

# MONITORING REPORT ON CONNECTION NETWORK CODES IMPLEMENTATION

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From: Steering Group Connection Network Codes – Implementation  
Monitoring Team

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## 1 Objective and Scope

### 1.1 Background of the Monitoring Report derived from the legal Framework

Since the previous Regulation (EU) No 714/2009 has been replaced by Regulation (EU) No 943/2019 the legal obligation by Article 8(8) of Regulation No 714/2009 for monitoring of the three Connection Network Codes (**CNC**) which are

- Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (**NC RfG**),
- Commission Regulation (EU) 2016/1388 of 17 August 2016 establishing a network code on demand connection (**NC DC**),
- 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**)

has been ceased.

By taking into consideration the withdrawal of the legal framework for monitoring obligations the European Network of Transmission System Operators for Electricity (**ENTSO-E**) decided to continue with the annual CNC monitoring on a voluntary basis.

The present monitoring report 2021 addresses the identification of any divergences in the implementation of the European Connection Network Codes at national level by each member state.

The 2021 monitoring process deals with the Operational Notification Procedure (**ONP**) as implemented by the member states for each Connection Network Code.

Country-wise divergences between the national implementation of Network Codes regarding the ONP and the Connection Network Codes themselves are identified and presented in the following chapters of this Implementation Monitoring Report (**IMR**).

## 2 Input Data for the Report

### 2.1 Approach of the 2021 Implementation Monitoring Report

Information about the ONP established in each Member State were gathered by an online survey to the relevant Transmission System Operators (**TSOs**). The monitoring survey comprised questions with respect to the relevant articles of each CNC introducing operational notification stipulations.

In case of closed questions, a simple “Yes / No” response was required although any additional explanations were highly appreciated.

In case of open questions, the expected response was more comprehensive and comprised any available level of detail.

### 2.2 Data basis for NC RfG relevant monitoring questions

For NC RfG the IMR focuses on Articles 29 to 37 of the Operational Notification Procedure for Connection, as detailed in chapter 3 (**NC RfG Implementation**).

According to NC RfG, Article 29(1) *“The power-generating facility owner shall demonstrate to the relevant system operator that it has complied with the requirements set out in Title II of this Regulation by completing successfully the operational notification procedure for connection of each power-generating module described in Articles 30 to 37”*.

Article 29(2) of NC RfG states *“The relevant system operator shall clarify and make publicly available the details of the operational notification procedure”*.

The survey was limited to TSO-connected PGMs. This covers typically type D generators, but depending on the voltage levels a TSO is in charge of, type B and C PGMs may be relevant as well (NC RfG Article 32, questions 6.1 – 6.14).

### 2.3 Data basis for NC DC relevant monitoring questions

For NC DC the IMR focuses on Articles 22 to 26 and Articles 31 to 33 of the Operational Notification Procedure, as detailed in chapter 4 (**NC DC Implementation**). Under the NC DC the Operational Notification Procedure is split into two parts. Article 22 of NC DC details the requirements for Transmission Connected Demand Facility Owners and Transmission Connected Distribution System Operators whereas Article 31 relates to the Operational Notification Procedure for Demand Units, Demand Facilities or Closed Distribution Systems which optionally provide demand response to System Operators.

According to NC DC, Article 22(2) *“Each transmission-connected demand facility owner or transmission-connected distribution system operator to which one or more of the requirements in Title II apply shall demonstrate to the relevant TSO that it has complied with the requirements set out in Title II of this Regulation by completing successfully the operational notification procedure for connection of each transmission-connected demand facility, each transmission-connected distribution facility and each transmission-connected distribution system described in Articles 23 to 26”*.

Article 22(3) of NC DC states *“The relevant TSO shall specify and make publicly available further details concerning the operational notification procedure.”*

In addition, Article 31(2) of NC DC states *“Each demand facility owner or CDSO, providing demand response to a relevant system operator or a relevant TSO, shall confirm to the relevant system operator, or relevant TSO, directly or indirectly through a third party, its ability to satisfy the technical design and operational requirements as referred to in Chapter 1 of Title III of this Regulation”.*

Article 31(3) of NC DC states *“The demand facility owner or the CDSO shall notify, directly or indirectly, through a third party, the relevant system operator or relevant TSO, in advance of any decision to cease offering demand response services and/or about the permanent removal of the demand unit with demand response. This information may be aggregated as specified by the relevant system operator or relevant TSO”*; and Article 31(4) of NC DC states *“The relevant system operator shall specify and make publicly available further details concerning the operational notification procedure”.*

## 2.4 Data basis for NC HVDC relevant monitoring questions

Under NC HVDC, as detailed in chapter 5 (**NC HVDC Implementation**) the Operational Notification Procedure is split into two parts. Article 55(1), Chapter 1 Title V details the Operational Notification Process for HVDC Systems and Article 60(2) Chapter 2 Title V details the Operational Notification Process for DC Connected Power Park Modules.

According to NC HVDC Article 55(1) states *“the HVDC system owner shall demonstrate to the relevant system operator that it has complied with the requirements set out in Title II to Title IV at the respective connection point by successfully completing the operational notification procedure for connection of the HVDC system as described in articles 56 to 59”.*

Article 55(2) of NC HVDC states that *“The relevant system operator shall specify any detailed provisions of the operational notification procedure and make the details publicly available”.*

With regard to DC Connected Power Park Modules, Article 60(2) of NC HVDC states *“The DC-connected power park module owner shall demonstrate to the relevant system operator its compliance with the requirements referred to in Title III at the respective connection points by successfully completing the operational notification procedure for connection of the DC-connected power park module in accordance with Articles 61 through to 66”.*

Article 60(3) of NC HVDC states that *“The relevant system operator shall specify further details of the operational notification and make those details publicly available”.*

## 2.5 Purpose of the IMR and introduction of the structure

The purpose of this IMR is to provide an overview of the national implementation as a matter of fact. The IMR refrains from any assessment, evaluation or comparison of the national implementations against each other.

The IMR chapters are clustered according to the three CNCs.

Each CNC chapter is structured by main sections which represent relevant CNC articles of the Operational Notification Procedures.

The requested data is represented in tabular forms which contain four columns with the following information:

- Country: Name of the Member State which participated in the survey.
- TSO: Name of the Transmission System Operator of the relevant Member State.
- Approval for publication in the IMR: Each TSO has been requested whether the provided information can be publicly shared by ENTSO-E in this IMR. In case of a “Yes” the following column “Answer” contains the requested and provided information. A “No” results in a simple dash in column “Answer” without any additional explanations.
- Answer: The provided information in dependence of the choice in column “Approval for publication in the IMR”.

At the end of each main section there is a pie chart. The pie chart delivers a statistical overview of the participating TSOs regarding public availability of the requested information in accordance with NC RfG Article 29(2), respectively in accordance with NC DC Article 22(3), respectively in accordance with NC HVDC Article 55(2). The following possibilities have been assessed:

- The requested information (related to the main section) is publicly available (“Yes”, green marked pie chart piece).
- The requested information (related to the main section) is not publicly available (“No”, red marked pie chart piece).
- The requested information (related to the main section) is not released yet for publication by the Member State (grey marked pie chart piece).



## 2.6 General information from some Member States

The following Member State TSOs gave additional explanation why certain data for ONP could not be provided.

- Austria: NC HVDC has not yet been nationally implemented in Austria. Currently there are no mid- or long-terming projects. Any details of ONP will be drafted in case there will be specific projects foreseeable.
- Czech Republic: The ONP for NC HVDC has not been specified at the national level so far. All requested information for ONP are individually specified during the connection procedure. So far there are no HVDC projects that should be connected to the transmission system.
- Portugal: Regarding NC DC and NC HVDC no data could be provided since the national implementation proposals are not yet published.
- Slovak Republic: Since there are no current HVDC projects or planned for future in Slovak Republic, no information could be provided for NC HVDC.

### 3 NC RfG Implementation

#### 3.1 Survey on general provisions pursuant to NC RfG art. 29

##### 3.1.1 Please provide the link to the details where the operational notification procedure is further specified acc. to art. 29(2)!

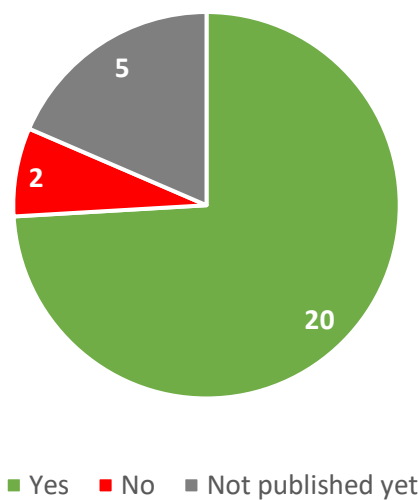
Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	<p>The main principles are described in the national grid code (TOR Erzeuger Typ A-D), which is publicly available here:  <a href="https://www.e-control.at/recht/marktregeln/tor">https://www.e-control.at/recht/marktregeln/tor</a></p> <p>These main principles applied by all RSOs in Austria.</p> <p>Details for Type D can be also found on APGs homepage:  <a href="https://www.apg.at/de/markt/strommarkt/rechtliches">https://www.apg.at/de/markt/strommarkt/rechtliches</a>  <a href="https://www.apg.at/markt/-/media/AE217A57A381421B88A3F786D9A32744.ashx">https://www.apg.at/markt/-/media/AE217A57A381421B88A3F786D9A32744.ashx</a></p>
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	No	–
Croatia	HOPS	Yes	<p>Operational notification procedure is defined in:  a) Transmission System Grid Code (from 2017) and Amendments to the Transmission System Grid Code (from 2020):  <a href="https://narodne-novine.nn.hr/clanci/sluzbeni/2017_07_67_15_85.html">https://narodne-novine.nn.hr/clanci/sluzbeni/2017_07_67_15_85.html</a>  <a href="https://narodne-novine.nn.hr/clanci/sluzbeni/2020_11_128_2_453.html">https://narodne-novine.nn.hr/clanci/sluzbeni/2020_11_128_2_453.html</a>  b) Regulation on issuing energy consent and establishing the conditions and terms of connection to the electricity network:  <a href="https://narodne-novine.nn.hr/clanci/sluzbeni/2020_11_128_2_453.html">https://narodne-novine.nn.hr/clanci/sluzbeni/2020_11_128_2_453.html</a></p>

Country	TSO	Approval for publication in the IMR	Answer
			<a href="http://novine.nn.hr/clanci/sluzbeni/2018_01_7_180.html">novine.nn.hr/clanci/sluzbeni/2018_01_7_180.html</a> c) Croatian TSO web page: <a href="https://www.hops.hr/gantogram-izrade-eotrp-a-sklapanja-ugovora-o-prikljucenju-i-izdavanja-elektroenergetske-suglasnosti">https://www.hops.hr/gantogram-izrade-eotrp-a-sklapanja-ugovora-o-prikljucenju-i-izdavanja-elektroenergetske-suglasnosti</a> d) Rules on connection to the transmission network (type D of power generating modules): <a href="https://www.hops.hr/page-file/qP0Fv6cmca2kFggK0HAiR3/pravila-o-prikljucenju-na-prijenosnu-mrezu/Pravila_o_priklju%C4%8Denju_na_prijenosnu_mre%C5%BEu-26-04-2018-sa_potpisom.pdf">https://www.hops.hr/page-file/qP0Fv6cmca2kFggK0HAiR3/pravila-o-prikljucenju-na-prijenosnu-mrezu/Pravila_o_priklju%C4%8Denju_na_prijenosnu_mre%C5%BEu-26-04-2018-sa_potpisom.pdf</a>
Czech Republic	ČEPS, a.s.	Yes	<a href="https://www.ceps.cz/cs/kodex-ps">https://www.ceps.cz/cs/kodex-ps</a>
Estonia	Elering AS	Yes	<a href="https://elering.ee/en/connection-conditions">https://elering.ee/en/connection-conditions</a>
Finland	Fingrid	Yes	<a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a>
France	RTE	Yes	The processes of certification are described on « Article 8.3.3 - Trame de procédure de contrôle de conformité pour le raccordement d'une installation de production. The technical documentation of RTE can be found here: <a href="https://www.services-rte.com/fr/la-bibliotheque.html">https://www.services-rte.com/fr/la-bibliotheque.html</a>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	The details for the operational notification procedure are published in four technical requirements (extra high voltage, high voltage, medium voltage, low voltage). Here is the link to the "Technical requirements for the connection and operation of customer. Installations to the extra high voltage network (TCR extra high voltage)", published in German: <a href="https://www.vde.com/de/fnn/arbeitsgebiete/tar/tar-hoechstspannung-vde-ar-n-4130">https://www.vde.com/de/fnn/arbeitsgebiete/tar/tar-hoechstspannung-vde-ar-n-4130</a>

Country	TSO	Approval for publication in the IMR	Answer
			The links is public; a download of the technical requirements is possible if purchased.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032">https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032</a>
Ireland	EirGrid	Yes	<a href="https://www.eirgridgroup.com/site-files/library/EirGrid/GridCodeVersion9.pdf">https://www.eirgridgroup.com/site-files/library/EirGrid/GridCodeVersion9.pdf</a>
Lithuania	LITGRID AB	Yes	<a href="https://www.litgrid.eu/uploads/files/dir519/dir25/dir1/4_0.php">https://www.litgrid.eu/uploads/files/dir519/dir25/dir1/4_0.php</a>
Luxembourg	Creos Luxembourg S.A.	Yes	<a href="https://www.creos-net.lu/particuliers/electricite/raccordement.html">https://www.creos-net.lu/particuliers/electricite/raccordement.html</a>
Netherlands	TenneT TSO	Yes	Website: <a href="https://www.netbeheernederland.nl/dossiers/regulering-20/documenten">https://www.netbeheernederland.nl/dossiers/regulering-20/documenten</a> Document: <a href="https://www.netbeheernederland.nl/_upload/Files/Regulering_20_d988538209.pdf">https://www.netbeheernederland.nl/_upload/Files/Regulering_20_d988538209.pdf</a>
Poland	PSE S.A.	Yes	PSE notification procedure for type D is publicly available on PSE website: <a href="https://www.pse.pl/documents/20182/1012700e-fb55-4159-adb8-688208fae946?">https://www.pse.pl/documents/20182/1012700e-fb55-4159-adb8-688208fae946?</a> Notifications procedures for type A, B & C were not published on PSE site due to fact that none of these objects could be connected to PSE grid (due to type D voltage criteria $U \geq 110\text{kV}$ ) and PSE did not develop these procedures. Notification procedures for type A, B & C were developed by the main PL DSOs and should be published on their websites. Please note, that in PL there are 187 DSOs (they are listed on PL NRA site: <a href="https://rejestr.ure.gov.pl/">https://rejestr.ure.gov.pl/</a> ) and PSE cannot provide information about operational

Country	TSO	Approval for publication in the IMR	Answer
			notifications for PGMs type A,B & C on behalf of them.
Portugal	REN	Yes	The Operational Notification Procedure (ONP) will be further specified in the transmission and distribution grid code, which is currently under revision by the competent regulatory authority. The main steps of ONP are already in practice for connections to transmission grid. Available link: <a href="http://www.mercado.ren.pt/PT/Electr/ActServ/AcessoRedes/LigProd/Paginas/default.aspx">http://www.mercado.ren.pt/PT/Electr/ActServ/AcessoRedes/LigProd/Paginas/default.aspx</a>
Romania	Transelectrica - TEL	Yes	Operational Notification Procedure – approved by NRA Order no. 51/17.04.2019: <a href="https://www.transelectrica.ro/documents/10179/3992478/Order+no.+51+of+17.04.2019+Notificati+Procedure+for+connection/96a7d710-f3d1-4f48-8091-d9649826598f">https://www.transelectrica.ro/documents/10179/3992478/Order+no.+51+of+17.04.2019+Notificati+Procedure+for+connection/96a7d710-f3d1-4f48-8091-d9649826598f</a>
Slovak Republic	SEPS	Yes	<a href="https://www.sepsas.sk/media/4672/dokument-n-tp-ucinnost-jan-2021.pdf">https://www.sepsas.sk/media/4672/dokument-n-tp-ucinnost-jan-2021.pdf</a>
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	<a href="https://www.ree.es/sites/default/files/01_ACTIVIDADES/Documentos/AccesoRed/Guia_descriptiva_del_procedimiento_de_puesta_en_servicio_V9_ene21.docx">https://www.ree.es/sites/default/files/01_ACTIVIDADES/Documentos/AccesoRed/Guia_descriptiva_del_procedimiento_de_puesta_en_servicio_V9_ene21.docx</a>
Sweden	Svenska Kraftnät	Yes	<a href="https://www.svk.se/om-kraftsystemet/legalt-ramverk/eu-lagstiftning-/natanslutning-av-generatorer-rfg/">https://www.svk.se/om-kraftsystemet/legalt-ramverk/eu-lagstiftning-/natanslutning-av-generatorer-rfg/</a>

### 3.1.2 Is the provision of the link publicly available in accordance with NC RfG Article 29(2)?



## 3.2 Survey on the operational notification of type B, C and D power-generating modules pursuant to NC RfG art. 31

### 3.2.1 Is the notification procedure for each type B, C and D power generating module publicly available?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes.
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	The system operator shall connect type D generating modules to the electricity transmission grid and type C generating modules to medium voltage busbars, which shall be connected directly to the substations owned by it. The request for study of the conditions for connection of sites of electricity producers to the electricity transmission network is publicly available on the website of the system operator. Connection agreements with specific manufacturers are not publicly available.
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW /	Yes	The notification procedure is published in the technical requirements (see question 4.1), the download is possible if purchased.

Country	TSO	Approval for publication in the IMR	Answer
	50Hertz)		
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Compliance scheme and operational notification is still under consideration.
Hungary	MAVIR	Yes	The notification procedure publicly available. The Hungarian Grid Code scope (extended) valid for all types of PGMs, demand side, HVDC which are connected to 132 kV and higher voltage levels, independently from TSO or DSO operated grid (the 220 kV and 400 kV and 750 kV network operated by MAVIR, and the 132 kV and lower voltage level network operated by distribution system operators. Important, all DSO has common Distribution Grid code. The reason is the Hungarian 132 kV distribution grid is a meshed grid with transmission grid. B and C PGM belong to the Distribution Grid Code.
Ireland	EirGrid	Yes	Type B and C are DSO connected. For Type D, details published to GridCode CC.15.9 to CC.15.15.7.
Lithuania	LITGRID AB	Yes	Yes
Luxembourg	Creos Luxembourg S.A.	Yes	Yes, for Type A & B
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	PSE notification procedure for type D is publicly available on PSE website: <a href="https://www.pse.pl/documents/20182/1012700e-fb55-4159-adb8-688208fae946">https://www.pse.pl/documents/20182/1012700e-fb55-4159-adb8-688208fae946</a> Notifications procedures for type B & C were not published on PSE site due to fact that none of these objects could be connected to PSE grid (due to type D voltage criteria $U \geq 110\text{kV}$ ) and PSE did not develop these procedures. Notification procedures for type B & C were



Country	TSO	Approval for publication in the IMR	Answer
			developed by the main PL DSOs and should be published on their sites (e.g. TAURON Dystrybucja S.A. website <a href="https://www.tauron-dystrybucja.pl/uslugi-dystrybucyjne/nc-rfg">https://www.tauron-dystrybucja.pl/uslugi-dystrybucyjne/nc-rfg</a> ) Please note, that in PL there are 187 DSOs (they are listed on PL NRA site: <a href="https://rejestr.ure.gov.pl/">https://rejestr.ure.gov.pl/</a> ) and PSE cannot provide information about operational notifications for PGMs type A,B & C on behalf of them.
Portugal	REN	Yes	For type D, the Operational Notification Procedure (ONP) will be further specified in the transmission and distribution grid code, which is currently under revision by the competent regulatory authority. The main steps of ONP are already in practice for connections to transmission grid. Available link: <a href="http://www.mercado.ren.pt/PT/Electr/ActServ/AcessoRedes/LigProd/Paginas/default.aspx">http://www.mercado.ren.pt/PT/Electr/ActServ/AcessoRedes/LigProd/Paginas/default.aspx</a>
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	Yes
Sweden	Svenska Kraftnät	Yes	A notification procedure for type D is published on the website provided above. Some detailed instructions related to validation of requirements are still outstanding, instructions are provided directly to connecting parties. Svenska Kraftnät is just handling type D (connection point at 110 kV or above) power generating modules because the transmission grid only contains 400 kV and 220 kV connections. Other connections are handled by owners of the distribution system.

