

# **General Guidance on Compliance Verification – Compliance Monitoring after operational notification**

## **ENTSO-E GUIDANCE DOCUMENT FOR NATIONAL IMPLEMENTATION FOR NETWORK CODES ON GRID CONNECTION**

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# 1 DESCRIPTION

## 1.1 Code(s) & Article(s)

The following articles in the three connection codes specify requirements and responsibilities concerning how to secure the compliance of facilities connected to the grid system during all time after an operational notification. When implementing the compliance monitoring tasks it must be distinguished between responsibilities of the power-generating facility owner and responsibilities of the Relevant System Operator in coordination with the Relevant TSO. For the three network codes the following text extract from the codes is addressing the responsibilities of parties involved in the various compliance monitoring tasks.

COMMISSION REGULATION (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators – NC RfG

The NC RfG Title IV, Chapter 1 is specifying the duties the power-generating facility owner and responsibilities of the Relevant System Operator.

Title IV Compliance: Chapter 1 – Compliance monitoring

Article 40 – Responsibility of the power-generating facility owner

- Article 40(1) The power-generating facility owner shall ensure that each power-generating module complies with the requirements applicable under this Regulation **throughout the lifetime** of the facility. For type A power-generating modules, the power-generating facility owner may rely upon equipment certificates, issued as per Regulation (EC) No 765/2008.
- Article 40(2) The power-generating facility owner shall notify to the relevant system operator any planned modification of the technical capabilities of a power-generating module which may affect its compliance with the requirements applicable under this Regulation, **before initiating that modification**.
- Article 40(3) The power-generating facility owner **shall notify the relevant system operator** of any operational incidents or failures of a power-generating module that affect its compliance with the requirements of this Regulation, **without undue delay, after the occurrence of those incidents**.
- Article 40(4) The power-generating facility owner shall notify the relevant system operator of the **planned test schedules** and procedures to be followed for verifying the compliance of a power-generating module with the requirements of this Regulation, **in due time and prior to their launch**. The **relevant system operator shall approve in advance** the planned

test schedules and procedures. Such approval by the relevant system operator shall be provided in a timely manner and shall not be unreasonably withheld.

- Article 40(5) The relevant system operator may participate in such tests and record the performance of the power-generating modules.

#### Article 41 – Tasks of the relevant system operator

- Article 41(1) The relevant system operator shall assess the compliance of a power-generating module with the requirements applicable under this Regulation, **throughout the lifetime** of the power-generating facility. The power-generating facility owner shall be informed of the outcome of this assessment.
- Article 41(2) The relevant system operator shall have the right to request that the power-generating facility owner carry out compliance tests and simulations according to a repeat plan or general scheme or after any failure, modification or replacement of any equipment that may have an impact on the power-generating module's compliance with the requirements of this Regulation. The power-generating facility owner shall be informed of the outcome of those compliance tests and simulations.
- Article 41(3) The relevant system operator shall make publicly available a list of information and documents to be provided as well as the requirements to be fulfilled by the power-

generating facility owner within the framework of the compliance process. The list shall cover at least the following information, documents and requirements:

- all the documentation and certificates to be provided by the power-generating facility owner;
- details of the technical data on the power-generating module of relevance to the grid connection;
- requirements for models for steady-state and dynamic system studies;
- timeline for the provision of system data required to perform the studies;
- studies by the power-generating facility owner to demonstrate the expected steady-state and dynamic performance in accordance with the requirements set out in Chapters 5 and 6 of Title IV;
- conditions and procedures, including the scope, for registering equipment certificates; and
- conditions and procedures for the use of relevant equipment certificates issued by an authorised certifier by the power-generating facility owner.
- Article 41(4) The relevant system operator shall make public the allocation of responsibilities between the power-generating facility owner and the system operator for compliance testing, simulation, and monitoring.
- Article 41(5) The relevant system operator may totally or partially delegate the performance of its compliance monitoring to third parties. In such cases, the relevant system operator shall continue ensuring compliance with Article 12 (confidentiality), including entering into confidentiality commitments with the assignee.

COMMISSION REGULATION (EU) 2016/1388 of 17 August 2016 establishing a Network Code on Demand Connection – NC DC.

The NC DC Title IV, Chapter 1 and Chapter 4 is specifying the duties the demand facility owner and responsibilities of the Relevant System Operator.

