

ENERGINET

Energinet
Tonne Kjærsvej 65
DK-7000 Fredericia

+45 70 10 22 44
info@energinet.dk
CVR no. 28 98 06 71

Date:
17 December 2019

Author:
JJB/CHD/MRR/SGL

TEST PLAN UNDER NETWORK CODE ON ELECTRICITY EMERGENCY AND RESTORATION (NC ER) ARTICLES 43-51

Please note: This translation of the original Danish text is for informational purposes only and is not a substitute for the official Danish text. The English text is not legally binding and offers no interpretation on the Danish text. In case of inconsistency, the Danish version applies.

TEST PLAN

OVERVIEW/CONTENTS

Part 1 Scope and definitions.....	3
Part 2 Compliance testing of capacity for power-generating facility capabilities.....	3
Part 3 Compliance testing of demand facilities providing demand side response	3
Part 4 Compliance testing of HVDC capabilities.....	4
Part 5 Compliance testing of low frequency demand disconnection relays	4
Part 6 Testing of communication systems	4
Part 7 Testing of tools and facilities	5
Part 8 Compliance testing and periodic review of the system defence plan	6
Part 9 Effective date	7
Appendix 1 Table for reporting load-shedding steps	8

TEST PLAN

Pursuant to Article 43(2) and Articles 44, 45, 46, 47, 48, 49, 50 and 51 of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and restoration (NC ER) and section 84(5) and (6) of Executive Order no. 840 of 15 August 2019 of the Danish Electricity Supply Act, the following is stipulated:

Part 1

Scope and definitions

1. (1) This test plan contains equipment and capability requirements relevant to the system defence plan and restoration plan.

(2) The test plan applies to all individuals designated to execute market functions pursuant to Article 2(1) of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and restoration.

Part 2

Compliance testing of capacity for power-generating facility capabilities

2. (1) Each restoration service provider which is a power-generating facility delivering a black start service must test the facility at least once a year and after the facility has undergone revisions or changes in accordance with Article 44(1) of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and restoration.

(2) The test must be performed according to the following principles:

1. Seven tests per calendar year consisting of: black start of auxiliary supply to the black start unit and operation for one hour. Two of the tests are ordered unannounced by Energinet Elsystemansvar A/S, and the remaining five are scheduled by the restoration service provider.
2. One test per calendar year consisting of: black start of the auxiliary supply of the black start unit followed by start-up of the black start unit itself. The test is carried out by de-energising the grid of the entire power plant/facility.

(3) Energinet Elsystemansvar A/S may order connection of a transmission line or black start of a large, isolated grid area, cf. point 2 in (2).

(4) The test, cf. point 2 in (2), must be performed in accordance with the test proposal approved by Energinet Elsystemansvar A/S.

(5) Each restoration service provider which is a power-generating facility delivering a black start service must submit documentation to Energinet Elsystemansvar A/S on the tests performed, cf. (1), in accordance with the agreement between the restoration service supplier and Energinet Elsystemansvar A/S.

Part 3

Compliance testing of demand facilities providing demand side response

It has not been possible to formulate a test plan for Article 45(1) and (2) as there are currently no market participants providing these services. If this changes at a later time, the test plan will be corrected to also describe tests for this article.

Part 4

Compliance testing of HVDC capabilities

3. (1) Each restoration service provider which is an HVDC system delivering a black start service must perform a black start capability test at least once a year and after the facility has undergone revisions or changes in accordance with Article 46 of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and restoration.

(2) The test must be performed according to the following principles:

1. Seven tests per calendar year consisting of: black start of auxiliary supply to the black start unit and operation for one hour. Two of the tests are ordered unannounced by Energinet Elsystemansvar A/S, and the remaining five are scheduled by the restoration service provider.
2. One test per calendar year consisting of: black start of the auxiliary supply of the black start unit followed by start-up of the black start unit itself. The test is carried out by de-energising the grid of the entire power plant/facility.

(3) Energinet Elsystemansvar A/S may order connection of a transmission line or black start of a large, isolated grid area, cf. point 2 in (2).

(4) The test, cf. point 2 in (2), must be performed in accordance with the test proposal approved by Energinet Elsystemansvar A/S.

(5) Each restoration service provider which is an HVDC system delivering a black start service must submit documentation to Energinet Elsystemansvar A/S on the tests performed, cf. (1), by the end of February.

Part 5

Compliance testing of low frequency demand disconnection relays

4. (1) Each distribution system operator (DSO) must test low frequency load-shedding relays in its installations within a period defined on the basis of their respective asset management systems, and at least every eight years, in accordance with Article 47 of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and restoration.

(2) The test must be performed according to the following principles:

1. Nominal voltage 0.15 Hz above set load-shedding value: no trip (tripping of load-shedding relay)
2. Nominal voltage 55 Hz: no trip
3. Nominal voltage 48 Hz with blocking function on: trip
4. Low voltage, corresponding to set value for voltage blocking, 48 Hz: no trip
5. Nominal voltage, set load-shedding value: trip, note relay time.

(3) Each DSO must submit documentation to Energinet Elsystemansvar A/S on the tests performed, cf. (1), by the end of February.

Part 6

Testing of communication systems

5. (1) Each DSO, significant grid user (SGU), TSO, and restoration service provider must test communication systems on an annual basis in accordance with Article 48(1) of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and restoration.

(2) Testing of communication systems includes IT systems and voice communication.

(3) The test is successful when contact is established with voice communication between Energinet Elsystemansvar A/S' Control Centre Electricity, and the relevant DSO or SGU. This

contact must also include confirmation that communication over IT systems was received and understood.