## 3.2.2 Do you allow the use of equipment certificates issued by an authorised certifier acc. to art. 31?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	In the connection process, the system operator allows the use of equipment certificates issued by an authorized certification body. The system operator also uses standard project designs and company standards.
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes, RTE allows the use of equipment certificates, but they are not delivered by an authorised certifier, always provided and signed by the PGM owner.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Most probably yes.

Country	TSO	Approval for publication in the IMR	Answer
Hungary	MAVIR	Yes	Yes. In the early phase of the connection procedure a Connection Plan is needed to design. In the Connection Plan is expected (mandatory) an evidence of conformity for RfG requirements, so the Detailed Equipment Certificate. (Remark: according to our practice there are three common institute for certification provider, like Bureau Veritas, TÜV SÜD and TÜV Rheinland but MAVIR could accept any other certification provider as well.)
Ireland	EirGrid	Yes	Type B and C are DSO connected. For Type D, they may provide it as part of their Testing and Commissioning but the certificates are not taken in lieu of physical testing or simulations.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	Yes
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	PSE developed common rules how to use a Equipment Certificates within the notification process in cooperation with PL DSOs via PTPIREE association. This document was published on PTPIREE website: <a href="http://www.ptpiree.pl/opracowania/kodeksy-sieci">http://www.ptpiree.pl/opracowania/kodeksy-sieci</a> (direct link to main document: <a href="http://www.ptpiree.pl/documents/opracowania/kodeksy_sieci/2021_04_26/20210426_zasady_wykorzystania_certyfikatow_v.1.2.pdf">http://www.ptpiree.pl/documents/opracowania/kodeksy_sieci/2021_04_26/20210426_zasady_wykorzystania_certyfikatow_v.1.2.pdf</a> ) and PSE website: <a href="https://www.pse.pl/documents/20182/7be20018-80ad-47a9-8683-4e9a8132ca3e">https://www.pse.pl/documents/20182/7be20018-80ad-47a9-8683-4e9a8132ca3e</a>
Portugal	REN	Yes	Yes, attached to a manufacturer declaration and in complement to simulations report and to power producer declaration (in transmission connections).

Country	TSO	Approval for publication in the IMR	Answer
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	Yes
Sweden	Svenska Kraftnät	Yes	Not concerning synchronous generators.

### 3.2.3 Which equipment certificates (e.g. generator, main transformer, bus bar, controller models etc.)?

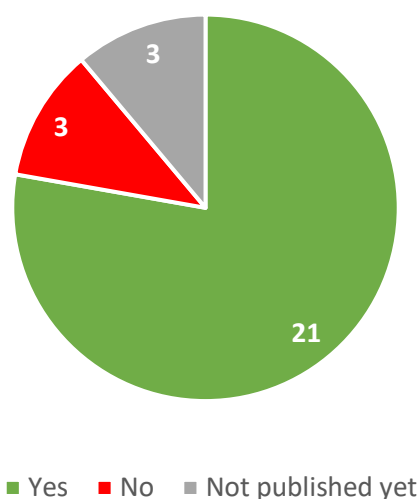
Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Generator; Main transformer; Bus bar; Controller models.
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	The equipment of the main electrical circuit of the site, including the generating modules and the main step-up transformers. The connection equipment (switches, disconnectors, measuring transformers) must meet the company standards of the system operator.
Croatia	HOPS	Yes	Generator.
Czech Republic	ČEPS, a.s.	Yes	Controller models; Bus bar; Main transformer; Generator; Inverters. We do not expect that equipment certificates fully replace the compliance tests and simulations.

Country	TSO	Approval for publication in the IMR	Answer
Estonia	Elering AS	Yes	Generator.
Finland	Fingrid	Yes	Certificates can be used to substitute commissioning testing. Instead of the relevant test, the power generating facility owner may use equipment certificates issued by an authorised certifier to demonstrate compliance with the relevant requirement. In such a case, the equipment certificates shall be provided to the relevant network operator. As a rule, equipment certificates cannot be relied upon to demonstrate the interoperability of the power generating facility as a whole and of all of its auxiliary equipment. Consequently, equipment certificates shall not be accepted as a primary means of verifying compliance, and their use must be agreed on separately with TSO and the relevant network operator.;Controller models; Generator;Main transformer.
France	RTE	Yes	Compliance of the owner assets with the operational RTE policies (examples: short circuit withstand capacity). Compliance of the owner IT with the RTE policies. And in some cases we ask for certificates for LVRT (low voltage ride through) and HVRT.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Generator, main circuit breaker, main transformer, tap changer (if available), speed controller, voltage controller, protection relays for grid relevant protection systems, controller models.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Generator; Controller models; EqC above are indicative, precise list is under consideration.
Hungary	MAVIR	Yes	Generator; Main transformer; Controller models; Inverter.
Ireland	EirGrid	Yes	Any equipment certificates can be provided but will not be taken in lieu of physical testing or simulations.

Country	TSO	Approval for publication in the IMR	Answer
Lithuania	LITGRID AB	Yes	Inverter for type B.
Luxembourg	Creos Luxembourg S.A.	Yes	Main transformer; Bus bar; Generator; Power generating module.
Netherlands	TenneT TSO	Yes	Generator; Main transformer; Bus bar; Controller models.
Poland	PSE S.A.	Yes	Utilisation of equipment certificates was described in Equipment Certificates Procedure ( <a href="http://www.ptpiree.pl/documents/opracowania/kodeksy_sieci/2021_04_26/20210426_zasady-wykorzystania_certyfikatow_v.1.2.pdf">http://www.ptpiree.pl/documents/opracowania/kodeksy_sieci/2021_04_26/20210426_zasady-wykorzystania_certyfikatow_v.1.2.pdf</a> ) and in proper notification procedure developed by relevant system operators.  Equipment certificates refer to: turbines, generators, power electronics also PPM, depending on the installation and technical requirements. In context of the specific requirement which have to be confirmed by the certificate certification body is responsible for identification which component or set of components have to be tested to verify technical capabilities (so called "Equipment under test").
Portugal	REN	Yes	Generator; Controller models.
Romania	Transelectrica - TEL	Yes	Generator; Main transformer; Bus bar; Controller models; We ask for unit equipment certificates, SPGM or PGM equipment certificates or components certificates.
Slovak Republic	SEPS	Yes	Not specified.
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	PGM certificates at the connection point. This certificate includes equipment certificates for the power generating unit and components of the PGM such as power park controllers, FACTS

Country	TSO	Approval for publication in the IMR	Answer
			devices, etc.
Sweden	Svenska Kraftnät	Yes	Not applicable.

## 3.2.4 Is the information included in this section of the survey (Operational notification of type B, C and D power-generating modules) publicly available in accordance with NC RfG Article 29(2)?



## 3.3 Survey on the procedure for type B and C power-generating modules pursuant to NC RfG art. 32

### 3.3.1 Please specify the content of the power-generating module document acc. to art. 32(2)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	The content of the document is described as a template in the national grid code (TOR Erzeuger Typ A-D)
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	The system operator does not connect type B modules. For type C modules the information is required according to art. 32 (2), which is collected and differentiated in the form of appendices to the connection contract.
Croatia	HOPS	Yes	a) statement of compliance; b) detailed technical data of the power-generating module; c) equipment certificates issued by an authorised certifier in respect of power-generating modules.
Czech Republic	ČEPS, a.s.	Yes	CEPS operates only the network on the 110 kV voltage level and higher therefore the details of the operational notifications belonging to power-generating module of type B and C have been implemented in DSOs Grid Codes.
Estonia	Elering AS	Yes	6.3.4 The real-time measurement and remote-control signals required by the TSO shall be tested from the electricity system control centre and with the power-generating module being tested in parallel operation to the system within three (3) months after synchronisation. 6.4 Type C power-generating modules 6.4.1 For the connection of type C power-generating modules to the electricity system, the producer shall submit an application for the connection of its power-generating module to the distribution system to the TSO using the e-mail address <a href="mailto:kliendihaldur@elering.ee">kliendihaldur@elering.ee</a> . 6.4.2 The producer shall submit the electrical



Country	TSO	Approval for publication in the IMR	Answer
			<p>design of the power-generating module for approval. The electrical design shall be approved by the TSO seven (7) days before synchronisation of the power-generating module. The electrical design shall include a single line diagram up to the connection point of the TSO (also including the client's cable and transformer details), the data sheets of the technical parameters issued by the manufacturer for every type of power generating unit, the basic data of the power generating module in accordance with subsection 1.1.2.1 of Annex 1 to the Connection 37 Conditions and the communication connection design in accordance with the guideline 'Requirements for data exchange related to the electrical installations of clients.'</p> <p>6.4.3 Before synchronisation of a power-generating module, the producer shall ensure and test the communication connection to the electricity system control centre in accordance with the guideline 'Requirements for data exchange related to the electrical installations of clients.'</p> <p>6.4.3.1 The real-time measurement and remote-control signals required by the TSO shall be tested from the electricity system control centre and with the power-generating module being tested in parallel operation to the system within three (3) months after synchronisation.</p> <p>6.4.3.2 The producer shall submit verified models prepared in accordance with the guideline 'Requirements for the preparation and modelling of electrical designs of clients' to the TSO.</p> <p>6.4.4 Before issuance of a final operational notification, the distribution system operator shall:</p> <p>6.4.4.1 Verify the absence of complaints from the TSO with regard to the functioning of the real-time measurement and remote-control signals forwarded to the electricity system control centre by the producer in real-time.</p>

Country	TSO	Approval for publication in the IMR	Answer
Finland	Fingrid	Yes	<a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a>
France	RTE	Yes	<ul style="list-style-type: none"> <li>• Protection and control settings relevant to the connection point between the relevant system operator and the power-generating facility owner.</li> <li>• Detailed technical data of the power-generating module.</li> <li>• Equipment certificates.</li> <li>• For Type C power-generating modules, simulation models (EMT and RMS).</li> <li>• Compliance test reports demonstrating steady-state and dynamic performance.</li> <li>• Studies demonstrating steady-state and dynamic performance</li> </ul>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<p>Up-to-date quality documents confirming the competence and confidence in the issued documents shall be accepted. In the context of the statement of compliance, the documents shall be reviewed with regard to the following aspects:</p> <ul style="list-style-type: none"> <li>– The settings of the installed power generating plant as indicated in the commissioning statement are in full compliance with the plant certificate, the unit certificate(s) and the component certificate(s).</li> <li>– The strategy for steady-state reactive power supply, the strategy for active power control as well as the implementation of dynamic network stability and the protection strategy have been implemented under consideration of the requirements of the network operator.</li> <li>– Inspection of the protection testing protocols. The statement of compliance shall include the commissioning statement of the power generating plant with associated protocols and proof. In the presence of any deviations of the installed power generating plant from the plant certificate, the PGP model shall be adapted accordingly by</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			the connection owner and resubmitted to the network operator. The statement of compliance shall be submitted by the plant operator to the network operator before the validity of the interim type approval ends (see 4.2.4). If the statement of compliance is not submitted to the network operator in due time, the latter is entitled to disconnect the installation from the network. If it cannot be ensured that the statement of compliance is submitted before the end of validity of the interim type approval, plant certificates for completed construction phases shall be submitted to the network operator and the statements of compliance shall then also be submitted for each individual construction phase. Expansion or adaptation of existing plant certificates is permitted. The verification process for the installation of the operational power generating plant is concluded with the statement of compliance. This also terminates the monitoring process of the plant certificate carried out by the accredited certification body. The network operator issues to the plant operator a final type approval. After that, the power generating plant is permitted to commence regular operation. Even after completed commissioning of the power generating plant, the network operator can require compliance testing of the electrical properties.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	The content of the PGMD is not defined yet
Hungary	MAVIR	Yes	<p>The B and C PGMs' relevant system operator are the DSOs. Their requirements are:</p> <ul style="list-style-type: none"> <li>• Protection and control settings</li> <li>• Detailed technical data of the power-generating module with relevance to the grid connection</li> <li>• Equipment certificates</li> <li>• Form of simulations model for Type C power-generating modules under development (for different simulation platform)</li> <li>• Compliance test reports demonstrating steady-</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			state and dynamic performance (under development)
Ireland	EirGrid	Yes	PGMD currently under development and not yet publish externally. The PGMD shall set out, clearly, and in the appropriate level of detail, all the individual milestones that need to be completed by the Generator along with their associated sequencing and timings. For controllable PPMs, the relevant PGMDs shall also set out, relevant testing carried out by the TSO and may be complimented by other documents which may emerge from time to time. Details will be published in next version of the Distribution Code, following NRA approval.
Lithuania	LITGRID AB	Yes	<a href="https://www.eso.lt/download/283758/eso%20tvarka.docx">https://www.eso.lt/download/283758/eso%20tvarka.docx</a> Requirement applicable for Distribution System Operator
Luxembourg	Creos Luxembourg S.A.	Yes	Evidence of an agreement on the protection and control settings Itemised statement of compliance. Detailed technical data of the power generating module. Equipment certificates issued by an authorised certifier
Netherlands	TenneT TSO	Yes	Types B and C are not relevant.
Poland	PSE S.A.	Yes	PSE is not able to provide information about details of notification procedures for PGMs type B & C. PSE was not qualified to be the relevant system operator for these objects (PGMs type B & C cannot be connected to TSO grid due to voltage criteria >110kV), so these procedures were developed only among PL DSOs and may differ between each of them. DSOs were obliged to publish these procedures on their websites.
Portugal	REN	Yes	Not applicable as defined in survey guide.

Country	TSO	Approval for publication in the IMR	Answer
Romania	Transelectrica - TEL	Yes	<p>The content of the power-generating module document (PGMD)-DUG for B, C and D Type is:</p> <ul style="list-style-type: none"> <li>- The technical documentation for generating units of Type B/C/D contains the following documents (Annex 2÷7 from the Operational Notification Procedure – NRA Order no. 51/2019):</li> <li>- The establishment authorization granted by NRA;</li> <li>- The contact details of the power-generating plant owner and the third party or aggregator, as appropriate.</li> <li>- The connection point.</li> <li>- The expected date of the application of power for the probationary period.</li> <li>- Type of primary energy source.</li> <li>- Equipment certificates issued by an approved certification body for the equipment used by the power generating units, together with the test results:</li> <li>- The detailed technical data of the power generating unit, the auxiliary installations as well as the single line diagram of the substation and the power plant.</li> </ul> <p>Mathematical models of PGM and parameters:</p> <ul style="list-style-type: none"> <li>- Electrical parameters specific to all cables and lines: type (material), <math>R + [\Omega / \text{km}]</math>, <math>R_0 [\Omega / \text{km}]</math>, <math>R_{m0} [\Omega / \text{km}]</math>, <math>X_0 [\Omega / \text{km}]</math>, <math>X_0 [\text{Km} / \text{s}]</math>, <math>C_0 [\mu\text{F} / \text{km}]</math>, <math>C_0 [\mu\text{F} / \text{km}]</math>, <math>S [\text{mm}]</math>, <math>U_n [\text{kV}]</math>.</li> <li>- For transformer units JT / MT kV: rated winding power, nominal voltages, loose losses, copper losses, short-circuit voltage, idle current, connection group, voltage setting (type of adjustment, including the number of the nominal plot, the maximum plot number), neutral treatment.</li> <li>- Reactive power compensation data if the case.</li> <li>- Data required for calculations of protection settings.</li> <li>- The telecommunication project that provides the communication path used to integrate into</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			DMS/EMS-SCADA.
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	Not applicable since REE does not handle type B and C. However, the main DSO association provides information on this procedure at this link: <a href="https://aelec.es/wp-content/uploads/2021/05/20210514-Guia-puesta-en-servicio-MGE-conectados-a-la-RdD-v2.pdf">https://aelec.es/wp-content/uploads/2021/05/20210514-Guia-puesta-en-servicio-MGE-conectados-a-la-RdD-v2.pdf</a>
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

### 3.3.2 Do you request evidence of an agreement on the protection and control settings relevant to the connection point acc. to art. 32(2)(a)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	Yes. The settings of the protections and the response of the control systems for limiting conditions at the connection point are agreed with the System Operator, in accordance with the Grid Code.
Croatia	HOPS	Yes	No

# Monitoring Report on Connection Network Codes Implementation



Final Version | 2 December 2021

Country	TSO	Approval for publication in the IMR	Answer
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	RTE does not request evidence protection and control setting, but we ask for simulation (for example : LVRT, HVRT and islanding) and tests for some control setting (for example : FSM, LFSMO and voltage control).
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Yes
Hungary	MAVIR	Yes	By the DSO.
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	Yes
Luxembourg	Creos Luxembourg S.A.	Yes	Yes
Netherlands	TenneT TSO	Yes	N/A
Poland	PSE S.A.	Yes	PSE is not able to provide information about details of notification procedures for PGMs type B & C.

Country	TSO	Approval for publication in the IMR	Answer
			PSE was not qualified to be the relevant system operator for these objects (PGMs type B & C cannot be connected to TSO grid due to voltage criteria >110kV), so these procedures were developed only among PL DSOs and may differ between each of them. DSOs were obliged to publish these procedures on their websites.
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C

### 3.3.3 Do you request an itemised statement of compliance acc. to art. 32(2)(b)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	No
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	Compliance by items is required only for basic equipment that directly affects the operation and safety of the elements of the electricity transmission network.