Title IV Compliance:

- Chapter 1 – General provisions
  - Article 35 – Tasks of the relevant system operator
    - Article 35 (4) The relevant system operator shall make public the allocation of responsibilities to the demand facility owner, the DSO or the CDSO and to the system operator for **compliance** testing, simulation, and **monitoring**.
    - Article 35 (5) The relevant system operator may totally or partially delegate the performance of its **compliance monitoring to third parties**. In such cases, the relevant system operator shall continue ensuring compliance with Article 11 (confidentiality), including entering into confidentiality commitments with the assignee.
- Chapter 4 – Compliance monitoring
  - Article 46 Compliance monitoring for transmission-connected distribution facilities
  - Regarding compliance monitoring of the reactive power requirements applicable to transmission-connected distribution facilities:
    - Article 46 (a) the transmission-connected distribution facility shall be equipped with necessary equipment to measure the active and reactive power, in accordance with Article 15 (Reactive power requirements); and
    - Article 46 (b) the relevant system operator shall specify the time frame for **compliance monitoring**.
  - Article 47 Compliance monitoring for transmission-connected demand facilities regarding **compliance monitoring** of the reactive power requirements applicable to transmission-connected demand facilities:
    - Article 47 (a) the transmission-connected demand facility shall be equipped with necessary equipment to measure the active and reactive power, in accordance with Article 15; and

- Article 47 (b) the relevant system operator shall specify the time frame for compliance monitoring.

COMMISSION REGULATION (EU) 2016/1447 of 26 August 2016 establishing a network code on requirements for grid connection of high voltage direct current systems and direct current-connected power park modules – NC HVDC.

The NC HVDC Title IV, Chapter 1 is specifying the duties and responsibilities of the Relevant System Operator.

Title VI Compliance:

- Chapter 1 – Compliance monitoring
  - Article 70 – Tasks of the relevant system operator
    - Article 70 (5) The relevant system operator may partially or totally assign the performance of its **compliance monitoring to third parties**. In this case, the relevant system operator shall ensure compliance with Article 10 (confidentiality) by appropriate confidentiality commitments with the assignee.

## 1.2 Introduction

The overall purpose of this Implementation Guidance Document (IGD) is to guide the Relevant System Operator (RSO) (DSO, TSO, CDSO) and the Relevant TSO on securing the compliance regarding the CNC requirements at the facility Connection Point (CP) at any time after an operational notification, which is required according to the CNCs.

The power-generating facility owner shall ensure that each power-generating module complies with the requirements applicable under this Regulation throughout the lifetime of the facility. To make sure that the connected facilities remain compliant with CNC requirements during its life cycle when grid connected, the relevant system operator and where applicable the relevant TSO has the right to request the owner of power-generating facilities, demand facilities and HVDC facilities to carry out and to perform compliance verification including declaration on the validity of applied EqCs and applied simulation models according to a compliance verification procedure specified by the RSO in coordination with the Relevant TSO.

Depending on the system needs and observed facility impact on grid stability and technical quality of provided services a large variety in monitoring procedures could be specified. The following are

examples of the procedure for complying with the CNC monitoring obligations of the parties involved.

- A self-assessment document format and expected content issued by the RSO to be fulfilled by the facility owner.
- Assessment of responses and autonomous actions of the grid connected facilities in case of incidences and/or failures occurs. Such assessments must be fulfilled by the RSO / TSO based on measured data and informed to the facility owner. Further actions to be completed by the facility owner.
- The RSO / TSO to request demonstration of compliance via selected onsite testing for the facility after an operational notification if any deviation from the grid connection requirements is observed.
- The RSO / TSO to request the facility owner to carry out compliance tests and relevant simulation studies in accordance with a compliance monitoring programme, after any failure, modification or replacement of any equipment or component that may have an impact on compliance with applicable requirements as described by RSOs and in line with CNCs, throughout the life cycle of the facility.

As per the EU Connection Network Codes (CNCs), new or significantly modernised facilities must be compliant with the relevant CNC technical requirements, and compliance must be verified at the time of the request for an operational notification and monitored throughout the life cycle.

For any new or significantly modernised equipment, initial compliance verification must be obtained using onsite tests and simulations during the operational notification process. The compliance monitoring must take place after the final operational notification as specified by the RSO in coordination with the Relevant TSO.

These stated requirements are in line with the ACER Framework Guidelines on Connection Codes, Article 2.4 “the basis of the Compliance testing, compliance monitoring and enforcement” and correspond to national processes through which RSOs seek assurance that all equipment connected to their grid systems complies with the generally acknowledged rules of technology and meets EU and national requirements and company standards in terms of technical capability, behaviour, and/or provision of services.

### 1.3 Scope of document

The scope of the present document is to guide the RSOs and if applicable the relevant TSO on the application of compliance monitoring in the process of securing compliance of the grid connection requirements for carrying the operational notification according to the signed connection agreement. It also emphasizes the strong obligation of the power-generating facility owner to support the RSO unsolicited throughout the compliance monitoring procedure by provision of all necessary information about the relevant facility and any changes of capabilities by modifications throughout the lifetime of the facility.

This guidance document is addressing the phase after a facility have been accepted for operation.