(4) Each DSO, SGU, TSO, and restoration service provider must submit documentation to Energinet Elsystemansvar A/S on the tests performed, cf. (1), by the end of February.

6. (1) Each DSO, SGU, TSO and restoration service provider must test the backup power supply of their communication systems every five years in accordance with Article 48(2) of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and restoration.

(2) The test is approved when the backup power supply supplies the communication systems.

(3) Each DSO, SGU, TSO, and restoration service provider must submit documentation to Energinet Elsystemansvar A/S on the tests performed, cf. (1), by the end of February.

Part 7

Testing of tools and facilities

7. (1) Energinet Elsystemansvar A/S must test the start-up function and delivery of emergency supply to Energinet Elsystemansvar A/S' primary control centre and the emergency control centre at least once a month. Energinet Elsystemansvar A/S must carry out inspections of the emergency supply to the primary control centre as well as to the emergency control centre at least once a year in accordance with Article 49(1) of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and system restoration.

(2) The test must cover all elements of the structure of the emergency supply system according to the following principles:

1. Installed equipment providing the supply must be demonstrably able to supply the system for the entire period of time specified in the equipment specifications.
2. Battery testing can be carried out in accordance with DEFU KR107 or similar standard. For generators, fuel cells, etc., start-up, operation, and capability to supply the necessary power must be demonstrated.

8. (1) Energinet Elsystemansvar A/S must test the functionality of critical tools and facilities, including testing of communication between Energinet Elsystemansvar A/S and the SCADA systems of the DSOs at least every three years pursuant to Article 49(2) of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and restoration. The test must cover both main and backup tools and facilities.

(2) Critical tools and facilities are those referred to in Article 24 of Commission Regulation (EU) 2017/1485 establishing a guideline on electricity transmission system operation

(3) As part of testing, commands from Energinet Elsystemansvar A/S's *Technical regulation 5.3.4.1 on the grid telegraph System (Nettelegrafen)* and *Technical regulation TR 5.3.4.2 on the generation telegraph system (Produktionstelegrafen)* are sent to the control rooms of the DSOs and SGUs.

(4) The test is successful when all commands have been exchanged, and confirmation of the commands received has been received in Control Centre Electricity of Energinet Elsystemansvar A/S.

(5) Where tools and facilities, cf. (1), involve DSOs or SGUs, these parties must participate in this test.

9. (1) Energinet Elsystemansvar A/S must test the capability of backup power sources to supply essential services of the substations at least every five years in accordance with Article 49(3) of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and restoration.

(2) The test must demonstrate the ability to supply the substations identified on the list of critical substations for 24 hours.

(3) The test must be performed according to the following principles:

1. Installed equipment providing the supply must be demonstrably able to supply the system for the entire period of time specified in the equipment specifications. Battery testing can be carried out in accordance with DEFU KR107 or similar standard. For generators, fuel cells, etc., start-up, operation, and capability to supply the necessary power must be demonstrated.
2. Alternative measures, such as emergency preparedness plans and mobile generators, are credibly shown to be able to cover demand not met by installed equipment.

(4) Tests of generators, fuel cells, etc. are considered successful when start-up, operation, and the capability to supply the necessary power have been demonstrated.

(5) For substations, cf. (1), in distribution systems, testing must be performed by the relevant DSO.

(6) Each DSO must submit documentation to Energinet Elsystemansvar A/S on the tests performed, cf. (1), by the end of February.

10. (1) Energinet Elsystemansvar A/S must test the transfer procedure to the emergency control centre at least once a year in accordance with Article 49(4) of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and system restoration.

(2) The test is considered to have been performed with the following:

1. Procedure test
2. Function test in emergency control centre
3. Operation from emergency control centre
4. Drills
5. Incidents.

Part 8

Compliance testing and periodic review of the system defence plan

11. (1) Each load-shedding region must submit annually, by the end of February at the latest, a confirmation of the location of the frequency relays, their settings, and a general overview of the size of the load-shedding steps in the previous year in accordance with Article 50 of Commission Regulation (EU) 2017/2196 establishing a network code on electricity emergency and system restoration.

(2) Confirmation, cf. (1), must be sent to the emergency preparedness coordinator of Energinet Elsystemansvar A/S: BeredskabsKoordinator@energinet.dk.

(3) The size of the load-shedding steps must generally be reported per load-shedding region. However, it is possible to submit a joint report from several load-shedding regions if a DSO is part of several load-shedding regions and the area demand (consumption) cannot therefore be retrieved directly from DataHub.

(4) The quality of the information must at least meet the following standards:

1. Hourly values: average values on an hourly basis over a whole year.
2. Area demand: total pure demand according to the ENTSO-E approved formula:

$$\text{Area demand} = \text{Generation}_{Net} + \text{Transit} - \text{Energy storage}$$

The demand stated as area demand in DataHub can be used.

3. Demand after load-shedding, for each step in MW. The demand must be the actual amount of power disconnected at the point of disconnection. Conversion of ampere measurements to MW may be used.
4. At least 95% of the data must be valid.
5. The file format can be either CSV or another type of spreadsheet. The layout must be as shown in *Appendix 1 – Table for reporting load-shedding steps*.

Part 9

Effective date

12. (1) The test plan enters into force from the date on which the Danish Utility Regulator approves the test plan.

Appendix 1 Table for reporting load-shedding steps

Hours	Area demand [MW]	Step 1		Step 2		Step 3		Step 4		Step 5		Step 6	
		[MW]	[%]	[MW]	[%]	[MW]	[%]	[MW]	[%]	[MW]	[%]	[MW]	[%]
1													
2													
3													
4													
...													
8760													