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Modification proposals:	**Grid Code GC0125: EU Code Emergency and Restoration: Black Start testing requirements for Interconnectors, HVDC System Owners and Owners of Transmission DC Converters** **Grid Code GC0127 and GC0128: EU Code Emergency and Restoration: Requirements resulting from System Defence and Restoration Plans**		
Decision:	The Authority[1] directs[2] that the proposed modifications to the Grid Code be made		
Target audience:	The Electricity System Operator (ESO), the Grid Code Review Panel, Grid Code users and other interested parties		
Date of publication:	5 February 2020	Implementation date:	12 February 2020

Background

The Regulation (EU) 2017/2196[3] establishing a network code on emergency and restoration (the NCER Regulation) entered into force on 18 December 2017. The NCER Regulation sets out rules relating to the management of the electricity transmission system in the emergency, blackout and restoration states. The main objective of these rules is to prevent the propagation or deterioration of an incident to avoid the system entering the blackout state as well to allow for the efficient and rapid restoration of the electricity system from the emergency or blackout states.

In accordance with Article 11 and 23 of the NCER Regulation, the Electricity System Operator (ESO) is required to create a System Defence Plan (SDP) and a System Restoration Plan (SRP). The first proposals for the SDP and the SRP were consulted on by the ESO in September 2018 and the elements of these plans that require our approval[4] were submitted to us on 18 December 2018. By decisions on 19 June 2019[5] and 21 October 2019,[6] we have requested amendments to these elements of the SDP and SRP and we have received the latest amended proposals on 20 December 2019. We will assess the amended proposals in due course and our decision on these Grid Code modifications does not fetter our discretion on our future decision on the elements of the SDP and SRP.

[1] 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.
[2] This document is notice of the reasons for this decision as required by section 49A of the Electricity Act 1989.
[3] The Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on electricity emergency and restoration is available at the following address : https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2017.312.01.0054.01.ENG
[4] In accordance with Article 4(2) and Articles 11 and 23 of the NCER Regulation, the following elements of the system defence plan and system restoration plan are subject to regulatory approval: (i) the list of significant grid users (SGUs) responsible for implementing on their installations the measures that result from mandatory requirements from Regulations (EU) 2016/631, (EU) 2016/1388 and (EU) 2016/1447 or from national legislation and the list of the measures to be implemented by these SGUs (the SGU list) and (ii) a list of high priority SGU and the terms and conditions for their disconnection in the System Defence Plan and System Restoration Plan (the High Priority SGU list).
[5] Decision available at: https://www.ofgem.gov.uk/publications-and-updates/request-amendment-electricity-system-operator-s-proposal-under-eu-emergency-and-restoration-network-code
[6] Decision available at: https://www.ofgem.gov.uk/publications-and-updates/request-further-amendments-electricity-system-operator-s-proposals-under-eu-emergency-and-restoration-network-code

In parallel to this process, the ESO initiated two code modifications (GC0127 and GC0128) to align the Grid Code with Articles 15(3), 44, 45, 47 and 48(2) of the NCER Regulation. The ESO also raised a related code modification (GC0125) to ensure compliance and alignment of the Grid Code with Article 46 of the NCER Regulation and 71(11) of the Regulation (EU) 2016/1447 establishing a network code on requirements for grid connection of high voltage direct current systems and direct current-connected park modules (the HVDC Regulation).[7]

As the three code modifications are aimed at aligning the Grid Code with the NCER Regulation and since the code modifications are interlinked, we have decided to issue a single decision letter setting out our decisions on the three code modifications.

The modification proposal

GC0125:

This code modification seeks to align the Grid Code with the NCER Regulation, specifically in relation to the testing of HVDC capabilities. In practice, this means including in the Grid Code details of black start testing for interconnectors, HVDC system owners and owners of transmission DC converters. The NCER Regulation sets the test to be followed by a restoration service provider that is an HVDC system in order to demonstrate its capacity to deliver black start services. The Grid Code however does not currently provide for any such test.