Country	TSO	Approval for publication in the IMR	Answer
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Set individually, depending on the project.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	No
Hungary	MAVIR	Yes	The relevant system operators for B and C PGMs are the DSOs (the DSOs have the common Distribution Network Code and the requirements' harmonization under process).
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	Yes
Luxembourg	Creos Luxembourg S.A.	Yes	Yes
Netherlands	TenneT TSO	Yes	N/A

Country	TSO	Approval for publication in the IMR	Answer
Poland	PSE S.A.	Yes	PSE is not able to provide information about details of notification procedures for PGMs type B & C.  PSE was not qualified to be the relevant system operator for these objects (PGMs type B & C cannot be connected to TSO grid due to voltage criteria >110kV), so these procedures were developed only among PL DSOs and may differ between each of them. DSOs were obliged to publish these procedures on their websites.
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

### 3.3.4 Do you request detailed technical data of the power-generating module with relevance to the grid connection acc. to art. 32(2)(c)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	Yes
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Yes
Hungary	MAVIR	Yes	The relevant system operators for B and C PGMs are the DSOs.
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Luxembourg	Creos Luxembourg S.A.	Yes	Yes
Netherlands	TenneT TSO	Yes	N/A
Poland	PSE S.A.	Yes	<p>PSE is not able to provide information about details of notification procedures for PGMs type B &amp; C.</p> <p>PSE was not qualified to be the relevant system operator for these objects (PGMs type B &amp; C cannot be connected to TSO grid due to voltage criteria &gt;110kV), so these procedures were developed only among PL DSOs and may differ between each of them. DSOs were obliged to publish these procedures on their websites.</p>
Portugal	REN	Yes	<p>PSE is not able to provide information about details of notification procedures for PGMs type B &amp; C. PSE was not qualified to be the relevant system operator for these objects (PGMs type B &amp; C cannot be connected to TSO grid due to voltage criteria &gt;110kV), so these procedures were developed only among PL DSOs and may differ between each of them. DSOs were obliged to publish these procedures on their websites.</p>
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

## 3.3.5 Please list the requested technical data of the power-generating module with relevance to the grid connection acc. to art. 32(2)(c)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	A template of all relevant technical data can be found in "TOR Erzeuger Typ C" (Annex A7) <a href="https://www.e-control.at/recht/marktregeln/tor">https://www.e-control.at/recht/marktregeln/tor</a>
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	Only basic data on the equipment of the main electrical circuit of the site is required, including the generating modules and the main step-up transformers. The connection equipment (switches, disconnectors, measuring transformers) must meet the company standards of the system operator.
Croatia	HOPS	Yes	N/A
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	<p>3 Content of the electrical part project</p> <p>3.1 The design of the consumption-oriented electrical part project must include the following:</p> <p>3.1.1 Primary part:</p> <p>3.1.1.1 The primary part of the electrical part project must include the following:</p> <p>3.1.1.1.1 General – short description;</p> <p>4</p> <p>3.1.1.1.2 The primary scheme up to the connection point;</p> <p>3.1.1.1.4 110 kV or 330 kV power transformers with basic parameters and a FAT report;</p> <p>3.1.1.1.5 Sections of the client's 110 kV or 330 kV bays and bus arrangements if the client's electrical installation is connected to the connection point of the TSO directly through bus arrangement;</p> <p>3.1.1.1.6 The results of measuring and calculating the contact voltage and step voltage (if the earthing loop of the client's electrical equipment is</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>electrically connected to the earthing loop of the substation or line of the TSO). The source data (shortcircuit values) required for the calculations shall be provided by the TSO;</p> <p>3.1.1.1.7 When connecting to the 110-330 kV cable:</p> <p>3.1.1.1.7.1 Cable length;</p> <p>3.1.1.1.7.2 Longitudinal profile, including intersections with other structures;</p> <p>3.1.1.1.7.3 Cable brand with electrical parameters;</p> <p>3.1.1.1.7.4 Drawing of the connection to the cable entry and connection point, also showing sections of the cable location;</p> <p>3.1.1.1.7.5 Position plan of the client's electrical installation in the protection zone of the TSO's electrical installation.</p> <p>3.1.1.1.8 When connecting to the 110-330 kV overhead line:</p> <p>3.1.1.1.8.1 Position plan and longitudinal profile of the client's electrical installation in the protection zone of the TSO's electrical installation;</p> <p>3.1.1.1.8.2 Support types (including support drawing);</p> <p>3.1.1.1.8.3 Line wire and lightning rope with electrical parameters;</p> <p>3.1.1.1.8.4 PSS/E model and PSCAD model shall be provided if the capacity of the electricity consumer to be connected to the single grid is over 10 MW.</p> <p>3.1.2 Secondary part:</p> <p>3.1.2.1 The secondary part of the project must include at least:</p> <p>3.1.2.1.1 A diagram of the arrangement of the main and reserve relays of an electrical installation with a voltage of 110 or 330 kV, including a</p> <p>3.1.1.1.3 A one-line diagram of the electrical installation up to the connection point, showing new and existing production units, reactive energy compensation devices, intermediate transformers, distribution and protection devices and cables and connections with nominal data; power transformer, along with measuring transformers, where the connections between the devices and</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>the types of relays are also shown;</p> <p>3.1.2.1.2 Relay protection and automatic system settings, which are needed to achieve cooperation of the client's and TSO's relays from the client's device to the connection point;</p> <p>5</p> <p>3.1.2.1.3 Control and automation in accordance with the connection conditions guide 'Data exchange requirements related to the client's electrical installation';</p> <p>3.1.2.1.4 Data communication parameters, IP addresses (static VPN of the concentrator, IP (RTU etc. of the devices requested by SCADA) on the side of the energy system control centre (SCADA) with a communication connection diagram and an explanatory note;</p> <p>3.1.2.1.5 RTU data volumes (measurements, controls and position signals);</p> <p>3.1.2.1.6 Guaranteed measurement accuracies.</p> <p>3.2 When connecting power-generating modules and mixed installations and changing their consumption and/or production conditions, the client must submit a production-oriented electrical part project, in the frame of which the submitted consumption-oriented design has to be supplemented if due to the changes in the client's electrical installation the data submitted in the consumption-oriented project have changed. In addition, the production-oriented project must include the following:</p> <p>3.2.1 An explanatory note if the submitted project has differences compared with the previously submitted consumption-oriented project;</p> <p>3.2.2 A position plan with the coordinates of the client's energy park module (on a scale of 1:200).</p>
Finland	Fingrid	Yes	<p>Please see Tables 7.1 and 7.2 of VJV2018 document.</p> <p><a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a></p>
France	RTE	Yes	<p>The needed data are described on Fiche F1 of « Article 8.3.3 - Trame de procédure de contrôle de conformité pour le raccordement d'une</p>

Country	TSO	Approval for publication in the IMR	Answer
			installation de production » which can be found: <a href="https://www.services-rte.com/fr/la-bibliotheque.html">https://www.services-rte.com/fr/la-bibliotheque.html</a>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<p>Agreed active connection power</p> <p>Agreed apparent connection power</p> <p>Designation of network connection point</p> <p>Set values of protection equipment at the network connection point</p> <p>Short-circuit protection equipment</p> <p>Decoupling protection</p> <p>System protection</p> <p>Specified settings of power generating units</p> <p>Decoupling protection</p> <p>Over-voltage protection / Under-voltage protection</p> <p>Over-frequency protection / Under-frequency protection</p> <p>Steady-state voltage stability</p> <p>Network data</p> <p>Neutral-point treatment - Type of neutral-point treatment, Installations at transformer's neutral-point on the extra high-voltage side</p>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	PGM, transformer and MV/LV feeder network conductors data sheets.
Hungary	MAVIR	Yes	<p>Defined in Distribution Network Code):</p> <ul style="list-style-type: none"> <li>• Protections setting (short current, over/under voltage)</li> <li>• Island operation detection</li> <li>• Frequency related parameters (and LFSM)</li> <li>• Automatic reconnection parameters after loss-of-mains</li> <li>• P/Q and <math>\cos\phi</math> set point.</li> </ul>
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	Power-generating module total active and reactive power capabilities.



Country	TSO	Approval for publication in the IMR	Answer
Luxembourg	Creos Luxembourg S.A.	Yes	Synchronous, asynchronous machine, grid- or self-controlled static system, active and reactive power, type of primary energy used.
Netherlands	TenneT TSO	Yes	N/A
Poland	PSE S.A.	Yes	<p>PSE is not able to provide information about details of notification procedures for PGMs type B &amp; C.</p> <p>PSE was not qualified to be the relevant system operator for these objects (PGMs type B &amp; C cannot be connected to TSO grid due to voltage criteria &gt;110kV), so these procedures were developed only among PL DSOs and may differ between each of them. DSOs were obliged to publish these procedures on their websites.</p>
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	<p>Acc. to the art. 32(2)(c) the documentation submitted by the applicant shall contain the following:</p> <p>For the type B, C (art. 22/ art. 43 from the Operational Notification Procedure - NRA Order no. 51/2019) the technical data submitted by the applicant contains at least:</p> <ul style="list-style-type: none"> <li>- Rated active power;</li> <li>- Minimum and maximum active and reactive power;</li> <li>- Admissible frequency range, RoCoF;</li> <li>- LFSM and FSM capability;</li> <li>- FRT diagram including Fast fault current injection;</li> <li>- P-Q diagram;</li> <li>- Schema of main controllers (speed, AVR, active and reactive power).</li> </ul>
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	N/A

Country	TSO	Approval for publication in the IMR	Answer
Spain	Red Eléctrica de España	Yes	Not applicable since REE does not handle type B and C
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

### 3.3.6 Do you request equipment certificates issued by an authorised certifier in respect of power-generating modules acc. to art. 32(2)(d)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	No
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	If the equipment is of a new type, unknown to the system operator.
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	No, but in many cases these are provided as evidence to show the fulfillment of requirements.
France	RTE	Yes	We ask for certifications, but they are delivered and signed by the PGM owner.
Germany	Representation of all German TSO's (Amprion / TenneT /	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
	TransnetBW / 50Hertz)		
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Most probably yes.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	No
Netherlands	TenneT TSO	Yes	N/A
Poland	PSE S.A.	Yes	Yes
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	No

Country	TSO	Approval for publication in the IMR	Answer
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

### 3.3.7 Please list the requested equipment certificates issued by an authorised certifier in respect of power-generating modules acc. to art. 32(2)(d)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Equipment certificates can be optionally delivered. Examples --> generator, main transformer, bus bar, controller models , etc.
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	Factory data for generating modules and main step-up transformers is required.
Croatia	HOPS	Yes	N/A
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	There are no lists for that. Power Generating Module Owner with authorized certifier will make proposal and TSO will consider it.
Finland	Fingrid	Yes	There is no defined list of these.
France	RTE	Yes	We ask for certification, but they are delivered by the PGM owner.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Generator, main circuit breaker, main transformer, tap changer (if available), speed controller, voltage controller, protection relais for grid relevant protection systems.

Country	TSO	Approval for publication in the IMR	Answer
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	Inverters and SPGMs.
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	Not relevant.
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	N/A
Poland	PSE S.A.	Yes	<p>If it comes to PGMs type B &amp; C, detailed information on equipment certificates is specified in separate document “Conditions and procedures for the use of certificates in the process of connecting power generating modules to power grids”, which is common for PL TSO &amp; DSOs (<a href="http://ptpiree.pl/documents/opracowania/kode_ksy_sieci/2021_04_26/20210426_zasady-wykorzysta_certyfikatow_v.1.2.pdf">http://ptpiree.pl/documents/opracowania/kode_ksy_sieci/2021_04_26/20210426_zasady-wykorzysta_certyfikatow_v.1.2.pdf</a>):</p> <p>Type B PGMs:</p> <ul style="list-style-type: none"> <li>• LFSM-O</li> <li>• Reactive Power Capability</li> <li>• FRT</li> <li>• Fast Fault Current Injection</li> <li>• Post Fault Active Power Recovery</li> <li>• Frequency Ranges</li> <li>• ROCOF</li> <li>• Active Power Reduction and Cease Active Power</li> </ul> <p>Type C PGMs:</p> <ul style="list-style-type: none"> <li>• LFSM-O</li> <li>• LFSM-U</li> <li>• Reactive Power Capability</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• FRT</li> <li>• Fast Fault Current Injection</li> <li>• Post Fault Active Power Recovery</li> <li>• Frequency Ranges</li> <li>• ROCOF</li> <li>• Active Power Reduction and Cease Active Power</li> </ul>
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	<p>The technical documentation for Type B and C power generating units contains the following documents (Annex 2(6) and Annex 4(7) from Operational Notification Procedure – NRA Order no. 51/2019):</p> <ul style="list-style-type: none"> <li>- Equipment certificates must be issued by an accreditation certification body – authorised certifier. The Equipment certificates must contain test results. The Equipment certificates must include at least:</li> <li>• Checking the P-Q capability curve;</li> <li>• Fault-ride-through with Fast fault current injection;</li> <li>• RoCoF;</li> <li>• LFSM;</li> <li>• FSM for C type;</li> <li>• Frequency range;</li> <li>• The capability of automatic reconnection of the power generating unit at voltage variations;</li> <li>• Electrical disturbances in accordance with EN 50160 in force;</li> <li>• The mode of responding to changes in active and reactive power setpoints.</li> </ul>
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	Not applicable since REE does not handle type B and C.

Country	TSO	Approval for publication in the IMR	Answer
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

## 3.3.8 Do you request simulation models for Type C Power Generating Modules acc. to art. 32(2)(e)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	If requested by RSO.
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	In principle, simulation models for type C generating modules are not required because they are not of system importance.
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration, most probably yes.
Hungary	MAVIR	Yes	Form of simulations model for Type C power-generating modules under development (for different simulation platforms).
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	N/A
Poland	PSE S.A.	Yes	<p>PSE is not able to provide information about details of notification procedures for PGMs type B &amp; C.</p> <p>PSE was not qualified to be the relevant system operator for these objects (PGMs type B &amp; C cannot be connected to TSO grid due to voltage criteria &gt;110kV), so these procedures were developed only among PL DSOs and may differ between each of them. DSOs were obliged to publish these procedures on their websites.</p>
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	N/A



Country	TSO	Approval for publication in the IMR	Answer
Spain	Red Eléctrica de España	Yes	Yes
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

### 3.3.9 Please list the requested simulation models for Type C Power Generating Modules acc. to art. 32(2)(e)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	<p>Examples:</p> <ul style="list-style-type: none"> <li>• Sub-models, depending on the existence of the individual components:</li> <li>• Alternator and prime mover,</li> <li>• Speed and power control,</li> <li>• Voltage control, including, if applicable, power system stabiliser ('PSS') function and excitation control system,</li> <li>• Power-generating module protection models</li> <li>• Converter models for power park modules.</li> </ul>
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	N/A
Croatia	HOPS	Yes	N/A
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	PSSE for over 5MW and PSCAD over 10 MW.
Finland	Fingrid	Yes	Generally, PSS/E 35 load flow and dynamic model is required. If not available, PSS/E 33 model is accepted. For converter connected facilities over

Country	TSO	Approval for publication in the IMR	Answer
			<p>60 MW, PSCAD model is required for SSO studies.</p> <p>Please see sections 15 and 20 of VJV2018 document for modelling information.</p> <p><a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a></p> <p>And for SSO (Subsynchronous oscillation) studies:</p> <p><a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/specific-study-requirements-for-power-park-modules-connected-in-vicinity-of.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/specific-study-requirements-for-power-park-modules-connected-in-vicinity-of.pdf</a></p>
France	RTE	Yes	RTE asks for static, EMT and RMS simulation models.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Type C not connected to the german TSO, therefore no knowledge of requested models for type C PGM's
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	WECC "generic" models for PE connected PPMs IEEE compatible models for SPGMs.
Hungary	MAVIR	Yes	<p>1) Currently MAVIR uses PSSE modeling</p> <p>2) PSSE has 3 possibilities for dynamic modeling.</p> <ul style="list-style-type: none"> <li>• Standard models</li> <li>• User defined models (UDM)</li> <li>• Graphical Model Builder (GMB)</li> </ul>
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	Not relevant.
Luxembourg	Creos Luxembourg S.A.	Yes	N/A

Country	TSO	Approval for publication in the IMR	Answer
Netherlands	TenneT TSO	Yes	N/A
Poland	PSE S.A.	Yes	<p>PSE is not able to provide information about details of notification procedures for PGMs type B &amp; C.</p> <p>PSE was not qualified to be the relevant system operator for these objects (PGMs type B &amp; C cannot be connected to TSO grid due to voltage criteria &gt;110kV), so these procedures were developed only among PL DSOs and may differ between each of them. DSOs were obliged to publish these procedures on their websites.</p>
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	<p>Acc. to art. 32(2)(e) the requested simulation models for Type C Power Generating Modules:</p> <ul style="list-style-type: none"> <li>• The network study for calculating the reactive power requirement at the connection point to meet the reactive power requirements at the connection point;</li> <li>• Studies on coordination of protection, with RSO agreement on the protection schemes at the connection point.</li> </ul>
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	<p>Simulation models for type C are requested by REE, notwithstanding the connection point is at distribution level as they might be relevant for system studies. The conditions and list of models is exhaustively provided in operation procedures number 9:</p> <p><a href="https://www.ree.es/sites/default/files/01_ACTIVIDADES/Documentos/ProcedimientosOperacion/BOE-A-2019-18275_ministerio_para_la_transicion_ecologica.pdf">https://www.ree.es/sites/default/files/01_ACTIVIDADES/Documentos/ProcedimientosOperacion/BOE-A-2019-18275_ministerio_para_la_transicion_ecologica.pdf</a></p>

Country	TSO	Approval for publication in the IMR	Answer
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

## 3.3.10 Do you request compliance test reports demonstrating steady-state and dynamic performance acc. to art. 32(2)(f)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	If necessary, protocols from the setting of relay protections and automatics are required.
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration, most probably yes.
Hungary	MAVIR	Yes	The test process is under development.
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	N/A
Poland	PSE S.A.	Yes	<p>PSE is not able to provide information about details of notification procedures for PGMs type B &amp; C.</p> <p>PSE was not qualified to be the relevant system operator for these objects (PGMs type B &amp; C cannot be connected to TSO grid due to voltage criteria &gt;110kV), so these procedures were developed only among PL DSOs and may differ between each of them. DSOs were obliged to publish these procedures on their websites.</p>
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

### 3.3.11 Please list the requested compliance test reports demonstrating steady-state and dynamic performance acc. to art. 32(2)(f)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	<p>Type B:</p> <ul style="list-style-type: none"> <li>• Tests: <ul style="list-style-type: none"> <li>o LFSM-O</li> </ul> </li> </ul> <p>Type C:</p> <ul style="list-style-type: none"> <li>• Tests: <ul style="list-style-type: none"> <li>o LFSM-O and LFSM-U</li> <li>o Q-capability and controllability</li> <li>o Re-synchronisation time &lt; 15 min (or operation at houseload)</li> </ul> </li> <li>• Optional: <ul style="list-style-type: none"> <li>o FSM --&gt; optional, only in case of prequalification</li> <li>o Frequency restoration --&gt; optional, only in case of prequalification</li> <li>o Synthetic inertia --&gt; optional</li> </ul> </li> <li>• Only if there is an agreement, that power plant is relevant for system restoration <ul style="list-style-type: none"> <li>o Island operation</li> <li>o Black start capability</li> </ul> </li> </ul>
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	Of special interest are protocols from compliance tests of automatics against the emergence of island mode.

Country	TSO	Approval for publication in the IMR	Answer
Croatia	HOPS	Yes	N/A
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	List depends on the connecting module.
Finland	Fingrid	Yes	Please see sections 14, 15, 19 and 20 of VJV2018 document for modelling information and test reports (incl. validation of the models). <a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a>
France	RTE	Yes	The tests are needed for the following points: <ul style="list-style-type: none"> <li>• Exchanged data</li> <li>• Network connection and disconnection</li> <li>• Power quality</li> <li>• Frequency control (FSM, LFSM, secondary frequency control)</li> <li>• Voltage control</li> <li>• Tests of all the automatic control used to solve any network constraints.</li> <li>• Houseload.</li> </ul>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	11.2.4 TAR 4130: Compliance test reports for the unit  The capacity of power generating units to supply reactive power shall be stated as a function of the active power in the unit certificate in the form of PQ diagrams taking into consideration the voltage limits. The respective voltage level or terminals to which the capacity applies shall be indicated.  For the voltage range for continuous operation declared by the manufacturer, the unit certificate shall state the maximum control ranges of reactive power for the under-excited and over-excited ranges as a function of the active power feed-in. Proof may be provided in the form of a manufacturer declaration.