## 1.4 Acronym applied

In table below is listed the acronyms applied in this document.

<b>CDSO:</b> Closed Distribution System Operator
<b>CP:</b> Connection Point
<b>CVT:</b> Compliance Verification Test (onsite test)
<b>CVS:</b> Compliance Verification Simulation (electrical simulation model)
<b>DF:</b> Demand Facility
<b>DRUD:</b> Demand Response Unit Document
<b>DU:</b> Demand Unit
<b>EqC:</b> Equipment Certificate
<b>HVDC:</b> High Voltage Direct Current
<b>IGD:</b> Implementation Guidance Document
<b>NC RfG:</b> Network Code for all Generators
<b>NC DCC:</b> Network Code for Demand Connection
<b>NC HVDC:</b> Network Code for HVDC systems
<b>NRA:</b> National Regulator Authority
<b>PGF:</b> Power Generating Facility
<b>PGFO:</b> Power Generating Facility Owner
<b>PGM:</b> Power Generating Module
<b>PGMD:</b> Power Generating Module Document
<b>PGU:</b> Power Generating Unit
<b>PPM:</b> Power Park Module (unit or an ensemble of units which can be understood as an aggregation of one or more PPGUs)
<b>RSO:</b> Relevant System Operator (TSO, DSO or CDSO)
<b>SPGM:</b> Synchronous Power Generating Module (an indivisible set of installations which can be understood as aggregation of one or more SPGUs)
<b>SPGU:</b> Synchronous Power Generating Unit
<b>SPPGU:</b> Synchronous Power Park Generating Unit (e.g., Permanent Magnet Synchronous Generator – a commercially available wind turbine generator system)

## 1.5 Definitions

No further definitions are needed.

## 1.6 NC frame

With the purpose of monitoring compliance with the required functionalities and capabilities according to the relevant CNC requirements are specified in the following network codes and articles:

- NC RfG Article 40 and 41
- NC DCC Article 35, 46 and 47
- NC HVDC Article 70

## 1.7 Role and responsibility of parties involved

The role and responsibility of the parties involved in compliance monitoring of grid connected facilities are the following.

The RSO in cooperation with the relevant TSO is responsible for specifying the compliance monitoring procedure(s). The power-generating facility owner is obliged to support the compliance monitoring procedure(s) and shall ensure that each PGM complies with the requirements applicable throughout the lifetime. To accomplish the specified compliance monitoring tasks, the RSO and relevant TSO may involve third parties partly or fully as discussed in the section “Involvement of Third Parties in compliance monitoring”.

One very essential role for the RSO in compliance monitoring is to keep track of the validity of the EqCs applied in the compliance verification process.

The Facility owner is responsible for following the compliance monitoring procedure and providing the results from required compliance verification test and simulation model executions.

If third parties are involved in accomplishing the compliance monitoring procedure(s) their role and responsibility might differ depending on the degree of involvement, but the role and responsibility of the third party(s) involved must be clearly specified in the agreement between the facilities owner and the RSO or the relevant TSO. Typically accredited certified company or laboratories could be involved as an independent party taking care of executing, reviewing, and reporting of results from the compliance monitoring procedure of facilities and related documentation.

Other third parties could be involved like manufactures, project developers, educational institutes and research teams that might derive learnings or product improvement points from the results obtained from the compliance monitoring procedure(s). But in general, their role must be clearly specified related to the compliance monitoring and confidentiality aspects must be ensured.

## 1.8 Compliance Monitoring procedure guidance

The compliance monitoring procedure is recommended to include at least, but are not limited to, the following main headlines for the three different areas covered by the connection network codes.

The procedure could also be split into several procedures if more convenient and efficient, e.g., a split into three procedures one procedure per connection code could be more efficient in practice as the key readers of the documents are different.

The following guidance could be given on compliance monitoring according to the NC RfG.

1. Compliance monitoring of generation facilities could include but are not limited to the following headlines.
  - Facility owner reports on observed deviations, retrofit actions, major software changes, change of protection relay settings etc.
  - Incidence reports and learning from incidences addressing specific generation facilities or group of facilities.
  - For type A and B one of the most essential actions for the RSO is continuously to keep track of the validity of the EqCs applied in the compliance verification process.
2. Exclusively test for specific types of SGUs might be relevant e.g., for type C and D in case of incidences or repeated incorrect response e.g., in the following cases:
  - significant changes in active power control system, repeated incorrect response active power control system
  - significant changes in reactive power control system, repeated incorrect response reactive power control system
  - modernization or replacement of essential equipment which effect the technical capabilities of facility, specified in CNCs.

The scope of the specific tests could be limited to specific SGU types and/or service providers depending on needs for actions based on system instability observations, near system split situations, large angle deviations inside a synchronous area (PMUs), low frequent active power oscillations etc.