The test is specified in Article 46 of the NCER Regulation and, by reference, in Article 71(11) of the HVDC Regulation,[8] which respectively reads as follows:

> *"Each restoration service provider which is an HVDC system delivering a black start service shall execute a black start capability test, at least every three years, following the methodology laid down in Article 70(11) of Regulation (EU) 2016/1447".*
>
> *"With regard to the black start test, if applicable:*
> - *a) the HVDC system shall demonstrate its technical capability to energise the busbar of the remote AC substation to which it is connected, within a time frame specified by the relevant TSO, according to Article 37(2);*
> - *b) the test shall be carried out while the HVDC system starts from shut down;*
> - *c) the test shall be deemed passed, provided that the following conditions are cumulatively fulfilled:*
>   - *i. the HVDC system has demonstrated being able to energise the busbar of the remote AC-substation to which it is connected;*
>   - *ii. the HVDC system operates from a stable operating point at agreed capacity, according to the procedure of Article 37(3)."*

GC0125 proposes to align the testing requirements set out in the Grid Code with those of the NCER Regulation by adding new requirements in OC.5.7 of the Grid Code. The new requirements:

[7] The Regulation (EU) 2016/1447 of 24 November 2017 establishing a network code on requirements for grid connection of high voltage direct current systems and direct current-connected park modules is available at the following address: https://eur-lex.europa.eu/eli/reg/2016/1447/oj

[8] Although Article 46 of the NCER Regulation makes reference to Article 70(11) of the HVDC Regulation, we understand that this is a typo and that Article 46 of the NCER Regulation should instead be read as referring to Article 71(11) of the HVDC Regulation.

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i) specify that HVDC systems delivering a black start service are required to execute a black start capability test at least every three years;
ii) detail how the test needs to take place; and
iii) as a result of workgroup discussions, the proposed code modification also introduces the term "Black Start Service Provider" to account for the fact that a wider range of technologies may provide black start services in the future, thus in effect future proofing the Grid Code.

An alternative proposal, WAGCM1, was raised by a workgroup member. WAGCM1 is the same as the original proposal but i) does not contain the proposed definition of "Black Start Service Provider" and ii) proposes to amend the definition of a Black Start Contract by adding a reference to the terms and conditions to act as a restoration service provider adopted in accordance with the NCER Regulation. The amended definition of a Black Start Contract would read as follows. The addition brought by WAGCM1 is underlined:

> *"An agreement; between a Generator or an HVDC System Owner and The Company under which the Generator or an HVDC System Owner or a DC Converter Station Owner provides Black Start Capability and other associated services; in accordance with the terms and conditions to act as restoration service provider on a contractual basis approved by the Authority in accordance with Article 4(2)(b) and (4) or as amended in accordance with Article 4(7), of Regulation (EU) 2017/2196."*

GC0127 and GC0128

These two modification proposals were submitted under the scope of a single Final Modification Report due to their overlapping aims and interdependencies. GC0127 and GC0128 seek to align the Grid Code with the obligations on GB parties stemming from Articles 15(3), 44, 45, 47 and 48(2) of the NCER Regulation.

Article 15(3) of the NCER Regulation specifies that:

> *"Prior to the activation of the automatic low frequency demand disconnection scheme, each TSO and DSO identified pursuant to Article 11(4) shall foresee that energy storage units acting as load connected to its system:*
> *(a) automatically switch to generation mode within the time limit and at an active power set-point established by the TSO in the system defence plan; or*
> *(b) when the energy storage unit is not capable of switching within the time limit established by the TSO in the system defence plan, automatically disconnect the energy storage unit acting as load."*

To meet this obligation, the ESO has included in its SDP a requirement for energy storage units to switch from demand to generation in such a short period of time that, in practice, means storage will have to disconnect from the network. The original proposal, in line with the SDP, creates Grid Code obligations on energy storage units to disconnect automatically during low frequency events as defined in OC6.6.6 of the Grid Code. To do this, the original proposal also uses some definitions originally developed as part of GC0096.

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Article 44 of the NCER Regulation specifies that:

> *"1. Each restoration service provider which is a power generating module delivering black start service shall execute a black start capability test, at least every three years, following the methodology laid down in Article 45(5) of Regulation (EU) 2016/631.*[9]
>
> *2. Each restoration service provider which is a power generating module delivering a quick re-synchronisation service shall execute tripping to houseload test after any changes of equipment having an impact on its houseload operation capability, or after two unsuccessful consecutive tripping in real operation, following the methodology laid down in Article 45(6) of Regulation (EU) 2016/631."*

The original proposal amends section OC5.7 of the Grid Code to include the obligations relating to black start capability tests for black start service providers and a quick resynchronisation unit tests for generators.