Country	TSO	Approval for publication in the IMR	Answer
			<p>Manufacturer indications regarding the reactive power capacity shall be verified by measurement for the maximum under-excited and the maximum over-excited range as a function of the active power feed-in at the power generating unit.</p> <p>The voltage at the time of measurement shall be taken into account for the verification. The measured reactive power capacity of the power generating unit shall be equal to or greater than the value indicated by the manufacturer. Manufacturer indications regarding the voltage dependence of the reactive power capacity shall be verified by measurements on at least two relevant operating points for the under-excited reactive power range and on at least two relevant operating points for the over-excited reactive power range. Transfer of the measurement results in accordance with item 3 of 11.2.1 is permitted for these verifications of the voltage dependence.</p> <p>Where one of the reactive power methods in accordance with 10.2.2.4 is present in the power generating unit, the control function shall be verified on the level of the power generating unit. In such cases, it shall be verified in the unit certificate that the requirements specified in 10.2.2.4 and Annex C.2 can be implemented and which technical boundary conditions are required for that purpose.</p> <p>It shall be stated in the unit certificate which types of set-point specifications are available and which interfaces for controlling the reactive power supply of the unit. For each interface/set-point combination indicated by the manufacturer, a Q transition function over a step response shall be stated.</p> <p>11.4.11 TAR 4130: Compliance test reports for the plant certificate.</p> <p>For the plant certificate, compliance with the requirements specified in 10.2.2 shall be verified at the network connection point. Verification is done by calculation based on the component and unit certificates and on the characteristics of other equipment of the power generating plant</p>



Country	TSO	Approval for publication in the IMR	Answer
			<p>(e.g. cables, transformers). The assumed position of generator transformers, the assumed control strategy and the set-point of the controller voltage UMS shall be stated. For verification purposes, the minimum network short-circuit power SkV shall be used. The plant certificate shall include a PQ diagram each for 0,85 pu, 0,9 pu, 1,00 pu, 1,05 pu and 1,10 pu of the voltage at the network connection point showing the maximum capacity of the power generating plant which shall be evaluated for compliance with the requirements of 10.2.2. In the PQ diagrams, concrete calculations are required for at least the active power levels of 0 %, 10 %, 20 %, 90 % and 100 % of the installed active power <math>P_{inst}</math>.</p> <p>For type 1 plants and also for type 2 plants (with technical minimum power), the active power levels below the technical minimum power are negligible. In this case, the reactive power supply at the respective minimum power shall be tested.</p>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	<p>The requirements are defined in the Distribution Network Code.</p> <p>The frequency related parameters belong to the TSO (MAVIR) (e.g. LFSM mode). In case that PGMs will participate on FSM system service, they have to participate in the qualifying process.</p>
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	Not relevant.
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	N/A

Country	TSO	Approval for publication in the IMR	Answer
Poland	PSE S.A.	Yes	<p>PSE is not able to provide information about details of notification procedures for PGMs type B &amp; C.</p> <p>PSE was not qualified to be the relevant system operator for these objects (PGMs type B &amp; C can not be connected to TSO grid due to voltage criteria &gt;110kV), so these procedures were developed only among PL DSOs and may differ between each of them. DSOs were obliged to publish these procedures on their websites.</p>
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	<p>Acc. to art. 32(2)(f) the requested compliance test reports demonstrating steady-state and dynamic performance are listed in the 18 point and are related on:</p> <ul style="list-style-type: none"> <li>• P - Q – U diagram in connection point;</li> <li>• reactive power and active power control in connection point for different setpoint values;</li> <li>• LFSM;</li> <li>• FSM;</li> <li>• The capability of automatic reconnection if the case;</li> <li>• Measurements of power quality in accordance with EN 50160.</li> </ul>
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	Not applicable since REE does not handle type B and C.
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

## 3.3.12 Do you request studies demonstrating steady-state and dynamic performance acc. to art. 32(2)(g)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	No, because this type generating modules are not of system importance.
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration, most probably yes.
Hungary	MAVIR	Yes	The studies process is under development at the DSOs supported by TSO MAVIR.

Country	TSO	Approval for publication in the IMR	Answer
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	N/A
Poland	PSE S.A.	Yes	<p>PSE is not able to provide information about details of notification procedures for PGMs type B &amp; C.</p> <p>PSE was not qualified to be the relevant system operator for these objects (PGMs type B &amp; C can not be connected to TSO grid due to voltage criteria &gt;110kV), so these procedures were developed only among PL DSOs and may differ between each of them. DSOs were obliged to publish these procedures on their websites.</p>
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

## 3.3.13 Please list the requested studies demonstrating steady-state and dynamic performance acc. to art. 32(2)(g)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	<ul style="list-style-type: none"> <li>• Simulations Type B (&gt; 5 MW): <ul style="list-style-type: none"> <li>o FRT</li> <li>o Dynamic fault current (only PPM)</li> <li>o Active power recovery after fault</li> </ul> </li> <li>• Simulations Type C: <ul style="list-style-type: none"> <li>o FRT</li> <li>o Dynamic fault current (only PPM)</li> <li>o Active power recovery after fault</li> <li>o Q-capability</li> <li>o PSS/capability to dampen oscillations</li> </ul> </li> </ul>
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	No, because this type generating modules are not of system importance.
Croatia	HOPS	Yes	N/A
Czech Republic	ČEPS, a.s.	Yes	It has not been implemented by CEPS because B and C power-generating modules are connected to the DS.
Estonia	Elering AS	Yes	<p>List depends on the connecting module:</p> <p><a href="https://elering.ee/sites/default/files/public/Teenused/Liitumine/07%20-%20Requirements%20for%20the%20testing%20of%20and%20preparation%20of%20a%20testing%20plan%20for%20the%20power-generating%20modules%20of%20clients.pdf">https://elering.ee/sites/default/files/public/Teenused/Liitumine/07%20-%20Requirements%20for%20the%20testing%20of%20and%20preparation%20of%20a%20testing%20plan%20for%20the%20power-generating%20modules%20of%20clients.pdf</a></p>
Finland	Fingrid	Yes	<p>Please see sections 14, 15, 19 and 20 of VJV2018 document for modelling information and test reports (incl. validation of the models).</p> <p><a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a></p>
France	RTE	Yes	<p>Simulations are needed for:</p> <ul style="list-style-type: none"> <li>• Reactive capabilities.</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• Dynamic behaviour of voltage simulation</li> <li>• Short circuit stability.</li> <li>• Voltage stability</li> <li>• LVRT (low voltage ride through) and HVRT</li> <li>• Voltage behaviour in case of frequency variation.</li> <li>• Reactive current injection for PPM.</li> </ul>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<p>10.2.2 TAR 4130: Steady-state voltage stability/reactive power supply</p> <p>Steady-state voltage stability is to be understood as the reactive power supply by a power generating plant for the purpose of voltage stability in the extra high-voltage network. The steady-state voltage stability is intended to keep slow (steady-state) voltage changes in the extra high-voltage network within acceptable limits.</p> <p>The network transformers of the power generating plants shall be equipped with an on-load tap changer. The transmission ratios and step control ranges shall be designed to meet the requirements for reactive power capability at the network connection point over the full range of permissible operating voltage. During stepwise transformer control, a temporary reduction of the active power feed-in in favour of the reactive power supply is permissible if required for the operational stability of the power generating plant (such as overload prevention) as stated by the manufacturer.</p> <p>Active power reduction during stepwise transformer control shall be terminated as soon as possible (according to ability and condition as stated by the manufacturer) after the respective reason has been eliminated. In justified exceptional cases, transformers without tap changer can also be used. Each set-point defined by the network operator according to the required reactive power range (Figure 5 and Figure 6) shall be reachable within 4 min and operable for any length of time. Changes of the reactive power supply within the agreed reactive power range shall be possible at any time.</p> <p>Apart from the requirement regarding the time</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>to reach a set-point defined by the network operator (maximum 10 min), the sub-clauses below also give further time-related requirements regarding the control behaviour.</p> <p>In addition, the following applies to type 1 power generating plants:</p> <ul style="list-style-type: none"> <li>– The reactive power supply or consumption of the power generating plant shall be adjusted via the stepwise control of the network transformer.</li> <li>– the generator voltage control of the power generating unit shall be activated in normal operation.</li> </ul> <p>Controlling the reactive power or the power factor is not permitted.</p> <p>In addition, the following applies to type 2 power generating plants:</p> <ul style="list-style-type: none"> <li>– According to all three methods described in 10.2.2.4 a) to c), the reactive power supply refers to the fundamental component of the positive-sequence components of current and voltage. When using a passive sign convention system, this means the operation of a power generating plant in Quadrant II (under-excited) or Quadrant III (over-excited).</li> </ul> <p>With respect to the voltage change when switching compensation installations, 5.4.2 applies.</p> <p>The responsibility for dimensioning the power generating plant with regard to the required reactive power supply at the network connection point lies with the connection owner. In 10.2.2.2 and 10.2.2.3, Pb inst is generally to be used as reference quantity for the minimum requirements regarding the reactive power supply. If Pb inst &gt; PAV, E, the reference quantity to be used instead is PAV, E.</p> <p>Upon contractual agreement with the network operator, the reactive power control range may be extended for a specific project.</p> <p>--&gt; Reactive power supply at the maximum active power output of all operating power generating units</p> <p>--&gt; Reactive power supply below the maximum</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>active power output of all operating power generating units</p> <p>TAR 10.2.3 Dynamic network stability</p> <p>The objective of dynamic network stability is to prevent any unintentional disconnection of the generation power and the risk to the network stability involved in the event of short-time voltage drops or rises.</p> <p>NOTE 1 Events leading to short-time voltage drops or rises are typically network faults (short circuits) but can also have other causes. In order to improve readability, the term network fault is used hereafter.</p>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Steady state load flow simulations to demonstrate compliance with the RfG reactive power requirements.
Hungary	MAVIR	Yes	The studies process is under development at the DSOs supported by TSO MAVIR.
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	Not relevant.
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	N/A
Poland	PSE S.A.	Yes	<p>PSE is not able to provide information about details of notification procedures for PGMs type B &amp; C.</p> <p>PSE was not qualified to be the relevant system operator for these objects (PGMs type B &amp; C can not be connected to TSO grid due to voltage criteria &gt;110kV), so these procedures were developed only among PL DSOs and may differ be-</p>



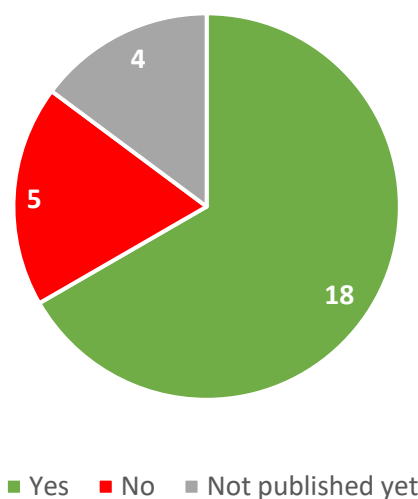
Country	TSO	Approval for publication in the IMR	Answer
			tween each of them. DSOs were obliged to publish these procedures on their websites.
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	<p>Acc. to art. 32(2)(g) the requested studies demonstrating steady-state and dynamic performance are listed in the Annex 4 (12, 13 and 18) from Operational Notification Procedure – NRA Order no. 51/2019) as follows:</p> <p>For type C studies on:</p> <ul style="list-style-type: none"> <li>- The capability to island operation – if the case;</li> <li>- The capability to provide reactive power at the connection point, including compensation of reactive power at the connection point when the active power produced is zero, the U-Q / Pmax diagram, the P-Q diagram;</li> <li>- Coordination of protection, with RSO agreement on the protection schemes at the connection point;</li> <li>- Permanent and dynamic performance at the level of detail required by RSO.</li> </ul>
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	Not applicable since REE does not handle type B and C.
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

## 3.3.14 Does your member state authority provide that power-generating module document shall be issued by an authorised certifier acc. to art. 32(6)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	No
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	Yes
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	No
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	No
France	RTE	Yes	No
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration, most probably yes.
Hungary	MAVIR	Yes	No

Country	TSO	Approval for publication in the IMR	Answer
Ireland	EirGrid	Yes	The PGMD is still under development and not published externally.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	No
Netherlands	TenneT TSO	Yes	N/A
Poland	PSE S.A.	Yes	No
Portugal	REN	Yes	Not applicable as defined in survey guide.
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	SEPS connects the Type D generators only.
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Not applicable since Svenska Kraftnät does not handle type B and C.

### 3.3.15 Is the information included in this section of the survey (Procedure for type B and C power-generating modules) publicly available in accordance with NC RfG Article 29(2)?



## 3.4 Survey on operational notification procedure for type D power-generating modules pursuant to NC RfG art. 33

### 3.4.1 Please provide the link to the details of the operational notification procedure acc. to art. 33!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	<p>The main principles are described in the national grid code (TOR Erzeuger Typ A-D), which is publicly available here:</p> <p><a href="https://www.e-control.at/recht/marktregeln/tor">https://www.e-control.at/recht/marktregeln/tor</a></p> <p>These main principles applied by all RSOs in Austria.</p> <p>Details for Type D can be also found on APGs homepage:</p> <p><a href="https://www.apg.at/de/markt/strommarkt/rechtlichkeiten">https://www.apg.at/de/markt/strommarkt/rechtlichkeiten</a></p> <p><a href="https://www.apg.at/markt/-/media/AE217A57A381421B88A3F786D9A32744.ashx">https://www.apg.at/markt/-/media/AE217A57A381421B88A3F786D9A32744.ashx</a></p>
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	<p>The connection procedure to the transmission grid includes:</p> <ul style="list-style-type: none"> <li>-- Request from the electricity producing facility to the system operator for study of the conditions and the way of connection;</li> <li>-- Statement from the system operator, containing the conditions for connection - up to 60 days after the receipt of the request;</li> <li>-- Request from the electricity producer to the system operator for concluding a preliminary contract;</li> <li>-- Preliminary contract for connection - up to 30 days after receipt of the request;</li> <li>-- Request from the electricity producer to the system operator for concluding a final contract;</li> <li>-- Final contract for connection - up to 60 days after receipt of the request;</li> <li>-- 72-hour trial operation of the connected facilities (EON);</li> </ul>

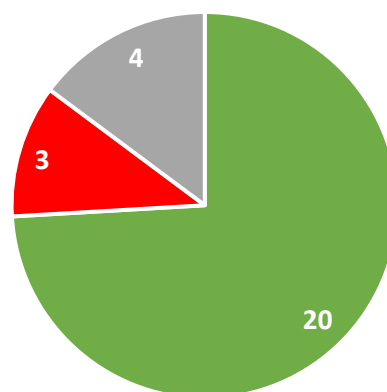
Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>-- 72-hour trial operation of individual equipment of the generating module;</li> <li>-- A written request from the system operation facility or a person authorized by him to conduct a complex 72-hour trial operation under operating conditions;</li> <li>-- 72-hour trial operation of the generating module in parallel with the electric power system (ION) + Access and transmission contracts with the system operator + Contract with a trader for the purchase of electricity;</li> <li>-- Commissioning (FON).</li> </ul>
Croatia	HOPS	No	–
Czech Republic	ČEPS, a.s.	Yes	<a href="https://www.ceps.cz/cs/kodex-ps">https://www.ceps.cz/cs/kodex-ps</a>
Estonia	Elering AS	Yes	<a href="https://elering.ee/sites/default/files/public/Teen%20used/Liitumine/01%20-%20Standard%20terms%20and%20conditions%20of%20connection%20to%20the%20electricity%20transmission%20system%20of%20Elering%20AS_2021.01.11.pdf">https://elering.ee/sites/default/files/public/Teen used/Liitumine/01%20-%20Standard%20terms%20and%20conditions%20of%20connection%20to%20the%20electricity%20transmission%20system%20of%20Elering%20AS_2021.01.11.pdf</a>
Finland	Fingrid	Yes	<a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a>
France	RTE	Yes	<p>The operational notification procedure is described in « Article 8.3.3 - Trame de procédure de contrôle de conformité pour le raccordement d'une installation de production ». The technical documentation of RTE can be found:</p> <p><a href="https://www.services-rte.com/fr/la-bibliotheque.html">https://www.services-rte.com/fr/la-bibliotheque.html</a></p>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<p>Please have a look at the answer to question 4.1.</p> <p>The details for the operational notification procedure are published in four technical requirements (extra high voltage, high voltage, medium voltage, low voltage).</p> <p>Here is the link to the "Technical requirements for the connection and operation of customer</p>

Country	TSO	Approval for publication in the IMR	Answer
			installations to the extra high voltage network (TCR extra high voltage)", published in german: <a href="https://www.vde.com/de/fnn/arbeitsgebiete/tar/tar-hoechstspannung-vde-ar-n-4130">https://www.vde.com/de/fnn/arbeitsgebiete/tar/tar-hoechstspannung-vde-ar-n-4130</a> The links is public; a download of the technical requirements is possible if purchased.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032">https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032</a>
Ireland	EirGrid	Yes	Details published to GridCode ( <a href="https://www.eirgridgroup.com/site-files/library/EirGrid/GridCodeVersion9.pdf">https://www.eirgridgroup.com/site-files/library/EirGrid/GridCodeVersion9.pdf</a> ) CC.15.10
Lithuania	LITGRID AB	Yes	<a href="https://www.litgrid.eu/uploads/files/dir519/dir25/dir1/4_0.php">https://www.litgrid.eu/uploads/files/dir519/dir25/dir1/4_0.php</a>
Luxembourg	Creos Luxembourg S.A.	Yes	No Type D power generating module connected to the Luxembourgish grid at the moment.
Netherlands	TenneT TSO	Yes	Website: <a href="https://www.netbeheernederland.nl/dossiers/regulering-20/documenten">https://www.netbeheernederland.nl/dossiers/regulering-20/documenten</a> Document: <a href="https://www.netbeheernederland.nl/_upload/Files/Regulering_20_d988538209.pdf">https://www.netbeheernederland.nl/_upload/Files/Regulering_20_d988538209.pdf</a>
Poland	PSE S.A.	Yes	PSE operational notification procedure for PGMs type D: <a href="https://www.pse.pl/documents/20182/1012700e-fb55-4159-adb8-688208fae946?">https://www.pse.pl/documents/20182/1012700e-fb55-4159-adb8-688208fae946?</a>
Portugal	REN	Yes	The Operational Notification Procedure (ONP) will be further specified in the transmission and distribution grid code, which is currently under revision by the competent regulatory authority. The main steps of ONP are already in practice for connections to transmission grid. Available link:

Country	TSO	Approval for publication in the IMR	Answer
			<a href="http://www.mercado.ren.pt/PT/Electr/ActServ/AcessoRedes/LigProd/Paginas/default.aspx">http://www.mercado.ren.pt/PT/Electr/ActServ/AcessoRedes/LigProd/Paginas/default.aspx</a>
Romania	Transelectrica - TEL	Yes	<a href="https://www.transelectrica.ro/documents/10179/9805941/Model+Accept+NFF/9e9249b7-24a1-43b1-a0bc-d2195ea6c26c">https://www.transelectrica.ro/documents/10179/9805941/Model+Accept+NFF/9e9249b7-24a1-43b1-a0bc-d2195ea6c26c</a> <a href="https://www.transelectrica.ro/documents/10179/9805941/Model+Accept+NPT/74aca2cf-c175-4e60-b157-c68c3f775af8">https://www.transelectrica.ro/documents/10179/9805941/Model+Accept+NPT/74aca2cf-c175-4e60-b157-c68c3f775af8</a> <a href="https://www.transelectrica.ro/documents/10179/9805941/Model+NFF/dac44742-ca2e-450b-8e5d-7792b38efdc3">https://www.transelectrica.ro/documents/10179/9805941/Model+NFF/dac44742-ca2e-450b-8e5d-7792b38efdc3</a> <a href="https://www.transelectrica.ro/documents/10179/9805941/Model+NFL/5f621d2f-583c-4538-a169-01449381becd">https://www.transelectrica.ro/documents/10179/9805941/Model+NFL/5f621d2f-583c-4538-a169-01449381becd</a> <a href="https://www.transelectrica.ro/documents/10179/9805941/Model+NPT/481c40d4-bf83-434b-8e10-ffb7eea42e25">https://www.transelectrica.ro/documents/10179/9805941/Model+NPT/481c40d4-bf83-434b-8e10-ffb7eea42e25</a> <a href="https://www.transelectrica.ro/documents/10179/9805941/Model+NFP/82b6dc16-33f9-4a60-b2a7-673c2790413d">https://www.transelectrica.ro/documents/10179/9805941/Model+NFP/82b6dc16-33f9-4a60-b2a7-673c2790413d</a>
Slovak Republic	SEPS	Yes	<a href="https://www.sepsas.sk/media/4672/dokument-n-tp-ucinnost-jan-2021.pdf">https://www.sepsas.sk/media/4672/dokument-n-tp-ucinnost-jan-2021.pdf</a>
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	<a href="https://www.ree.es/sites/default/files/01_ACTIVIDADES/Documentos/AccesoRed/Guia_descriptiva_del_procedimiento_de_puesta_en_servicio_V9_ene21.docx">https://www.ree.es/sites/default/files/01_ACTIVIDADES/Documentos/AccesoRed/Guia_descriptiva_del_procedimiento_de_puesta_en_servicio_V9_ene21.docx</a>
Sweden	Svenska Kraftnät	Yes	<a href="https://www.svk.se/om-kraftsystemet/legalt-ramverk/eu-lagstiftning-/natanslutning-av-generatorer-rfg/">https://www.svk.se/om-kraftsystemet/legalt-ramverk/eu-lagstiftning-/natanslutning-av-generatorer-rfg/</a>



### 3.4.2 Is the provision of the link publicly available in accordance with NC RfG Article 29(2)?



■ Yes ■ No ■ Not published yet

## 3.5 Survey on the interim operational notification (ION) for type D power-generating modules pursuant to NC RfG art. 35

### 3.5.1 Have you specified a default period for an ION or is it set individually?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes. Default is 3 months as a deadline for the PGMD owner, in order to deliver the relevant information prior to the issuing of ION, which can be used for 24 months according to NC RfG.
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	The temporary notification for operation is issued by the system operator and entitles the owner of the generating module to carry out 72 hours of trial operation.
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	It will be set individually but not longer than 24 months as prescribed by NC RfG.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	No
France	RTE	Yes	No, RET has not specify a default period for ION.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	No default period, but a maximum of 24 months is permitted. Upon request, the network operator may extend the validity of the interim type approval up to a maximum of 24 months if significant progress has been made with respect to full compliance.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet

Country	TSO	Approval for publication in the IMR	Answer
Hungary	MAVIR	Yes	There is no default period, it is set individually.
Ireland	EirGrid	Yes	Shall not be longer than 24 months.
Lithuania	LITGRID AB	Yes	ION is the same as set in the Regulation.
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	<ul style="list-style-type: none"> <li>• Default period as stated in NC RfG: 24 months</li> <li>• Optionally specified individually</li> <li>• Within a maximum of four weeks after receiving the statement of compliance of the Power Generating Facility Owner (PGFO), the RSO will respond. If the assessment of compliance is positive an ION will be granted by the RSO;</li> <li>• The PGFO shall have an ION at least one month before taking the first Generating Unit in operation;</li> </ul>
Poland	PSE S.A.	Yes	In PSE procedure validity period for ION is specified individually (in line with connection schedule specified in connection agreement), no longer than 24 months.
Portugal	REN	Yes	Art. 35(4) applies without further specifications.
Romania	Transelectrica - TEL	Yes	No, TEL did not specify a default period for an ION.
Slovak Republic	SEPS	Yes	Yes, by default 12 months.
Slovenia	ELES	Yes	It is set individually.
Spain	Red Eléctrica de España	Yes	No, the 24 months period specified in RfG is maintained.

