by the Authority³ that is designed to better facilitate the achievement of the Applicable Distribution Code Objectives⁴ so far as is consistent with particular requirements set out in that condition⁵. Electricity distribution licence holders are required to periodically review the Distribution Code and its implementation and, where appropriate, modify the Distribution Code, subject to the Authority's approval, with any revisions as they reasonably think are required for continuing achievement of the Applicable Distribution Code Objectives.

This proposed Distribution Code modification relates solely to the limits specified in Engineering Recommendation G59/2 for the injection of direct current (DC) into distribution networks by generators.

Until the introduction of Engineering Recommendation G83⁶, no fixed limits were imposed by licensees for the injection of direct current into distribution networks. However, Engineering Recommendation G54-1⁷, which addresses voltage quality, does comment on this as follows: "This Engineering Recommendation does not contain provisions for DC current emissions because of their deleterious effects on the supply system. All DC emissions are deprecated."

All direct current sources of electricity (e.g. Photo Voltaic (PV) panels) employ an inverter to convert the direct current to alternating current (AC) so that they can be connected to the system. These inverters do not create a perfect alternating current waveform. They do produce a small amount of direct current. Larger devices also employ a transformer between the inverter and the network and this effectively protects the network from the DC injection. However, smaller devices are connected directly so that the direct current does enter the network.

Due to the growth of inverter connected generation it is now considered necessary to impose limits for DC injection. This is recognised in Engineering Recommendation G83 where a limit of 20mA has been set. When Engineering Recommendation G59 was

¹This decision document includes the reasons for this decision as required by section 49A of the Electricity Act 1989.

² This includes the fourteen ex-PES licensees referred to as DNOs and all other licence holders referred to as IDNOs.

³ The terms 'the Authority', 'Ofgem' and 'we' are used interchangeably in this document. The Authority is the Gas and Electricity Markets Authority; the regulator of the gas and electricity industries in GB. Ofgem is the Office of the Gas and Electricity Markets which supports the Authority.

⁴ The Objectives are set out in Standard condition 21.4 of the electricity distribution licence.

⁵ The requirements appear in Standard conditions 21.2 and 21.3 of the electricity distribution licence.

⁶ Engineering Recommendation G83/1-1 - Recommendations For The Connection Of Small-Scale Embedded Generators (Up To 16 A Per Phase) In Parallel With Public Low-Voltage Distribution Networks.

⁷ Engineering Recommendation G5/4-1 - Planning levels for harmonic voltage distortion and the connection of non-linear equipment to transmission and distribution systems in the United Kingdom.

updated to G59/2 in August last year a limit on DC injection was introduced at the same 20mA level applied in G83.

Subsequently, several developers of inverters for renewable generator systems have approached DNOs and Ofgem complaining that the single limit of 20mA is too low and is effectively a barrier to the development of those renewable technologies that employ an inverter. In response to these complaints, and encouraged by Ofgem, the DNOs undertook a review of this issue. A review of international practice and recent UK research⁸ was carried out focusing on the effects that DC injection can have.

The DNOs consider that galvanic corrosion of DNO and third party assets is the least well understood and potentially most significant concern. They believe that further research is likely to be required on this issue. However, they do believe that there is scope to raise the existing 20mA limit prior to the completion of such research. They have therefore proposed that G59/2 should retain the 20mA limit for generators up to 2kW but, for larger generators, the limit should be 0.25% of the AC current rating of the device. This should be considered as an interim measure that could be revisited following further research.

As this proposal is a relaxation of an existing requirement its environmental impact is considered to be wholly positive. It will make it easier to connect inverter interfaced renewable energy generators to distribution networks. Therefore it was decided that an environmental impact assessment was not required.

The modification proposal

The modification to the Distribution Code itself is simply to replace the four references to "G59/2" with "G59/2-1".

The modifications to ER G59/2 are made on the two pages where the DC injection limits are referred to: paragraph 13.7.6.4 and Appendix A 13.1.

DCRP recommendation

The Distribution Code Review Panel (DCRP) considered this issue as a matter of some urgency at its meeting on 25 November 2010. At the Panel meeting of 3 March 2011, the DNOs reported on the review they had carried out and their proposal as set out here. The Panel agreed that the best way forward was to make a change to ER G59/2 to create ER G59/2-1. The Panel unanimously supported the proposal to seek the Authority's approval for the modification to be implemented.

The changes proposed by the DNOs are set out in the Report to the Authority of 5 March 2011 sent in accordance with SLC 21.9.

The Authority's decision

SLC 21.10 of the Electricity Distribution Licence provides that modifications to the Distribution Code that are proposed by the licensees and sent to the Authority under SLC 21 cannot be implemented without the Authority's approval.

The Authority has considered the Report dated 5 March 2011. The Authority has concluded that:

1. implementation of the proposed changes will better facilitate compliance with the relevant requirements of the Electricity Distribution Licence; and
2. the modification made is consistent with the Authority's principal objective and statutory duties⁹.

⁸ <http://webarchive.nationalarchives.gov.uk/20100919181607/http://www.ensg.gov.uk/assets/dgcg0000200.pdf>

⁹ The Authority's statutory duties are wider than matters which the Panel must take into consideration and are largely provided for in statute, principally in this case the Electricity Act 1989 as amended, as well as arising from directly effective European Union law.

Reasons for the Authority's decision

We understand that the imposition of unnecessarily restrictive technical limits can have direct impacts on parties wishing to connect to distribution networks.

We understand why the single limit of 20mA was adopted in ER G59/2 and that there do need to be limits on direct current injection to limit its potential effects¹⁰. However, we also consider that these limits should not be unnecessarily restrictive, particularly where this causes practical and/or economic difficulties in achieving network connections.

We therefore support the proposal to raise the direct current injection limit in ER G59/2 for devices of greater than 2kW. We recognise that this creates a minor discontinuity between ER G83/1-1 and ER G59/2-1 (as proposed). However, we understand that the DNOs will be carrying out further work on this issue and will be reviewing ER G83/1-1 in the near future.

Decision notice

In accordance with SLC 21.10 of the Electricity Distribution Licence, the Authority, hereby directs that **the modifications to the Distribution Code set out in the Report to the Authority of 5 March 2011** be made.



Rachel Fletcher

Partner Distribution

Signed on behalf of the Authority and authorised for that purpose

¹⁰ These are discussed in the report in footnote 8.