Article 45 of the NCER Regulation specifies that:

> *"1. Each defence service provider delivering demand response shall execute a demand modification test, after two consecutive unsuccessful responses in real operation or at least every year, following the methodology laid down in Article 41(1) of Regulation (EU) 2016/1388.*[10]
>
> *2. Each defence service provider delivering demand response low frequency demand disconnection shall execute a low frequency demand disconnection test within a period to be defined at national level and following the methodology laid down in Article 37(4) of Regulation (EU) 2016/1388 for transmission connected demand facilities or according to a similar methodology defined by the relevant system operator for other demand facilities."*

The original proposal amends section DRSC11.7 of the Grid Code to include an obligation on non-embedded customer and CUSC parties who are demand response providers to test their capability after two consecutive unsuccessful responses or every year. In addition, it sets out the obligation for these parties to test their low frequency demand disconnection every three years.

Article 47 of the NCER Regulation specifies that:

> *"Each DSO and TSO shall execute testing on the low frequency demand disconnection relays implemented on its installations, within a period to be defined at national level and following the methodology laid down in Article 37(6) and Article 39(5) of Regulation (EU) 2016/1388."*

The original proposal amends section ECC.A.5.4 of the Grid Code to include an obligation on non-embedded customer, network operators, and relevant transmission licensee to aim to test their low frequency demand disconnection relays at least once every three

[9] Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators is available at the following address: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R0631

[10] Commission Regulation (EU) 2016/1388 of 17 August 2016 establishing a Network Code on Demand Connection is available at the following address: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2016.223.01.0010.01.ENG

years, with a possibility to extend testing to no more than every five years if considered to be required for operational purposes.

Article 48(2) of the NCER Regulation specifies that:

> *2. Each DSO and SGU identified pursuant to Article 23(4), each TSO and each restoration service provider shall test the backup power supply of their communication systems at least every five years."*

The original proposal amends section ECC.6.5.4.4 of the Grid Code to include the requirement for EU Code Users[11] to test the backup power supplies feeding its control telephony facilities at least every five years.

During the workgroup, the proposer also considered the need for amendments to the Grid Code due to the provisions of Articles 13(2)(a), 21(1)(b), 27(4), and 40 of the NCER Regulation. However, the original proposal did not suggest any amendment to the Grid Code in relation to these articles.

Alternative proposals for GC0127/128

Three alternative proposals were raised by a workgroup member for GC0127 and GC0128. These proposals were accepted and formally became WAGCM1, WAGCM2, and WAGCM3 respectively.

WAGCM1 is the same as the original proposal except that it intends to broaden the scope of the parties who have to comply with the new requirements inserted in the Grid Code by GC0127/128. This alternative proposal was raised because the proposer of WAGCM1 believes that the parties that are required to fulfil the requirements of the Grid Code (CUSC parties) does not capture all of the parties that have obligations under the NCER Regulation.

The additional legal text in WAGCM1 intends to include non-CUSC parties listed in the scope of application of the NCER Regulation as per Article 2 of the NCER Regulation. The legal text for WAGCM1 tries to achieve this by creating a new section of the Grid Code for non-CUSC parties. In practice, it states that non-CUSC parties will have to comply with the relevant provisions of the NCER Regulation, and that defence/restoration service providers[12] will have to comply with the SDP/SRP.

WAGCM2 is the same as the original proposal except that it defines the time limit and an active power set-point referred to in Article 15(3)(a) of the NCER Regulation. WAGCM2 requires new and existing storage units to switch from load to generation mode in 20 seconds during periods of low system frequency where they are technically capable to do so. If this capability cannot be met, the plant is required to automatically disconnect at or below 49.2Hz.

WAGCM3 is the same as the original proposal but it incorporates the proposed modifications of both WAGCM1 and WAGCM2.

[11] The definition of an EU Code User can be found in section GD of the Grid Code.
[12] Parties who have obligations under the SDP and/or SRP.