Country	TSO	Approval for publication in the IMR	Answer
Sweden	Svenska Kraftnät	Yes	Default maximum of 24 months.

## 3.5.2 Have you specified a shorter ION validity period than the maximum (<24 months) according to art. 35(4) NC RfG or is it set individually?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	No. It might be set individually, if agreed between the RSO and the PGM owner.
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	The temporary notification for operation is issued after a written request from the generating facility or a person authorized by him for conducting a complex 72-hour test under operating conditions, with a fixed time schedule.
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	It will be set individually but not longer than 24 months as prescribed by NC RfG.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Upon receiving an interim operational notification (ION), the power generating facility owner shall have the right to operate the power generating facility and generate power to the connection point for not more than 18 months.
France	RTE	Yes	No, RET has not specified a shorter ION validity period than the maximum (<24 months).

Country	TSO	Approval for publication in the IMR	Answer
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Set individually, depending on the project.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet
Hungary	MAVIR	Yes	There is no default period, it is set individually.
Ireland	EirGrid	Yes	No
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	No. Optionally specified individually.
Poland	PSE S.A.	Yes	In PSE procedure validity period for ION is specified individually (in line with connection schedule specified in connection agreement), no longer than 24 months.
Portugal	REN	Yes	Art. 35(4) applies without further specifications.
Romania	Transelectrica - TEL	Yes	No, acc. to art. 35(4) NC RfG TEL did not specify a shorter ION validity period than the maximum (<24 months) but RSO is entitled to set a shorter validity period for ION (art. 29 – Type B/art. 48 – Type C/art. 82 – Type D from Operational Notification Procedure – NRA Order no. 51/2019).
Slovak Republic	SEPS	Yes	Yes, 12 months.

Country	TSO	Approval for publication in the IMR	Answer
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	No, the 24 months period specified in RfG is maintained.
Sweden	Svenska Kraftnät	Yes	No, it is specified to 24 months.

### 3.5.3 What is your default period during which the power-generating facility owner maintains an ION acc. to art. 35(4)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	24 months according to NC RfG.
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	72 hours.
Croatia	HOPS	Yes	0-12 months.
Czech Republic	ČEPS, a.s.	Yes	The ION default period is 24 months but according to the TSO, this period can be adjusted with regards to the reason for issuing the ION.
Estonia	Elering AS	Yes	2 years.
Finland	Fingrid	Yes	Upon receiving an interim operational notification (ION), the power generating facility owner shall have the right to operate the power generating facility and generate power to the connection point for not more than 18 months.

Country	TSO	Approval for publication in the IMR	Answer
France	RTE	Yes	No, RTE does not define default period during which the power-generating facility owner maintains an ION.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	No default period, but a maximum of 24 months is permitted. See answer to question 8.1
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	There is no default period, it is set individually.
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	24 months.
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	24 months.
Poland	PSE S.A.	Yes	In PSE procedure validity period for ION is specified individually (in line with connection schedule specified in connection agreement), no longer than 24 months.
Portugal	REN	Yes	Art. 35(4) applies without further specifications.
Romania	Transelectrica - TEL	Yes	Acc. to art. 35(3)(a) NC RfG the default period is the same with the maximum period during which the power-generating plant owner can maintain ION status and it is 24 months (art. 29 – Type B/art. 48 – Type C/art. 82 – Type D from Operational Notification Procedure – NRA Order no. 51/2019).

Country	TSO	Approval for publication in the IMR	Answer
Slovak Republic	SEPS	Yes	12 months.
Slovenia	ELES	Yes	24 months.
Spain	Red Eléctrica de España	Yes	No, the 24 months period specified in RfG is maintained.
Sweden	Svenska Kraftnät	Yes	It is specified to 24 months or until the final operational notice is issued.

## 3.5.4 Do you request an itemised statement of compliance acc. to art. 35(3)(a)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	No
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	Yes
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes



# Monitoring Report on Connection Network Codes Implementation



Final Version | 2 December 2021

Country	TSO	Approval for publication in the IMR	Answer
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	No
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Portugal	REN	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Yes

## 3.5.5 Do you request detailed technical data of the power-generating module of relevance of the grid connection acc. to art. 35(3)(b)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	Yes
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes

# Monitoring Report on Connection Network Codes Implementation



Final Version | 2 December 2021

Country	TSO	Approval for publication in the IMR	Answer
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Yes
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	Yes
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Portugal	REN	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Spain	Red Eléctrica de España	Yes	Yes
Sweden	Svenska Kraftnät	Yes	Yes

## 3.5.6 Please list the requested technical data of the power-generating module of relevance of the grid connection acc. to art. 35(3)(b)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	A template of all relevant technical data can be found in “TOR Erzeuger Typ D” (Annex A7) <a href="https://www.e-control.at/recht/marktregeln/tor">https://www.e-control.at/recht/marktregeln/tor</a>
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	Detailed technical data for the generating module (rated electrical parameters, reactants, time constants, stability parameters), factory data for power step-up transformers are required, rated power, rated voltage, short circuit voltage), executive drawings, characteristics and test reports and settings at the request of the network operator. A declaration is required for the presence of trained operational electrical personnel who are familiar with the requirements of the relevant regulations and a list of operational personnel who will make contacts with the system operator.
Croatia	HOPS	Yes	N/A
Czech Republic	ČEPS, a.s.	Yes	The list of the requested technical data of the power-generating module of relevance of the grid connection acc. to art. 35(3)(b) will be set individually according the the specific power generating module to be connected to TS during

Country	TSO	Approval for publication in the IMR	Answer
			the connection process.
Estonia	Elering AS	Yes	<p>3 Content of the electrical part project</p> <p>3.1 The design of the consumption-oriented electrical part project must include the following:</p> <p>3.1.1 Primary part:</p> <p>3.1.1.1 The primary part of the electrical part project must include the following:</p> <p>3.1.1.1.1 General – short description;</p> <p>4</p> <p>3.1.1.1.2 The primary scheme up to the connection point;</p> <p>3.1.1.1.3 A one-line diagram of the electrical installation up to the connection point, showing new and existing production units, reactive energy compensation devices, intermediate transformers, distribution and protection devices and cables and connections with nominal data;</p> <p>3.1.1.1.4 110 kV or 330 kV power transformers with basic parameters and a FAT report;</p> <p>3.1.1.1.5 Sections of the client's 110 kV or 330 kV bays and bus arrangements if the client's electrical installation is connected to the connection point of the TSO directly through bus arrangement;</p> <p>3.1.1.1.6 The results of measuring and calculating the contact voltage and step voltage (if the earthing loop of the client's electrical equipment is electrically connected to the earthing loop of the substation or line of the TSO). The source data (shortcircuit values) required for the calculations shall be provided by the TSO;</p> <p>3.1.1.1.7 When connecting to the 110-330 kV cable:</p> <p>3.1.1.1.7.1 Cable length;</p> <p>3.1.1.1.7.2 Longitudinal profile, including intersections with other structures;</p> <p>3.1.1.1.7.3 Cable brand with electrical parameters;</p> <p>3.1.1.1.7.4 Drawing of the connection to the cable entry and connection point, also showing sections of the cable location;</p> <p>3.1.1.1.7.5 Position plan of the client's electrical</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>installation in the protection zone of the TSO's electrical installation.</p> <p>3.1.1.1.8 When connecting to the 110-330 kV overhead line:</p> <p>3.1.1.1.8.1 Position plan and longitudinal profile of the client's electrical installation in the protection zone of the TSO's electrical installation;</p> <p>3.1.1.1.8.2 Support types (including support drawing);</p> <p>3.1.1.1.8.3 Line wire and lightning rope with electrical parameters;</p> <p>3.1.1.1.8.4 PSS/E model and PSCAD model shall be provided if the capacity of the electricity consumer to be connected to the single grid is over 10 MW.</p> <p>3.1.2 Secondary part:</p> <p>3.1.2.1 The secondary part of the project must include at least:</p> <p>3.1.2.1.1 A diagram of the arrangement of the main and reserve relays of an electrical installation with a voltage of 110 or 330 kV, including a power transformer, along with measuring transformers, where the connections between the devices and the types of relays are also shown;</p> <p>3.1.2.1.2 Relay protection and automatic system settings, which are needed to achieve cooperation of the client's and TSO's relays from the client's device to the connection point;</p> <p>5</p> <p>3.1.2.1.3 Control and automation in accordance with the connection conditions guide 'Data exchange requirements related to the client's electrical installation';</p> <p>3.1.2.1.4 Data communication parameters, IP addresses (static VPN of the concentrator, IP (RTU etc. of the devices requested by SCADA) on the side of the energy system control centre (SCADA) with a communication connection diagram and an explanatory note;</p> <p>3.1.2.1.5 RTU data volumes (measurements, controls and position signals);</p> <p>3.1.2.1.6 Guaranteed measurement accuracies.</p> <p>3.2 When connecting power-generating modules and mixed installations and changing their consumption and/or production conditions, the</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>client must submit a production-oriented electrical part project, in the frame of which the submitted consumption-oriented design has to be supplemented if due to the changes in the client's electrical installation the data submitted in the consumption-oriented project have changed. In addition, the production-oriented project must include the following:</p> <p>3.2.1 An explanatory note if the submitted project has differences compared with the previously submitted consumption-oriented project;</p> <p>3.2.2 A position plan with the coordinates of the client's energy park module (on a scale of 1:200).</p>
Finland	Fingrid	Yes	<p><a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a></p> <p>Please see VJV2018 Tables 7.2-7.4</p>
France	RTE	Yes	<p>The needed data are described on Fiche F1 of « Article 8.3.3 - Trame de procédure de contrôle de conformité pour le raccordement d'une installation de production » which can be found: <a href="https://www.services-rte.com/fr/la-bibliotheque.html">https://www.services-rte.com/fr/la-bibliotheque.html</a></p>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<p>Data is requested during the grid connection request:</p> <p>Technical data of the generator/turbo generator set for each generating unit</p> <ul style="list-style-type: none"> <li>- Rated voltage [kV]</li> <li>- Rated apparent power at the generator terminals under standard conditions [MVA].</li> <li>- Rated active power at the generator terminals under standard conditions [MW].</li> <li>- Maximum active power of the turbo generator set at the generator terminals at full load [MW].</li> <li>- Minimum active power of the turbogenerator set at the generator terminals [MW].</li> <li>- Load increase rate of the turbo generator set from minimum to maximum power output [MW/min].</li> <li>- Load reduction rate of the turbo generator set from maximum to minimum power output [MW/min].</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>- Range of the load factor of the turbo generator set, inductive and capacitive (<math>\cos \phi</math>)</li> <li>- Generator operation diagram</li> <li>- Generator data for dynamic simulations: <ul style="list-style-type: none"> <li>- Reactances (unsaturated): <math>x_d, x_q</math> [%].</li> <li>- Reactances (unsaturated and saturated): <math>x_d', x_d'', x_q', x_q'', x_a</math> [%]</li> <li>- Ohmic resistance of the stator: <math>r_a</math> [%]</li> <li>- Time constants: <math>T_d'', T_d', T_q'', T_q'</math> [sec].</li> <li>- Start-up time constant <math>T_A</math> of the entire shaft train of the turbo set [sec].</li> </ul> </li> <li>- Generator-controller block diagrams suitable for simulation calculations of grid faults (turbine controller with power and speed controller, frequency statics, valve representation and turbine representation of the various pressure stages, load jump relay or acceleration protection, voltage controller with PSS, underexcitation and overexcitation limitation, stator current limitation, etc.).</li> <li>Technical data of the machine, auxiliary power and reserve power transformers <ul style="list-style-type: none"> <li>- Rated transformation ratio [kV/kV]</li> <li>- Rated apparent power [MVA]</li> <li>- vector group</li> <li>- Relative short-circuit voltage at minimum, maximum and medium stage position [%]</li> <li>- Relative no-load current [%]</li> <li>- Short-circuit active losses (copper losses) [kW]</li> <li>- No-load active losses (iron losses) [kW]</li> <li>- Step adjuster range in both directions [%]</li> <li>- Number of stages of the tap changer in both directions</li> <li>- Type of tap changer (under load, no-load)</li> <li>- Zero sequence impedances [W]</li> <li>- Star point treatment</li> <li>- If required: neutral point impedance</li> </ul> </li> <li>Technical data for cables/overhead lines of the feed-in, auxiliary and reserve network connections <ul style="list-style-type: none"> <li>- Nominal voltage [kV]</li> <li>- Specific values of resistivity, reactance and susceptance of the co-system [W/km].</li> <li>- Specific values of resistance, reactance and susceptance of the zero-sequence system</li> </ul> </li> </ul>



Country	TSO	Approval for publication in the IMR	Answer
			<p>[W/km].</p> <ul style="list-style-type: none"> <li>- Length of the respective connection lines to the grid connection points [km].</li> </ul> <p>Technical data of the auxiliary power system</p> <ul style="list-style-type: none"> <li>- Active and reactive power demand for generator operation [MW, MVar].</li> <li>- Active and reactive power demand during plant standstill [MW, MVar].</li> <li>- Active and reactive power demand during start-up [MW, MVar].</li> <li>- RMS value of the power plant-side contribution to the initial short-circuit alternating current for the feed-in, auxiliary and reserve grid connections in the event of a three-phase fault at the grid connection points (without generator) [kA].</li> </ul>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	PGM and transformer data sheets, MV/LV feeder network conductors data.
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/239793359/Generator_Data_ENG.pdf/740d9568-443a-d291-e945-74b004efe424?t=1624890701110">https://www.mavir.hu/documents/10258/239793359/Generator_Data_ENG.pdf/740d9568-443a-d291-e945-74b004efe424?t=1624890701110</a>
Ireland	EirGrid	Yes	<a href="http://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-compliance-test/compliance-testing/index.xml">http://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-compliance-test/compliance-testing/index.xml</a>
Lithuania	LITGRID AB	Yes	Detail electric parameters: impedances, nominal power, active and reactive power output, relay protection settings.
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	<p>As described in chapter 13 of the Netcode elektriciteit. Structural data:</p> <ul style="list-style-type: none"> <li>a) In-service date</li> <li>b) Connection point nominal voltage</li> <li>c) Primary energy source</li> <li>d) Maximum capacity</li> <li>e) Minimum and maximum active power</li> <li>f) Voltage controller type</li> <li>g) Voltage and reactive power regulating capacity</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			h) Rated auxiliary power i) Data and models needed for dynamic simulations j) Data needed for short-circuit analysis k) Step-up transformer data l) FCR data m) FRR data n) HV-network recovery related data
Poland	PSE S.A.	Yes	Requested data is site specific, so we did not provide list of requested technical data. These data should include: a) generator data b) converter data (for PPMs) c) transformer data d) HV line data e) HV switchgear data f) AUX system data g) sensors data h) control unit data i) emergency power supply data
Portugal	REN	Yes	Including, but not limited to, the specific design characteristics of the installation, equipment, command, control, protection, measurement and counting systems. Also a simulation model.
Romania	Transelectrica - TEL	Yes	The technical data submitted by the applicant contains at least: - rated active power; - single line diagram; - minimum and maximum active and reactive power; - admissible frequency range, RoCoF; - LFSM and FSM capability; - FRT diagram including Fast fault current injection; - P-Q diagram; - Schema of main controllers (speed, AVR, voltage in connection point, active and reactive power).
Slovak Republic	SEPS	Yes	Nominal capacity, Maximum capacity at the connection point, power generating module parameters, excitation system, P/Q diagram, parameters of PSS, parameters of voltage controller, parameters of the the turbines, data about power plant auxiliary system, step up transformers,

Country	TSO	Approval for publication in the IMR	Answer
			connection lines, power plant flow diagram.
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	This information can be found in this link: <a href="https://www.ree.es/sites/default/files/12_CLIENTES/Documentos/Formulario_Generacion_Renovable_Res_e_HidRev_T243_(Puesta_en_servicio)_Ed7.0.xlsm">https://www.ree.es/sites/default/files/12_CLIENTES/Documentos/Formulario_Generacion_Renovable_Res_e_HidRev_T243_(Puesta_en_servicio)_Ed7.0.xlsm</a>
Sweden	Svenska Kraftnät	Yes	Reactive power capability, section 2.1 and 2.2 in attachment 3 Active power capability at frequencies below 50 HZ, section 2.3 in attachment 3 Protections and settings, sections 3.1-3.4 in attachment 3 Limitations in the voltage controller, section 3.5 in attachment 3 Automatic disconnection due to voltage variations, section 3.6 in attachment 3 Robustness to fast frequency variations, section 3.7 in attachment 3 Available magnetizing power, section 3.8 in attachment 3 Robustness to voltage variations and/or frequency variations, sections 3.9-3.11 in attachment 3 Reconnection to the power system and synchronization, sections 4.1-4.4 in attachment 3 Active power control, including local backup control, sections 5.1-5.4 in attachment 3 Information exchange, section 6.1 in attachment 3 Real time monitoring, section 6.2 in attachment 3 Monitoring and fault registration, section 6.3 in attachment 3

## 3.5.7 Do you request equipment certificates issued by an authorised certifier in respect of power-generating modules acc. to art. 35(3)(c)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	No
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	If the equipment is of a new type, unknown to the system operator.
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	Yes, but we do not expect that equipment certificates fully replace the compliance tests and simulations.
Estonia	Elering AS	Yes	If the customer wishes.
Finland	Fingrid	Yes	No
France	RTE	Yes	RTE asks for certifications, but they are delivered and signed by the PGM owner.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Most probably yes.
Hungary	MAVIR	Yes	MAVIR expects the manufacturer test plan and result of the test (the test accomplished by producer at the manufacturer facility and on site test as well).

Country	TSO	Approval for publication in the IMR	Answer
Ireland	EirGrid	Yes	No but may be submitted by user if they wish.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	Optional
Poland	PSE S.A.	Yes	Yes
Portugal	REN	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	Yes
Sweden	Svenska Kraftnät	Yes	Not by default.