In general, a monitoring procedure could include specific post operational analysis of performance or quality parameters – like correlation of frequency quality and the frequency related functions and the implemented parameter ranges.

The following guidance could be given on compliance monitoring according to the NC DCC.

The following guidance could be given on compliance monitoring according to the NC DCC.

3. Compliance monitoring of demand facilities could include but are not limited to the following headlines.

- Facility owner reports on observed deviations, failure statistics, retrofit actions, major software changes, change of protection relay settings etc.
- Incidence reports and learning from incidences addressing specific demand facilities or group of facilities.
- Tripping statistics and analysis of demand response services provided

As for PGM facilities compliance monitoring procedure for demand facilities could include specific post operational analysis of performance quality – like correlation of voltage stability voltage related functions and provision of the reactive capability as well as implemented parameter ranges.

The following guidance could be given on compliance monitoring according to the NC HVDC.

4. Compliance monitoring of HVDC facilities could include, but are not limited to, the following headlines.

- Facility owner reports on observed deviations, failure statistics, retrofit actions, major software changes, change of protection relay settings etc.
- Incidence reports and learning from incidences addressing specific HVDC facilities or group of facilities.
- Reports on operational performance and provision of ramping restrictions
- Tripping statistics and redundant system activation

As for PGM and demand facilities compliance monitoring procedure for HVDC facilities could include specific post operational analysis of performance quality – like correlation of frequency quality and the frequency related functions and parameter ranges.

## 1.9 Involvement of Third Parties in compliance monitoring

As also described in the IGD “GENERAL GUIDANCE ON COMPLIANCE verification – Compliance testing and use of Equipment Certificates”, as well the IGD “GENERAL GUIDANCE ON COMPLIANCE

verification – using simulation models” Third parties like authorized certifiers and/or authorized laboratories could be included by the RSO as well as the owner of a facility to perform the compliance monitoring procedure(s). The degree of involvement could vary from member state to member state and even between RSO to RSO.

The degree on involvement must be specified / accepted by the RSO and relevant TSO and could be sorted into the following categories.

1. RSO in coordination with the relevant TSO and/or the facility owner are doing all actions in the specified compliance monitoring procedure(s).
2. RSO in coordination with the relevant TSO and/or the facility owner could involve Authorized Certifiers and/or authorized laboratories to cover some part of the compliance monitoring process.
3. RSO in coordination with the relevant TSO and/or the facility owner fully outsource the compliance monitoring procedure(s) tasks to Authorized Certifiers and/or Authorized Laboratories.

The role of Authorized Certifiers and Authorized Laboratories is to assure independency, harmonized methodology, criteria, and degree of evaluation of equipment or components as per the CNC requirements (mandatory and non-mandatory) as specified in EU regulations (CNCs) and national regulation and implementation specifications.

## 2 FURTHER INFORMATION

- General Guidance on Compliance Verification – Compliance Testing and use of Equipment Certificates, Published – Nov 2021
- General Guidance on Compliance Verification – using simulation models, to be published

## 3 INTERDEPENDENCIES

### 3.1 Between CNCs

This IGD includes guidance on implementing the compliance monitoring activities to secure that all facilities are compliant all throughout the lifetime of connected facilities.

The IGD for compliance monitoring relates to application of equipment certificates, compliance testing and application of simulation models in the compliance verification process as required in the three Connection Network Codes (CNC) –EU 2016/631 NC RfG; EU 2016/1388 NC DCC; EU 2016/1447 NC HVDC.

### 3.2 To other NCs

System Operation Guideline (SO GL) / Network Code on Emergency and Restoration (NC ER)

- Black Start services and monitoring under the scope of NC ER and SO GL.
- Coordinated synchronisation

### 3.3 System characteristics

Not applicable.

## 4 COORDINATION

### 4.1 TSO-MS-NRA

If compliance is not established, the right to connect to the system or to import/export power through the connection point can be withheld or removed from the facility owner by the RSO; alternatively, a derogation could be requested from the NRA.

### 4.2 RSO – Grid User

Compliance Monitoring is joint task for the TSO/RSO and the facility owner and is required as part of the connection procedure and must be maintained during the life cycle of the facility.

## 5 REFERENCES

- [1] General Guidance on Compliance Verification – Compliance Testing and use of Equipment Certificates, Published – Nov 2021  
  
[https://www.entsoe.eu/Documents/Network%20codes%20documents/NC%20RfG/210730\\_IGD\\_Guidance\\_on\\_Compliance\\_Verification.pdf](https://www.entsoe.eu/Documents/Network%20codes%20documents/NC%20RfG/210730_IGD_Guidance_on_Compliance_Verification.pdf)
- [2] General Guidance on Compliance Verification – Compliance Testing using simulation models, to be published