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Grid Code Review Panel recommendation

GC0125

At its meeting on 29 October 2019, the Grid Code Review Panel agreed by a majority that the GC0125 original and WAGCM1 better facilitate the Grid Code objectives compared to the baseline. The Grid Code Review Panel recommended the adoption of GC0125 original.

GC0127 and GC0128

At its meeting on 28 November 2019, the Grid Code Review Panel agreed by majority that the GC0127/128 original, WAGCM1, WAGCM2 and WAGCM3 better facilitate the Grid Code objectives compared to the baseline. The Grid Code Review Panel recommended the adoption of GC0127/128 original proposal.

Our decision

We have considered the issues raised by the code modification proposals for GC0125, GC0127 and GC0128 and in the Final Modification Reports dated 12 November 2019 and 3 December 2019 respectively. We have considered and taken into account the responses to the industry consultations for the code modification proposals which are included in the respective Final Modification Reports.[13] We have concluded that:

- implementation of the original modification proposal for GC0125 will better facilitate the achievement of the objectives of the Grid Code;[14]
- implementation of the original modification proposals for GC0127 and GC0128 will better facilitate the achievement of the objectives of the Grid Code; and
- approving the original modifications is consistent with our principal objective and statutory duties.[15]

Our decision on these code modifications is without prejudice to our decision on the elements of the SDP and SRP which are subject to our approval or rejection of GC0096 modification.

Reasons for our decision

We consider the original modification proposal for GC0125 will better facilitate Grid Code objectives (iii) and (iv) and has a neutral impact on the other objectives.

We consider the original modification proposal for GC0127 and GC0128 will better facilitate Grid Code objectives (iii) and (iv) and has a neutral impact on the other objectives.

[13] GC0125, GC0127 & and GC0128 proposals, Final Modification Reports and representations can be viewed on NGESO's website at the following addresses: https://www.nationalgrideso.com/codes/grid-code/modifications/gc0125-eu-code-emergency-restoration-black-start-testing-requirements https://www.nationalgrideso.com/codes/grid-code/modifications/gc0127-eu-code-emergency-restoration-requirements-resulting-system https://www.nationalgrideso.com/codes/grid-code/modifications/gc0128-eu-code-emergency-restoration-requirements-resulting-system

[14] As set out in Standard Condition C14(1)(b) of the Electricity Transmission Licence, available at: https://epr.ofgem.gov.uk/

[15] The Authority's statutory duties are wider than matters which the Grid Code Panel Review must take into consideration and are detailed mainly in the Electricity Act 1989 as amended.

(iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole

GC0125

The implementation of the original proposal and its alternative proposal, WAGCM1, will ensure that testing for interconnectors, HVDC system owners and owners of transmission DC converters is included in the Grid Code. We believe that this will help ensure that the ESO has a reliable set of tools to secure the system against unforeseen events.

Therefore, we believe that both the original proposal and WAGCM1 better facilitates objective (iii).

GC0127 and GC0128

By ensuring that the Grid Code aligns with the provisions of the NCER Regulation, the original proposal and alternative proposals for GC0127 and GC0128 provide more visibility and ensure that all relevant parties are aware of their defence and restoration obligations that apply to them.

We believe however that the original proposal better facilitates objective (iii) compared to the baseline and compared to WAGCM1, WAGCM2 and WAGCM3, for the following reasons:

- WAGCM 1: we understand that the legal text for the WAGCM creates two obligations which are either inefficient or redundant:
  i) by requiring non-CUSC parties to comply with the relevant requirements of the NCER Regulation, we understand that the WAGCM would be redundant. The obligations laid on the non-CUSC parties in the NCER Regulation do not need to be repeated in the Grid Code. This duplication of norms does not promote security or efficiency of the electricity system; and
  ii) by requiring non-CUSC parties who are defence or restoration service providers to comply with the SDP and SRP, we understand that the WAGCM would unduly extend the scope of application of the SDP and SRP. The SDP and SRP currently only identify measures to be implemented by CUSC parties and we do not believe that it is appropriate for the Grid Code to contradict the scope of the application of these plans. In this respect, we do not believe that WAGCM1 better promotes security or efficiency of the electricity system compared to the original.