## 3.5.8 Please list the requested equipment certificates issued by an authorised certifier in respect of power-generating modules acc. to art. 35(3)(c)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Equipment certificates can be optionally delivered. Examples --> generator, main transformer, bus bar, controller models , etc.
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	Certificates for wind turbine equipment are required.
Croatia	HOPS	Yes	N/A
Czech Republic	ČEPS, a.s.	Yes	No specific list of the equipment certificates has been issued since we do not expect that equipment certificates fully replace the compliance tests and simulations.
Estonia	Elering AS	Yes	There is no certain list. PGM owner and certifying company make an proposal and TSO reviews it.
Finland	Fingrid	Yes	None
France	RTE	Yes	RTE asks for certification, but provided by the PGM owner.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Generator, main circuit breaker, main transformer, tap changer (if available), speed controller, voltage controller, protection relais for grid relevant protection systems.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	The certificates are needed for: - Synchronous generator - Step-up (main) transformer - Inverter

Country	TSO	Approval for publication in the IMR	Answer
Ireland	EirGrid	Yes	N/A
Lithuania	LITGRID AB	Yes	Not relevant.
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	Optional.
Poland	PSE S.A.	Yes	<p>If it comes to PSE detailed information on equipment certificates is specified in separate document “Conditions and procedures for the use of certificates in the process of connecting power generating modules to power grids” (<a href="http://ptpiree.pl/documents/opracowania/kodeksy_sieci/2021_04_26/20210426_zasady-wykorzystania_certyfikatow_v.1.2.pdf">http://ptpiree.pl/documents/opracowania/kodeksy_sieci/2021_04_26/20210426_zasady-wykorzystania_certyfikatow_v.1.2.pdf</a>):</p> <ul style="list-style-type: none"> <li>• LFSM-O</li> <li>• LFSM-U</li> <li>• Reactive Power Capability</li> <li>• FRT</li> <li>• Fast Fault Current Injection</li> <li>• Post Fault Active Power Recovery</li> <li>• Frequency Ranges</li> <li>• ROCOF</li> <li>• Active Power Reduction and Cease Active Power</li> </ul>
Portugal	REN	Yes	The owner must submit a statement from the manufacturer of the equipment stating that it ensures the capabilities and operating conditions established in Regulation (EU) 2016/631 and national implementation, according to the form made available by the TSO, attaching the relevant equipment certificates to support this declaration.
Romania	Transelectrica - TEL	Yes	Equipment certificates must be issued by an accreditation certification body – authorised certifier. The Equipment certificates must contain test results. The Equipment certificates must include

Country	TSO	Approval for publication in the IMR	Answer
			at least: <ul style="list-style-type: none"> <li>• P - Q capability curve;</li> <li>• fault-ride-through with Fast fault current injection;</li> <li>• RoCoF;</li> <li>• LFSM;</li> <li>• FSM;</li> <li>• Frequency range;</li> <li>• Capability of automatic reconnection of the power generating unit at voltage variations;</li> <li>• Power quality in accordance with EN 50160 in force;</li> </ul> Response to different active and reactive power setpoints.
Slovak Republic	SEPS	Yes	Not specified.
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	Only compulsory before the issuance of the FON. Before the issuance of the FON, it is requested a PGM certificate according to NTS (Spanish technical standard for compliance) <a href="https://api.esios.ree.es/documents/628/download?locale=es">https://api.esios.ree.es/documents/628/download?locale=es</a>
Sweden	Svenska Kraftnät	Yes	Equipment certificates are not used, however compliance certificate shall be issued by the connecting entity.

## 3.5.9 Do you request simulation models acc. to art. 35(3)(d)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	If requested by TSO.
Belgium	ELIA GROUP	No	—



Country	TSO	Approval for publication in the IMR	Answer
Bulgaria	ESO EAD	Yes	If the equipment is of a new type, missing from the system operator's software library.
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Yes, but still under consideration.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	Yes
Luxembourg	Creos Luxembourg S.A.	Yes	N/A

Country	TSO	Approval for publication in the IMR	Answer
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Portugal	REN	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	Yes
Sweden	Svenska Kraftnät	Yes	Yes

## 3.5.10 Please list the requested simulation models acc. to art. 35(3)(d)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	<p>Examples:</p> <ul style="list-style-type: none"> <li>• Sub-models, depending on the existence of the individual components:</li> <li>• Alternator and prime mover,</li> <li>• Speed and power control,</li> <li>• Voltage control, including, if applicable, power system stabiliser ('PSS') function and excitation control system,</li> <li>• Power-generating module protection models</li> <li>• Converter models for power park module.</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	Of interest are simulation models of park modules of a new type, power storage systems, excitation and PSS systems of synchronous modules.
Croatia	HOPS	Yes	N/A
Czech Republic	ČEPS, a.s.	Yes	The simulation models will be required individually according to the parts and complexity of the TS connected power generating modules.
Estonia	Elering AS	Yes	5 MW PSSE and 10 MW PSCAD.
Finland	Fingrid	Yes	<p>Generally, PSS/E 35 load flow and dynamic model is required. If not available, PSS/E 33 model is accepted. For converter connected facilities over 60 MW, PSCAD model is required for SSO studies. Please see sections 15 and 20 of VJV2018 document for modelling information.</p> <p><a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a></p> <p>And for SSO (Subsynchronous oscillation) studies:</p> <p><a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/specific-study-requirements-for-power-park-modules-connected-in-vicinity-of.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/specific-study-requirements-for-power-park-modules-connected-in-vicinity-of.pdf</a></p>
France	RTE	Yes	RTE asks for static, EMT and RMS simulation models.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Detailed and aggregated models of the PGM.
Greece	Independent Power Transmission	Yes	WECC generic models for PE connected PPMs IEEE compatible models for SPGMs.

Country	TSO	Approval for publication in the IMR	Answer
	Operator S.A. (IPTO S.A.)		
Hungary	MAVIR	Yes	<p>SPGM:</p> <ul style="list-style-type: none"> <li>- subtransient level generator model</li> <li>- AVR</li> <li>- governor model</li> </ul> <p>PPM:</p> <ul style="list-style-type: none"> <li>- renewable generator model</li> <li>- generic renewable electrical control model</li> </ul> <p>Remark: the required model is based on PSS/E</p>
Ireland	EirGrid	Yes	As per RfG, EirGrid requests steady state and dynamic models of the facility including all relevant sub-models, such as governor, excitation system, stabiliser etc., and we also look for drive train parameters for new generators. EirGrid does not look for EMT models for synchronous machines.
Lithuania	LITGRID AB	Yes	A detailed dynamic mathematical model for all control methods, according to the parameter values indicated in the connection requirements as well block diagrams of the control system operation describing the operations in detail shall be provided for the TSO. The mathematical model must be verified by simulating parameter changes that must be compared to the actual measured results. The results shall be documented in the verification report and submitted along with the compliance verification report.
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	<p>Full detail simulation model of the PGM up to the Connection Point, including individual Generating Units.</p> <p>Transformers, inter-array cabling (in case of a PPM or OPPM), step-up transformer(s), high voltage cables, reactive power compensation equipment (if any), FACTS (if any), and PGM controllers and other active components.</p> <p>For SPGM: Dynamic simulation models of exciter, governor, power system stabiliser and any other</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>limiters or controls shall be described by means of generic terms and parameters given by IEC and IEEE series</p> <p>For PPM and for OPPM: Full detail simulation model of Generating Unit and PPM controller and any other active component for load flow, short-circuit, harmonic (up to the 50<sup>th</sup> harmonic order) and dynamic simulations including manual and model controller settings to be applied shall be supplied;</p> <p>Aggregation of Power-Generating Facility for the simulation model: The power flow simulation models, fault current simulation models and dynamics simulation models of each Power-Generating Facility shall be delivered as an entity compiled into a minimum number of single equivalent generators; The model shall cover – alongside the equivalent generators – the transformers needed to connect the generators and the Power-Generating Facility to the power system; This aggregation level should be adequate for the optimal use of the dynamic simulation models for Generating Unit and PPM controller; the aggregated model shall be described by means of generic terms and parameters given by IEC 61400-27 series; All models shall be delivered in latest versions of both PSS/E and PowerFactory format; Report on validation of simulation models shall be supplied.</p>
Poland	PSE S.A.	Yes	<p>According to Art. 15.6.c RfG simulation models should shall contain the following sub-models, depending on the existence of the individual components:</p> <ul style="list-style-type: none"> <li>• Alternator and prime mover,</li> <li>• Speed and power control,</li> <li>• Voltage control, including, if applicable, power system stabiliser ('PSS') function and excitation control system,</li> <li>• Power-generating module protection models, as agreed between the relevant system operator and the power- generating facility owner, and</li> <li>• Converter models for power park modules.</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
Portugal	REN	Yes	The owner must present a valid simulation model for each generator module (systemic model representative of the generator module at the connection point to the grid for the purpose of studies in steady state, dynamic regime and short circuits), as well as the results of the simulations. The model must be presented in a specific software format, and supporting documentation must also be provided that briefly explains the block diagrams that make up the respective model. The TSO has the right to verify that the generator module meets the required requirements and must provide the owner with the technical data necessary for the creation of Thevenin equivalents of the network at the generator module connection point, specifically the current values of short circuit and X/R ratios at the generator module connection point.
Romania	Transelectrica - TEL	Yes	Acc. to art. 35(3)(d) the requested simulation models are: - Simulations on validated models provided by authorised certifiers; - Validated models with specific values of parameters and range of parameters setting, in aim to integrate them in our own models and simulations.
Slovak Republic	SEPS	Yes	Synchronnous/asynchronnous module, step up transformers, voltage regulator, stator current limiter, rotor current (overexcitation) limiter, underexcitation limiter, model of turbine.
Slovenia	ELES	Yes	<a href="https://www.eles.si/Portals/0/Documents/Zahteve%20in%20priporočila%20za%20simulacjske%20modele.pdf">https://www.eles.si/Portals/0/Documents/Zahteve%20in%20priporočila%20za%20simulacjske%20modele.pdf</a>
Spain	Red Eléctrica de España	Yes	Only compulsory before the issuance of the FON. The simulation models could be either for: - Compliance simulations: not requested on purpose, just to be used by the certification entities to demonstrate compliance with requirements - System studies: the conditions and list of models is exhaustively provided in operation procedures number 9: <a href="https://www.ree.es/sites/default/files/01_ACTIVI">https://www.ree.es/sites/default/files/01_ACTIVI</a>

Country	TSO	Approval for publication in the IMR	Answer
			<a href="#">DADES/Documentos/ProcedimientosOperacion/BOE-A-2019-18275_ministerio_para_la_transicion_ecologica.pdf</a>
Sweden	Svenska Kraftnät	Yes	PSS-E model specified by the grid owner (a specific set of data detailed by Svenska kraftnät shall be provided), see section 2.1 in attachment 4. A detailed electro magnetic transient model is requested when needed depending on the grid conditions, see section 2.2 in attachment 4. All models used in the simulation studies that verifies that the power generating module fulfils the requirements in RfG. A model validation report that validates simulated response against measured response shall be provided, see section 2.3 in attachment 4.

## 3.5.11 Do you request studies demonstrating steady-state and dynamic performance acc. to art. 35(3)(e)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	If necessary, studies proving dynamic characteristics and indicators are required, or the necessary data are required to perform the study by a system operator.
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Yes, but the precise list is under consideration.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Portugal	REN	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes



Country	TSO	Approval for publication in the IMR	Answer
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Yes

## 3.5.12 Please list the requested studies demonstrating steady-state and dynamic performance acc. to art. 35(3)(e)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	General stability studies during early planning phase: • Simulations Type D: FRT Dynamic fault current (only PPM) Active power recovery after fault Q-capability PSS/capability to dampen oscillations
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	Studies related to the analysis of the contribution of wind and photovoltaic park modules to short-circuit currents are required.
Croatia	HOPS	Yes	-
Czech Republic	ČEPS, a.s.	Yes	Currently the decree for connection (legal document issued by NRA) allows system operators to ask for study for connection. In the framework of study for connection types of studies can be specified.

Country	TSO	Approval for publication in the IMR	Answer
Estonia	Elering AS	Yes	<p>5.7 Studies covered by the report (this list is not exhaustive):</p> <p>5.7.1 An overview of the connected electrical installation;</p> <p>5.7.2 The possibility of loading the electrical installation based on the ambient temperature and other temperatures;</p> <p>5.7.3 The active and reactive power flows of the power-generating module occur at different operating points and the accompanying voltage changes in the internal network of the production unit and at the connection point;</p> <p>5.7.4 PQ curves for the power-generating module and production unit;</p> <p>5.7.5 Simulation of different points on the U-Q/Pmax graph according to RfG requirements;</p> <p>5.7.6 A description of control functions;</p> <p>5.7.7 Frequency control capability;</p> <p>5.7.8 Active power control capability;</p> <p>5.7.9 Voltage control capability;</p> <p>5.7.10 Reactive power control capability;</p> <p>5.7.11 The effect of the excitation controller;</p> <p>5.7.12 Power system stabiliser adjustment and operation;</p> <p>5.7.13 The ability to pass the fault-ride;</p> <p>5.7.14 An analysis of the electricity quality of the power-generating module and compliance with the limit values;</p> <p>5.7.15 An analysis of harmonics according to the impedance characteristics issued by the TSO;</p> <p>5.7.16 Selection of filter parameters, impact analysis (if filters are used to attenuate harmonics);</p> <p>5.7.17 Mains overvoltages;</p> <p>5.7.18 Transient and temporary overvoltages;</p> <p>5.7.19 Lightning surges;</p> <p>5.7.20 Ferroresonance;</p> <p>5.7.21 Insulation coordination;</p> <p>5.7.22 Sub-synchronous oscillation processes, possible countermeasures;</p> <p>5.7.23 Blind start analysis;</p> <p>5.7.24 The effect of relay protection and automation;</p> <p>5.7.25 Noise study.</p>

Country	TSO	Approval for publication in the IMR	Answer
			5.8 The exact scope of the study will depend on the technology and location of the connected installation in the electricity system and will be agreed with the TSO.
Finland	Fingrid	Yes	<p>Please see sections 14, 15, 19 and 20 of VJV2018 document for modelling information and test reports (incl. validation of the models).</p> <p><a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a></p>
France	RTE	Yes	<p>Simulations are needed for:</p> <ul style="list-style-type: none"> <li>• Reactive capabilities.</li> <li>• Dynamic behaviour of voltage simulation</li> <li>• Short circuit stability.</li> <li>• Voltage stability</li> <li>• LVRT (low voltage ride through) and HVRT</li> <li>• Voltage behaviour in case of frequency variation. Reactive current injection for PPM.</li> </ul>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<p>11.2.4 TAR 4130: Compliance test reports for the unit:</p> <p>The capacity of power generating units to supply reactive power shall be stated as a function of the active power in the unit certificate in the form of PQ diagrams taking into consideration the voltage limits. The respective voltage level or terminals to which the capacity applies shall be indicated. For the voltage range for continuous operation declared by the manufacturer, the unit certificate shall state the maximum control ranges of reactive power for the under-excited and over-excited ranges as a function of the active power feed-in. Proof may be provided in the form of a manufacturer declaration. Manufacturer indications regarding the reactive power capacity shall be verified by measurement for the maximum under-excited and the maximum over-excited range as a function of the active power feed-in at the power generating unit. The voltage at the time of measurement shall be taken into account for the verification. The measured reactive power capacity of the power generating unit shall be equal to or greater than the value indicated by</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>the manufacturer. Manufacturer indications regarding the voltage dependence of the reactive power capacity shall be verified by measurements on at least two relevant operating points for the under-excited reactive power range and on at least two relevant operating points for the over-excited reactive power range. Transfer of the measurement results in accordance with item 3 of 11.2.1 is permitted for these verifications of the voltage dependence. Where one of the reactive power methods in accordance with 10.2.2.4 is present in the power generating unit, the control function shall be verified on the level of the power generating unit. In such cases, it shall be verified in the unit certificate that the requirements specified in 10.2.2.4 and Annex C.2 can be implemented and which technical boundary conditions are required for that purpose. It shall be stated in the unit certificate which types of set-point specifications are available and which interfaces for controlling the reactive power supply of the unit. For each interface/set-point combination indicated by the manufacturer, a Q transition function over a step response shall be stated.</p> <p>11.4.11 TAR 4130: Compliance test reports for the plant certificate. For the plant certificate, compliance with the requirements specified in 10.2.2 shall be verified at the network connection point. Verification is done by calculation based on the component and unit certificates and on the characteristics of other equipment of the power generating plant (e.g. cables, transformers). The assumed position of generator transformers, the assumed control strategy and the set-point of the controller voltage UMS shall be stated. For verification purposes, the minimum network short-circuit power <math>S_{KV}</math> shall be used. The plant certificate shall include a PQ diagram each for 0,85 pu, 0,9 pu, 1,00 pu, 1,05 pu and 1,10 pu of the voltage at the network connection point showing the maximum capacity of the power generating plant which shall be evaluated for compliance with the requirements of 10.2.2. In the PQ diagrams, concrete calculations are required for at least the active power levels of 0 %, 10 %, 20 %, 30 %, 40 %, 50 %, 60 %, 70 %, 80 %, 90 % and 100 %.</p>

Country	TSO	Approval for publication in the IMR	Answer
			90 % and 100 % of the installed active power Pinst. For type 1 plants and also for type 2 plants (with technical minimum power), the active power levels below the technical minimum power are negligible. In this case, the reactive power supply at the respective minimum power shall be tested. In addition, the reactive power exchange at the network connection point while the power generating plant is operated within the range between 0 and 0,10 Pinst shall be stated and evaluated for compliance with the requirements of 10.2.2.3. A reactive power control range of the power generating plant exceeding the reactive power value of 0,05 Pinst in the under-excited range or, respectively, 0,00 Pinst (e.g. STATCOM)
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Static load flows for rfg rective power requirements for both PPMs and SPGMs, transient (angle) stability studies for SPGMs.
Hungary	MAVIR	Yes	According to RfG Article 53.
Ireland	EirGrid	Yes	EirGrid looks for studies in the areas of: Fault Ride Through, LFSM-O, LFSM-U, FSM, Load Rejection, Reactive Capability, Power System Stabiliser.
Lithuania	LITGRID AB	Yes	Not relevant.
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	LFSM-O, LFSM-U, FSM, Black-start capability (if applicable), Reactive power capability, Island operation (if applicable), Fault-Ride-Through type D, Post fault active power recovery, Power Oscillation Damping Control (if applicable), Fast fault current injection, Synthetic inertia (if applicable), Power quality: rapid voltage change, flicker emissions, harmonics, Insulation coordination.
Poland	PSE S.A.	Yes	Requested studies demonstrating steady-state and dynamic performance are in line with

Country	TSO	Approval for publication in the IMR	Answer
			<p>Chapter 5, 6 or 7 of Title IV RfG:</p> <p>sPGMS:</p> <ul style="list-style-type: none"> <li>• LFSM-O response simulation</li> <li>• FRT simulation capability</li> <li>• Post fault active power recovery simulation</li> <li>• LFSM-U response simulation</li> <li>• FSM response simulation • island operation simulation • reactive power capability simulation</li> <li>• Power oscillations damping control simulation</li> </ul> <p>PPMs and oPPMs:</p> <ul style="list-style-type: none"> <li>• LFSM-O response simulation</li> <li>• Fast fault current injection simulation</li> <li>• FRT simulation capability</li> <li>• Post fault active power recovery simulation</li> <li>• LFSM-U response simulation</li> <li>• FSM response simulation • island operation simulation</li> <li>• Capability of providing synthetic inertia simulation</li> <li>• Reactive power capability simulation • power oscillations damping control simulation</li> </ul>
Portugal	REN	Yes	<p>Response in LFSM-O, LFSM-U, FSM mode. Fast fault current injection for symmetrical three-phase faults. Ability to support FRT and active power recovery. Island operation (when applicable). Provision of synthetic inertia (when applicable). Reactive injection/absorption capacity and automatic control damping control of power swings (when applicable).</p>
Romania	Transelectrica - TEL	Yes	<p>The network study for calculating the Q requirement at the connection point, the dynamic regime study to determine the measures to avoid or assure island operation and studies on coordination of protection, with RSO agreement on the protection schemes at the connection point (Annex 6(13, 14 and 19) from Operational Notification Procedure – NRA Order no. 51/2019).</p>
Slovak Republic	SEPS	Yes	Not requested.

Country	TSO	Approval for publication in the IMR	Answer
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	Not applicable, since these studies are performed by the TSO based on the data (e.g. dynamic model) provided by the PGM.
Sweden	Svenska Kraftnät	Yes	LFSM-O, section 3.1 in attachment 5. LFSM-U, section 3.2 in attachment 5. FSM, section 3.3 in attachment 5. Active power controllability and control range including response time, sections 3.4-3.6 in attachment 5. Trip to house-load operation, section 3.7 in attachment 5. Voltage control, sections 4.1-4.2 in attachment 5. PSS, section 4.3 in attachment 5. Fault-ride-through capability, section 5.1 in attachment 5. Post-fault active power recovery, section 5.2 in attachment 5. Limiters, sections 6.1-6.4 in attachment 5.

## 3.5.13 Do you request details of the intended compliance tests acc. to art. 35(3)(f)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	Generating modules of system importance require test reports and test results.
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	Yes

# Monitoring Report on Connection Network Codes Implementation



Final Version | 2 December 2021

Country	TSO	Approval for publication in the IMR	Answer
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Set individually, depending on the project.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	Yes
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Portugal	REN	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes



Country	TSO	Approval for publication in the IMR	Answer
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	Yes
Sweden	Svenska Kraftnät	Yes	Yes

## 3.5.14 Please list the requested details of the intended compliance tests acc. to art. 35(3)(f)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	<p>Type D:</p> <ul style="list-style-type: none"> <li>• Tests: <ul style="list-style-type: none"> <li>o LFSM-O and LFSM-U</li> <li>o Q-capability and controllability</li> <li>o Re-synchronisation time &lt; 15 min (or operation at houseload)</li> </ul> </li> <li>• Optional: <ul style="list-style-type: none"> <li>o FSM --&gt; optional, only in case of prequalification</li> <li>o Frequency restoration --&gt; optional, only in case of prequalification</li> <li>o Synthetic inertia --&gt; optional</li> </ul> </li> <li>• Only if there is an agreement, that power plant is relevant for system restoration <ul style="list-style-type: none"> <li>o Island operation</li> </ul> </li> </ul> <p>Black start capability</p>
Belgium	ELIA GROUP	No	—

Country	TSO	Approval for publication in the IMR	Answer
Bulgaria	ESO EAD	Yes	Protocols of tests and trials concerning participation in primary regulation, secondary regulation, voltage regulation, suppression of active power fluctuations, reaction of control systems and emergency automation in emergency situations are required.
Croatia	HOPS	Yes	-
Czech Republic	ČEPS, a.s.	Yes	CEPS developed a methodology for compliance tests and compliance simulations that is non-mandatory for power generating module owner to prove the compliance with the NC RfG but CEPS uses this methodology as the default way for verification of compliance. The required details of the compliance process for every tests or simulations relevant for power generating module of type D are described in this methodology.
Estonia	Elering AS	Yes	<a href="https://elering.ee/sites/default/files/public/Teenused/Liitumine/07%20-%20Requirements%20for%20the%20testing%20of%20and%20preparation%20of%20a%20testing%20plan%20for%20the%20power-generating%20modules%20of%20clients.pdf">https://elering.ee/sites/default/files/public/Teenused/Liitumine/07%20-%20Requirements%20for%20the%20testing%20of%20and%20preparation%20of%20a%20testing%20plan%20for%20the%20power-generating%20modules%20of%20clients.pdf</a>
Finland	Fingrid	Yes	Please see sections 14.4 and 19.4 of VJV2018 document for commissioning test information. <a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a>
France	RTE	Yes	The tests are needed for the following points : <ul style="list-style-type: none"> <li>• Exchanged data</li> <li>• Network connection and disconnection</li> <li>• Power quality</li> <li>• Frequency control (FSM, LFSM, secondary frequency control)</li> <li>• Voltage control</li> <li>• Tests of all the automatic control used to solve any network constraints.</li> <li>• Houseload.</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Verification of FRT, simulation models for FRT, short-circuit resistance. Details are covered in the guideline TR 3 - Determination of the electrical characteristics of generation units and plants, storage facilities and for their components on the medium, high and extra-high voltage grid
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration.
Hungary	MAVIR	Yes	<ul style="list-style-type: none"> <li>• Test methods</li> <li>• Detailed test record</li> </ul>
Ireland	EirGrid	Yes	<a href="http://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-compliance-test/compliance-testing/index.xml">http://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-compliance-test/compliance-testing/index.xml</a>
Lithuania	LITGRID AB	Yes	<p>The test program shall be developed and coordinated with TSO and include, the following tests:</p> <p>Active power regulator and Voltage regulator</p> <p>Step response test.</p> <p>Q and U control test.</p> <p>Power oscillation damping efficiency test,</p> <p>Reactive power capability test based on PQ capabilities.</p> <p>Emergency power control FCR, LFSM and aFRR test.</p> <p>Power quality measurements.</p>
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	<p>LFSM-O</p> <ul style="list-style-type: none"> <li>• The simulated frequency, P, Q, V shall be measured as function of the time at the Connection Point; all will be recorded on the same time scale;</li> <li>• Applied settings of PGM and GU controller including frequency droop setting;</li> <li>• A measuring error of max. +/- 5% of the measured value will be accepted.</li> </ul> <p>LFSM-U</p>

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• The simulated frequency, P, Q, V shall be measured as function of the time at the Connection Point; all will be recorded on the same time scale;</li> <li>• Applied settings of PGM and GU controller including frequency droop setting;</li> <li>• A measuring error of max. +/- 5% of the measured value will be accepted.</li> </ul> <p>FSM</p> <ul style="list-style-type: none"> <li>• Maximum Capacity</li> <li>• Active Power set point for each test</li> <li>• The simulated frequency shall be measured as function of the time</li> <li>• P, Q, V shall be measured as function of the time at the Connection Point;</li> <li>• Record the initial delay time t1;</li> <li>• Record the time for full activation time t2 of the frequency response;</li> <li>• Applied settings of PGM and GU controller including frequency droop setting;</li> <li>• A measuring error of max. +/- 5% of the measured value will be accepted.</li> </ul> <p>Frequency restoration</p> <ul style="list-style-type: none"> <li>• The grid frequency or turbine speed;</li> <li>• The frequency change injection signal;</li> <li>• The active power setpoint;</li> <li>• The active power at the Connection Point.</li> </ul> <p>Black-start capability (if applicable)</p> <ul style="list-style-type: none"> <li>• Speed, voltage, active and reactive power output of auxiliary gas turbine/diesel generators for Black Start function;</li> <li>• Terminal voltages of auxiliary MV and LV switchgear;</li> <li>• Auxiliary power output of emergency generators;</li> <li>• Turbine speed, -terminal voltage and active and reactive power output of the (gas)turbine that is started;</li> <li>• Active and reactive power output of the (gas)turbine that is started at the Connection Point;</li> <li>• Voltage and frequency at the Connection Point.</li> </ul> <p>Tripping to houseload</p>

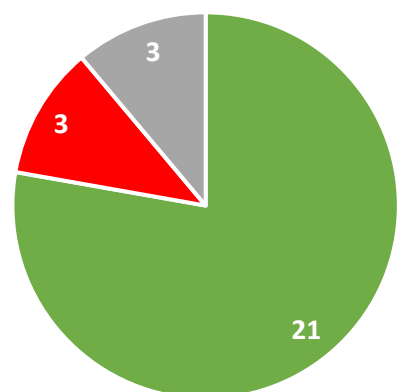
Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• At the Connection Point: power (P, Q), Voltage (V), Current (I);</li> <li>• Synchronisation of units.</li> </ul> <p>Frequency range</p> <ul style="list-style-type: none"> <li>• Time of start and end of test;</li> <li>• PGM voltage and frequency as time function;</li> <li>• PGM active and reactive power output as time functions</li> <li>• Ambient and PGM temperatures as time functions in relation to PGM error messages.</li> </ul> <p>Voltage range</p> <ul style="list-style-type: none"> <li>• Time of start and end of test;</li> <li>• PGM voltage and frequency as time function;</li> <li>• PGM active and reactive power output as time functions</li> <li>• Ambient and PGM temperatures as time functions in relation to PGM error messages</li> </ul> <p>Reactive power capability</p> <ul style="list-style-type: none"> <li>• At the Connection Point: P, Q, V, I.</li> <li>• Tap changer positions of transformers, if applicable</li> <li>• At reactive power compensation equipment if applicable: Switching on/off position, Q, V, I</li> </ul> <p>Active power controllability</p> <ul style="list-style-type: none"> <li>• P, Q, V shall be measured as function of the time at the Connection Point as momentary values or as one-minute average;</li> <li>• Active power setpoint</li> <li>• Applied settings of PPM and GU controllers;</li> </ul> <p>Voltage control mode</p> <ul style="list-style-type: none"> <li>• Prior to the start of the tests and any changes to the following, if any values change during the tests: <ul style="list-style-type: none"> <li>o All relevant transformer tap positions (if applicable);</li> <li>o Number of Power Park Units in operation;</li> </ul> </li> <li>• P, Q, V, setpoints and simulated actual voltage level shall be measured for each step; the measurement location depends on the availability of the actual voltage signal; transient measurement equipment will be required to evaluate speed of</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<p>response and damping of voltage change and voltage/reactive power/power factor response; preferably this should be the Connection Point or the HV side of the step-up transformer.</p> <ul style="list-style-type: none"> <li>• Response time of activation;</li> <li>• A measuring error of max. +/- 5% of the measured value will be accepted. Reactive power control mode (details can be found in the Compliance verification document which link is provided in the question 25)</li> <li>• Power factor control mode (details in the document)</li> <li>• Fault-Ride-Through SPGM type D (details in the document)</li> <li>• Reconnecting after disconnection (details in the document)</li> </ul> <p>Power quality</p> <ul style="list-style-type: none"> <li>• Rapid voltage change, flicker emissions, harmonics</li> </ul>
Poland	PSE S.A.	Yes	<p>In PSE procedure detailed information on planned compliance tests are specified in separate document "Testing procedure for power generating modules with the division of responsibilities between the power generating facility owner and the system operator for the purposes of compliance testing" (<a href="https://www.pse.pl/documents/20182/609727c3-63c4-48a8-9063-8608b33294c1?">https://www.pse.pl/documents/20182/609727c3-63c4-48a8-9063-8608b33294c1?</a>), including the test schedule</p>
Portugal	REN	Yes	<p>Response in MLSF-O, MLSF-U, FSM mode (1). Reactive power capacity. Control capability and active power control range. Reactive power control mode, Voltage control mode, Power factor control mode. Note (1) - Carrying out these tests is subject to verification of their feasibility.</p>
Romania	Transelectrica - TEL	Yes	<p>Acc. to art. 35(3)(f) regarding the intended tests, TSO requests verification tests relating to connection point, after commissioning. Tests refer to:</p> <ul style="list-style-type: none"> <li>• P - Q – U diagram in connection point;</li> <li>• voltage, reactive power and active power control in connection point to different setpoint values;</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• LFSM;</li> <li>• FSM;</li> <li>• The capability of automatic reconnection if the case;</li> <li>• Measurements of power quality in accordance with EN 50160 .</li> </ul>
Slovak Republic	SEPS	Yes	Compliance test methodologies is published at <a href="https://www.sepsas.sk/media/4682/dokument-f-tp-ucinost-apr-2021.pdf">https://www.sepsas.sk/media/4682/dokument-f-tp-ucinost-apr-2021.pdf</a>
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	Only compulsory before the issuance of the FON. Details provided in NTS: <a href="https://api.esios.ree.es/documents/628/download?locale=es">https://api.esios.ree.es/documents/628/download?locale=es</a>
Sweden	Svenska Kraftnät	Yes	<p>Details to be included are listed in attachment 6; a detailed test program covering the items below shall be submitted. The test program shall detail pre-conditions concerning control modes and intended active and reactive power load for each test. The final program is agreed with the system operator based on the grid conditions.</p> <p>Active power control at frequency variations</p> <p>Maximum reduction of active power during reduced frequencies</p> <p>Rapid reduction of active power</p> <p>Controllability active power</p> <p>Limited Frequency Sensitive mode- Over frequency (LFSM-O)</p> <p>Limited Frequency Sensitive mode- Under frequency (LFSM-U)</p> <p>Frequency sensitive mode (FSM)</p> <p>Resynchronisation within 15 minutes</p> <p>Transition into local islanding operation</p> <p>Voltage control capability</p> <p>Fault ride-through capability during of severe undervoltages</p> <p>Available magnetization power</p> <p>Continuous generation and consumption of reactive power</p> <p>Activation of limiters and protection functions</p>

Country	TSO	Approval for publication in the IMR	Answer
			Field current limiter Stator current limiter Flux limiter (Voltage/Frequency) Under magnetization limiter Power System Stabiliser (PSS)

3.5.15 Is the information included in this section of the survey (Interim operational notification (ION) for type D power-generating modules) publicly available in accordance with NC RfG Article 29(2)?



■ Yes ■ No ■ Not published yet



## 3.6 Survey on the final operational notification for type D power-generating modules pursuant to NC RfG art. 36

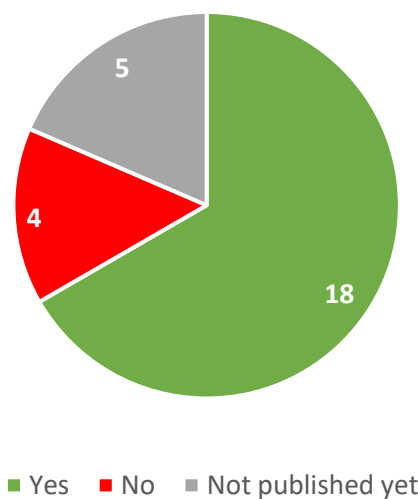
### 3.6.1 Do you apply any criteria to allow a derogation procedure if an incompatibility is identified with the connection when issuing an ION acc. to art. 36(4)? If yes, please provide some examples!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Derogations should be initiated as early as possible (ideally before ION). Derogations must be approved by NRA, in order to grant a FON.
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	There is no normatively justified practice for a system operator to grant a derogation to producers, in case of incompatibility with the requirements for parallel operation with the electricity system.
Croatia	HOPS	No	—
Czech Republic	ČEPS, a.s.	Yes	It will be agreed individually when any incompatibility is identified. ČEPS does not specify any criteria to allow a derogation procedure for issuing an ION acc. to art. 36(4).
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Please see section 8 of VJV2018 document for information about derogation procedure. In practice, no derogations have not been requested yet. <a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/grid-code-specifications-for-power-generating-facilities-vjv2018-.pdf</a>
France	RTE	Yes	RET applies articles Articles 60 to 63, to deal with the RfG requirement derogation. RTE has not a specific procedure.
Germany	Representation of all German TSO's (Amprion /	No	—

Country	TSO	Approval for publication in the IMR	Answer
	TenneT / TransnetBW / 50Hertz)		
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration.
Hungary	MAVIR	Yes	In case of incompatibility of ancillary services, the derogation is not enabled. The derogation process can be start if (e.g.): <ul style="list-style-type: none"> <li>• The VAR/voltage regulation band different from the design documentation and does not compatible with RfG requirement</li> <li>• MAVIR has never been enabled any derogation (untill now).</li> </ul>
Ireland	EirGrid	Yes	Yes. See CRU decision paper. <a href="https://www.cru.ie/wp-content/uploads/2017/07/CER17084-Decision-paper-on-Criteria-re-Derogations-Pursuant-to-Articles-62-and-63-of-the-RfG.pdf">https://www.cru.ie/wp-content/uploads/2017/07/CER17084-Decision-paper-on-Criteria-re-Derogations-Pursuant-to-Articles-62-and-63-of-the-RfG.pdf</a>
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	Derogation sub-procedure, which is developed in line with Art. 60 NC RfG, was implemented directly in PSE operational notification procedure. The criteria for granting derogations pursuant to Articles 52 and 53 were specified by PL NRA <a href="https://www.ure.gov.pl/pl/urząd/informacje-ogolne/komunikaty-prezesa-ure/7240,Komunikat-nr-722017.html">https://www.ure.gov.pl/pl/urząd/informacje-ogolne/komunikaty-prezesa-ure/7240,Komunikat-nr-722017.html</a>
Portugal	REN	Yes	Yes. The general derogation procedure, established by the relevant regulatory authority, can be applied.

Country	TSO	Approval for publication in the IMR	Answer
			<p>It is considered that the granting of a derogation is justifiable when the applicant proves that the following criteria are met:</p> <ol style="list-style-type: none"> <li>1. The request is duly instructed and reasonable.</li> <li>2. The derogation does not negatively affect the operation, stability and security of the network.</li> <li>3. The derogation does not have a negative impact on market participants.</li> <li>4. The derogation has no adverse effects on cross-border electricity trade.</li> </ol>
Romania	Transelectrica - TEL	Yes	<p>Yes, acc. to art. 36(4) is about FON not ION.</p> <ul style="list-style-type: none"> <li>• If TSO finds that the identified non-compliance requires a request for derogation from the requirements of the technical standard, the owner of the power generation plant shall submit a request to the TSO in accordance with the procedure for granting derogations to electricity generating installations from the obligation to fulfil one or more than one of the requirements in the technical connection standard in force.</li> <li>• If the derogation is not granted, RSO has the right not to allow the operation of the power generating unit until the power generating plant owner has rectified the non-compliance and the power generating unit fully complies with the requirements of the technical connection standard in force.</li> <li>• If the RSO and the power generating plant owner does not remedy the non-compliance within six months at the latest of notification of the decision not to grant the derogation, each party may submit the matter to NRA.</li> </ul>
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	If any transient non-compliance is identified, then a LON is issued.
Sweden	Svenska Kraftnät	Yes	A few outstanding items concerning theoretical validation may be accepted as rest items to be resolved prior to the issuing of the FON.

### 3.6.2 Is this information publicly available in accordance with NC RfG Article 29(2)?



## 3.7 Survey on limited operational notification for type D power-generating modules pursuant to NC RfG art. 37

### 3.7.1 Have you specified a default period for a LON or is it set individually? If so, please provide your answer!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	12 months.
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	There is no normatively justified practice for a system operator to allow limited operation of generating modules.
Croatia	HOPS	No	–
Czech Republic	ČEPS, a.s.	Yes	No, ČEPS hasn't specified a default period. It will be set individually but not longer than 12 months as prescribed by NC RfG.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Maximum period of validity which shall not exceed 12 months. The initial period granted may be shorter with the possibility of an extension if evidence is submitted to the satisfaction of the relevant network operator demonstrating that substantial progress has been made towards achieving full compliance.
France	RTE	Yes	No
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	No
Greece	Independent Power Transmission	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.

Country	TSO	Approval for publication in the IMR	Answer
	Operator S.A. (IPTO S.A.)		
Hungary	MAVIR	Yes	The LON is set individually.
Ireland	EirGrid	Yes	Shall not exceed 12 months or otherwise individually specified.
Lithuania	LITGRID AB	Yes	LON is the same as set in the Regulation.
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	In PSE procedure there is no default period for a LON. LON period will be set individually within the range specified in NC RfG ( $\leq 12$ months)
Portugal	REN	Yes	No. It can be set individually.
Romania	Transelectrica - TEL	Yes	NO, TEL did not specify a default period for a LON.
Slovak Republic	SEPS	Yes	A default period.
Slovenia	ELES	Yes	It is set individually.
Spain	Red Eléctrica de España	Yes	The regulation in Spain has established a general period of 24 months based on 37(5) of RfG.
Sweden	Svenska Kraftnät	Yes	It is set individually.

## 3.7.2 Have you specified a shorter LON validity period than the maximum (<12 months' period) according to art. 35(4) NC RfG or is it set individually?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	No. It might be set individually, if agreed between the RSO and the PGM owner.
Belgium	ELIA GROUP	No	—
Bulgaria	ESO EAD	Yes	N/A
Croatia	HOPS	No	—
Czech Republic	ČEPS, a.s.	Yes	No, ČEPS hasn't specified a shorter LON validity period. It will be set individually but not longer than 12 months as prescribed by NC RfG.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	The initial period granted may be shorter with the possibility of an extension if evidence is submitted to the satisfaction of the relevant network operator demonstrating that substantial progress has been made towards achieving full compliance.
France	RTE	Yes	No
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Set individually, depending on the project.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.