- WAGCM 2: we understand from the workgroup and Panel discussions that there has not been a thorough assessment of the suitability of the WAGCM2 solution. Given that the parameters set out in WAGCM2 contradict the provisions of the SDP, it is not clear whether the proposed 20-second period for energy storage units to switch from load to generation mode best ensures system security during times of frequency disturbance. With the limited evidence in favour of WAGCM2 made available to us in the FMR, we believe that the original proposal better promotes security and efficiency in the electricity system than WAGCM2. We nevertheless ask the ESO to collaborate with relevant industry parties to assess further the possibility for storage units to switch from load to generation mode and thus contribute effectively to system security in periods of low system frequency.

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We therefore believe that the original proposal provides the most appropriate solution as it promotes security and efficiency in a way that is robust and consistent with the provisions of the SDP, SRP and the NCER regulation. We also note that there is no obligation to extend the scope of application of those articles through modifications of the Grid Code and we do not believe that it is efficient to place such obligations on parties where it is not necessary for ensuring system security. Nevertheless, if a future edition of the SDP puts requirements on parties that are currently not in scope of the plan, we would expect the Grid Code to be amended to ensure its consistency with the SDP.

In conclusion, we believe that the original proposal better facilitates objective (iii) compared to the baseline and compared to WAGCM1, WAGCM2 and WAGCM3.

(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.

GC0125

Both the original proposal and WAGCM1 further align the Grid Code with the requirements set out in Articles 46 of the NCER Regulation and 71(11) of the HVDC Regulation. GC0125 extends existing Grid Code conditions for the provision of black start services by generators to interconnectors. Both extend the requirements to align compliance testing requirements with those set out in the NCER Regulation.

We believe that the proposal of WAGCM1 to insert a cross-reference to the terms and conditions to act as restoration service providers in the definition of a black start contract is an unnecessary change. The NCER Regulation already provides for the approval of those terms and conditions and we do not believe that the insertion of a cross reference in the definition of the black start contract would serve any meaningful purpose.

In addition, the WAGCM1 proposed definition of a Black Start Contract does not include the proposed definition of a "Black Start Service Provider". We believe that the introduction of the term "Black Start Service Provider" is a positive change from a future proofing perspective, and in that respect, we consider the original proposal for GC0125 is better than WAGCM1.

Therefore, we believe that the original proposal better facilitates objective (iv) compared to the baseline.

GC0127 and GC0128

We believe that the original proposal better aligns the Grid Code with the NCER Regulation compared to WAGCM1, WAGCM3. We believe that only those parties that are directly referred to in Articles 15(3), 44, 45, 47 and 48(2) of the NCER Regulation are within the scope of their obligations. There is no obligation to extend the scope of application of those articles through modifications of the Grid Code.

We also consider that WAGCM2 has a slightly negative effect with respect to objective (iv). We note that it is not for the Grid Code but for the SDP to set the parameters required by Article 15(3)(a) of the NCER Regulation. We understand from the latest edition of the SDP that the ESO has determines that it is more efficient to ask energy storage units to automatically disconnect rather than switch from load to generation

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mode. The SDP therefore defines the period of time that an energy storage unit should automatically switch from load to generating mode to be set to a very low value (e.g. 1μs), making it the default for energy storage unit to automatically disconnect. By proposing a 20-second period, the WAGCM2 contradicts the provisions of the SDP. Therefore, WAGCM2 does not better facilitate objective (iv).

We therefore consider that the original proposal for GC0127 and GC0128 better aligns the Grid Code with the NCER Regulation and that both better facilitates objective (iv) compared to the baseline.

Decision notice

In accordance with Standard Condition C14 of the Transmission Licence, the Authority hereby directs that the following original Grid Code modification proposals be made:

- GC0125: "Grid Code GC0125: EU Code Emergency and Restoration: Black Start testing requirements for Interconnectors, HVDC System Owners and Owners of Transmission DC Converters"; and
- Grid Code GC0127 and GC0128: "EU Code Emergency and Restoration: Requirements resulting from System Defence and Restoration Plans".

Leonardo Costa
Senior Manager – SO/DSO
Signed on behalf of the Authority and authorised for that purpose

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