Country	TSO	Approval for publication in the IMR	Answer
Hungary	MAVIR	Yes	The LON is set individually.
Ireland	EirGrid	Yes	No, unless individually specified.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	In PSE procedure there is no default period for a LON. LON period will be set individually within the range specified in NC RfG ( $\leq 12$ months)
Portugal	REN	Yes	No. It can be set individually.
Romania	Transelectrica - TEL	Yes	No, according to art. 35(4) NC RfG we did not specify a shorter LON validity period than the maximum ( $< 12$ months' period).
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	The regulation in Spain has established a general period of 24 months based on 37(5) of RfG.
Sweden	Svenska Kraftnät	Yes	It is set individually.



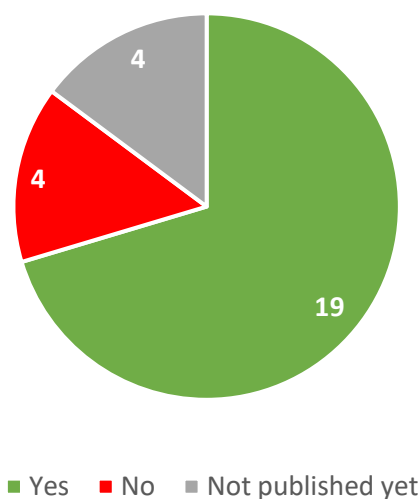
## 3.7.3 In the case of a LON, have you defined the required responsibilities and timescales for the expected solution acc. to art. 37(3)(b)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	PGM owner must show regularly the process / milestones to RSO.
Belgium	ELIA GROUP	No	–
Bulgaria	ESO EAD	Yes	N/A
Croatia	HOPS	No	–
Czech Republic	ČEPS, a.s.	Yes	No, ČEPS hasn't defined responsibilities and time-scales for the expected solution. It will be set individually according to the reason for issuing the LON and complexity of the appeared circumstances according to the article 37.1.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	<p>Please see section 6.4.3.5 of VJV2018 document for information about LON</p> <p>A LON shall be issued by the relevant network operator and shall contain the following information which shall be clearly identifiable:</p> <ul style="list-style-type: none"> <li>• The unresolved issues justifying the granting of the LON; The responsibilities and timescales for the expected solution;</li> <li>• A maximum period of validity which shall not exceed 12 months.</li> </ul> <p>The initial period granted may be shorter with the possibility of an extension if evidence is submitted to the satisfaction of the relevant network operator demonstrating that substantial progress has been made towards achieving full compliance. The FON shall be suspended during the period of validity of the LON with regard to the items for which the LON has been issued.</p> <p>A further extension of the period of validity of the</p>

Country	TSO	Approval for publication in the IMR	Answer
			LON may be granted upon a request for a derogation made to the relevant network operator before the expiry of that period, in accordance with the derogation procedure described in Chapter 8. The relevant network operator shall have the right to refuse to allow the operation of the power generating facility once the LON is no longer valid. In such cases, the FON shall automatically become invalid. If the relevant network operator does not grant an extension of the period of validity of the LON when a request for derogation has been made or if it refuses to allow the operation of the power generating facility once the LON is no longer valid, the power generating facility owner may refer the issue for decision to the Finnish Energy Authority within six months after the notification of the decision of the relevant network operator.
France	RTE	Yes	No
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	No
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Individual agreement contains the responsibilities, expected solution and the resolving time-scale. This agreement is part of Connection Agreement.
Ireland	EirGrid	Yes	Not defined as it will be on a case by case basis.
Lithuania	LITGRID AB	Yes	Not relevant.

Country	TSO	Approval for publication in the IMR	Answer
Luxembourg	Creos Luxembourg S.A.	Yes	N/A
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	In PSE procedure required responsibilities and timescales for the expected solution are required in LON request. They will be defined individually with PGM owner.
Portugal	REN	Yes	No required responsibilities and timescales for the expected solution are defined in advance in particular or in general terms. In the case of a LON, art. 37(3)(b) will be applied and the required responsibilities and timescales for the expected solution will be defined based on the actual situation.
Romania	Transelectrica - TEL	Yes	Yes, acc. to art. 37(3)(b) TEL specified that the LON should also contain the required responsibilities and timescales for the expected solution (art. 64(1)(b) – for type C and art. 98(1)(b) from Operational Notification Procedure – NRA Order no. 51/2019).
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	Yes
Sweden	Svenska Kraftnät	Yes	Not yet.

3.7.4 Is the information included in this section of the survey (Limited operational notification for type D power-generating modules) publicly available in accordance with NC RfG Article 29(2)?



## 4 NC DC Implementation

4.1 Survey on operational notification procedure for transmission-connected demand facilities, new transmission-connected distribution facilities and new transmission-connected distribution systems pursuant to NC DC art. 22

4.1.1 Please provide the link to the details of the operational notification procedure acc. to art. 22(3)!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	<p>The main principles are described in the national grid code (TOR Netze und Lasten mit Übertragungsnetzanschluss), which is publicly available here:</p> <p><a href="https://www.e-control.at/recht/marktregeln/tor">https://www.e-control.at/recht/marktregeln/tor</a></p> <p>Details can be also found on APGs homepage:</p> <p><a href="https://www.apg.at/de/markt/strommarkt/rechtliches">https://www.apg.at/de/markt/strommarkt/rechtliches</a></p> <p><a href="https://www.apg.at/markt/-/media/376916F726894A239966E506165B0CB.B.ashx">https://www.apg.at/markt/-/media/376916F726894A239966E506165B0CB.B.ashx</a></p>
Belgium	ELIA GROUP	Yes	Not available yet.
Bulgaria	ESO EAD	Yes	<a href="https://www.dker.bg/uploads/normative_docs/naredbi/Naredba_6_27092019.pdf">https://www.dker.bg/uploads/normative_docs/naredbi/Naredba_6_27092019.pdf</a>
Croatia	HOPS	Yes	<p>Operational notification procedure is defined in Transmission System Grid Code (from 2017) and Amendments to the Transmission System Grid Code (from 2020)</p> <p><a href="https://narodne-novine.nn.hr/clanci/sluzbeni/2017_07_67_1585.html">https://narodne-novine.nn.hr/clanci/sluzbeni/2017_07_67_1585.html</a></p> <p><a href="https://narodne-novine.nn.hr/clanci/sluzbeni/2020_11_128_2453.html">https://narodne-novine.nn.hr/clanci/sluzbeni/2020_11_128_2453.html</a></p>
Czech Republic	ČEPS, a.s.	Yes	<a href="https://www.ceps.cz/cs/kodex-ps">https://www.ceps.cz/cs/kodex-ps</a>

Country	TSO	Approval for publication in the IMR	Answer
Estonia	Elering AS	Yes	<a href="https://elering.ee/en/connection-conditions">https://elering.ee/en/connection-conditions</a>
Finland	Fingrid	Yes	<a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/kulutuksen-jarjestelmatekniset-vaatimukset-kjv2018--en.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/kulutuksen-jarjestelmatekniset-vaatimukset-kjv2018--en.pdf</a>
France	RTE	Yes	<a href="https://www.services-rte.com/fr/la-bibliotheque.html">https://www.services-rte.com/fr/la-bibliotheque.html</a>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Technical requirements for the connection and operation of customer installations to the extra high voltage network (TAR extra high voltage): <a href="https://www.vde-verlag.de/standards/0100494/vde-ar-n-4130-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100494/vde-ar-n-4130-anwendungsregel-2018-11.html</a>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet
Hungary	MAVIR	Yes	<p>Please find the links here (Hungarian only):</p> <p><a href="https://www.eon.hu/content/dam/eon/eon-hungary/documents/hatarozatok-szabalyzatok-aram/elosztoi-szabalyzat/2021/Elo-szab-t%C3%B6rzs-15-sz-mod-2021-06-15.pdf">https://www.eon.hu/content/dam/eon/eon-hungary/documents/hatarozatok-szabalyzatok-aram/elosztoi-szabalyzat/2021/Elo-szab-t%C3%B6rzs-15-sz-mod-2021-06-15.pdf</a></p> <p><a href="https://www.eon.hu/content/dam/eon/eon-hungary/documents/hatarozatok-szabalyzatok-aram/elosztoi-szabalyzat/2021/Elo-szab-melleklet-15-sz-mod-2021-06-15.pdf">https://www.eon.hu/content/dam/eon/eon-hungary/documents/hatarozatok-szabalyzatok-aram/elosztoi-szabalyzat/2021/Elo-szab-melleklet-15-sz-mod-2021-06-15.pdf</a></p> <p>Comments: Demand facilities are not connected to the 400/220 kV Grid of the TSO in Hungary, due to the DSO's 132 kV network. The links above are referring to E.ON (in Hungary there are six different DSO), but the regulation are the same for all DSOs in Hungary.</p> <p>Demand Facilities to connect the transmission grid must fulfill the minimum requirements as can be seen here:</p> <p><a href="https://www.mavir.hu/documents/10258/239171205/7.1.+DCC_alapveto_kovetelmenyek">https://www.mavir.hu/documents/10258/239171205/7.1.+DCC_alapveto_kovetelmenyek</a></p>

# Monitoring Report on Connection Network Codes Implementation

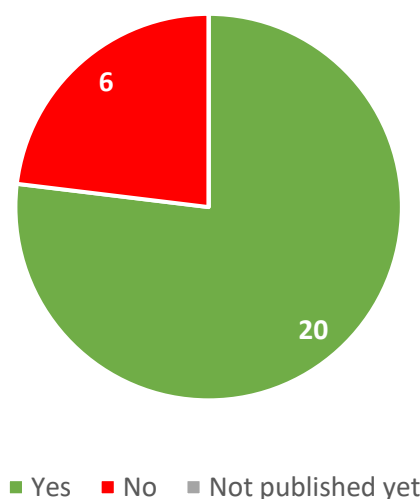


Final Version | 2 December 2021

Country	TSO	Approval for publication in the IMR	Answer
			<a href="#">HUN.pdf/f0ffbb65-8328-f901-0fb6-3d11b51c6c1a?t=1611056940873</a>
Ireland	EirGrid	Yes	Planned publication in July 2021 within latest version of the GridCode. Details of Grid Code modification paper under MPID 282. <a href="https://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-info/modifications/">https://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-info/modifications/</a>
Lithuania	LITGRID AB	Yes	<a href="https://www.litgrid.eu/uploads/files/dir519/dir25/dir1/4_0.php">https://www.litgrid.eu/uploads/files/dir519/dir25/dir1/4_0.php</a>
Luxembourg	Creos Luxembourg S.A.	Yes	Not available, client has to take contact with the HV Grid service.
Netherlands	TenneT TSO	Yes	Website: <a href="https://www.netbeheernederland.nl/dossiers/regulering-20/documenten">https://www.netbeheernederland.nl/dossiers/regulering-20/documenten</a> Document: <a href="https://www.netbeheernederland.nl/_upload/Files/Regulering_20_f726bfa3d1.pdf">https://www.netbeheernederland.nl/_upload/Files/Regulering_20_f726bfa3d1.pdf</a>
Poland	PSE S.A.	Yes	PSE notification procedure for transmission connected demand facilities (TC DF) and transmission-connected distribution systems (TC DS) is publicly available on PSE website: <a href="https://www.pse.pl/documents/20182/d92b8c86-7543-4484-8ac0-93b2490e1ffc?">https://www.pse.pl/documents/20182/d92b8c86-7543-4484-8ac0-93b2490e1ffc?</a>
Romania	Transelectrica - TEL	Yes	Operational Notification Procedure – approved by NRA Order no. 176/07.09.2019: <a href="https://www.transelectrica.ro/documents/10179/3992480/Ordinul+ANRE+nr.+176_07.08.2019+-+Procedura+de+notificare+a+locurilor+de+consum/1917d4e5-6295-46a4-a767-7f6ad9ea2d64">https://www.transelectrica.ro/documents/10179/3992480/Ordinul+ANRE+nr.+176_07.08.2019+-+Procedura+de+notificare+a+locurilor+de+consum/1917d4e5-6295-46a4-a767-7f6ad9ea2d64</a>
Slovak Republic	SEPS	Yes	<a href="https://www.sepsas.sk/media/4672/dokument-n-tp-ucinnost-jan-2021.pdf">https://www.sepsas.sk/media/4672/dokument-n-tp-ucinnost-jan-2021.pdf</a>
Slovenia	ELES	Yes	N/A

Country	TSO	Approval for publication in the IMR	Answer
Spain	Red Eléctrica de España	Yes	<a href="https://www.ree.es/sites/default/files/01_ACTIVIDADES/Documentos/AccesoRed/Guia_d_escritiva_del_procedimiento_de_puesta_en_servicio_V9_ene21.docx">https://www.ree.es/sites/default/files/01_ACTIVIDADES/Documentos/AccesoRed/Guia_d_escritiva_del_procedimiento_de_puesta_en_servicio_V9_ene21.docx</a>
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing but no link to the details is available today.  Parts of the operational notification procedure are already part of the existing connection procedure but the two processes need to be aligned.

## 4.1.2 Is the provision of the link publicly available in accordance with NC DC Article 22(3)?





## 4.2 Survey on interim operational notification (ION) for transmission-connected demand facilities, new transmission-connected distribution facilities and new transmission-connected distribution systems pursuant to NC DC art. 24

### 4.2.1 Have you specified a default period for an ION (please provide it) or is it set individually?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes. Default is 3 months as a deadline for the DF owner or DSO, in order to deliver the relevant information prior to the issuing of ION, which can be used for 24 months according to NC DC.
Belgium	ELIA GROUP	Yes	Not determined yet.
Bulgaria	ESO EAD	Yes	72 hours.
Croatia	HOPS	Yes	A default period for an ION is it set individually.
Czech Republic	ČEPS, a.s.	Yes	No, it will be set individually but not longer than 24 months as prescribed by NC DC.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Upon receiving the EON and the ION, the connecting party shall have the right to energise the network beyond the connection point and use his/her electrical equipment for no more than 6 months.
France	RTE	Yes	No default period ; set individually (DTR 5.3.1).
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	The network operator grants an interim type approval (permission for trial operation with active power feed-in) for a maximum of 24 months.
Greece	Independent Power Transmission	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.

Country	TSO	Approval for publication in the IMR	Answer
	Operator S.A. (IPTO S.A.)		
Hungary	MAVIR	Yes	No, the default period for the ION in Hungary is 24 months.
Ireland	EirGrid	Yes	Shall not be longer than 24 months.
Lithuania	LITGRID AB	Yes	ION is set the same as in Regulation.
Luxembourg	Creos Luxembourg S.A.	Yes	No, individually.
Netherlands	TenneT TSO	Yes	<p>Default period as stated in NC RfG: 24 months</p> <p>Optionally specified individually</p> <ul style="list-style-type: none"> <li>• Within a maximum of four weeks after receiving the statement of compliance of the facility owner or distribution system operator, the RSO will respond. If the assessment of compliance is positive an ION will be granted by the RSO;</li> <li>• The facility owner or distribution system operator shall have an ION at least one month before taking the first demand unit or the distribution system in operation;</li> </ul>
Poland	PSE S.A.	Yes	<p>For TC-DF:</p> <p>In PSE procedure validity period for ION is specified individually (in line with connection schedule specified in connection agreement), no longer than 24 months.</p> <p>For TC-DS:</p> <p>In PSE procedure validity period for ION is specified individually, no longer than 24 months.</p>
Romania	Transelectrica - TEL	Yes	NO, TEL did not specify a default period for an ION.
Slovak Republic	SEPS	Yes	Default period of 12 months.

Country	TSO	Approval for publication in the IMR	Answer
Slovenia	ELES	Yes	ION is set individually.
Spain	Red Eléctrica de España	Yes	No, for demand facilities and distribution facilities only one Operational Notification is issued considered as EON, ION and FON.
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

## 4.2.2 Have you specified a shorter ION validity period than the maximum (<24 months) acc. to art. 24(4)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	No
Belgium	ELIA GROUP	Yes	Not decided yet.
Bulgaria	ESO EAD	Yes	No
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	No, it will be set individually but not longer than 24 months as prescribed by NC DC.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes
France	RTE	Yes	No

Country	TSO	Approval for publication in the IMR	Answer
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes, it's basically possible and depends on the projekt. At the earliest, the trial operation of the customer installation starts when the interim type approval is obtained from the network operator and the network connection has been commissioned as agreed.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet
Hungary	MAVIR	Yes	No
Ireland	EirGrid	Yes	No
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	No
Netherlands	TenneT TSO	Yes	No. Optionally specified individually.
Poland	PSE S.A.	Yes	In PSE procedure validity period for ION is specified individually, no longer than 24 months.
Romania	Transelectrica - TEL	Yes	No
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	N/A

Country	TSO	Approval for publication in the IMR	Answer
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

## 4.2.3 Do you request an itemised statement of compliance acc. to art. 24(3)(a)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	No
Belgium	ELIA GROUP	Yes	Not determined yet.
Bulgaria	ESO EAD	Yes	Compliance by items is required only for basic equipment that directly affects the operation and safety of the elements of the electricity transmission network.
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes. Prior to the start of the trial operation, content and scope of the compliance verifications (testing) shall be agreed. Additionally, the required certificates shall be prepared.

Country	TSO	Approval for publication in the IMR	Answer
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Most probably: No
Hungary	MAVIR	Yes	No
Ireland	EirGrid	Yes	Under development.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	Yes
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	Only a confirmation is requested.
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

## 4.2.4 Do you request detailed technical data of the transmission connected demand facility, transmission connected distribution facility or transmission connected distribution system of relevance of the grid connection acc. to art. 24(3)(b)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	Yes	Yes
Bulgaria	ESO EAD	Yes	Basic technical data are required for the needs of the connection.
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes. The connection owner specifies the network connection planning with reference to the network connection point determined in the course of planning and communicates the relevant data of the customer installation to the network operator.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Yes
Hungary	MAVIR	Yes	Yes, the procedures are according to the 24(3)(b), especially with respect to the following: Protection calculation - Parameters of the main

Country	TSO	Approval for publication in the IMR	Answer
			equipments (Transformers, transmission lines & busbars, compensators). Please find the link for the detailed regulation here (only in Hungarian; title: 2.5 SZ. MELLÉKLET: HÁLÓZATSZÁMÍTÁSHOZ SZÜKSÉGES ADATOK KÖZLÉSÉRE VONATKOZÓ ELŐÍRÁSOK): <a href="https://www.mavir.hu/documents/10258/239609830/USz_M24.+kiad%C3%A1s_Mell%C3%A9klet_2021.04.27_clean.pdf/f83727b8-2196-1e7e-f1b4-e01c94a1cfcd?t=1619605252601">https://www.mavir.hu/documents/10258/239609830/USz_M24.+kiad%C3%A1s_Mell%C3%A9klet_2021.04.27_clean.pdf/f83727b8-2196-1e7e-f1b4-e01c94a1cfcd?t=1619605252601</a>
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	Yes
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	Yes
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.



Country	TSO	Approval for publication in the IMR	Answer
			Technical data is already to some extent requested in the existing connection procedure.

## 4.2.5 Do you request equipment certificates issued by an authorised certifier in respect of each transmission connected demand facility, transmission connected distribution facility or transmission connected distribution system acc. to art. 24(3)(c)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	No
Belgium	ELIA GROUP	Yes	Not determined yet.
Bulgaria	ESO EAD	Yes	If the equipment is of a new type, unknown to the system operator.
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	Yes but we do not expect that equipment certificates fully replace the compliance tests and simulations.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	No
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT /	Yes	No, in principle not, but in individual cases it would be conceivable (depends on the project). Ultimately, a declaration of conformity or a successfully completed individual verification

Country	TSO	Approval for publication in the IMR	Answer
	TransnetBW / 50Hertz)		procedure is required for a grid connection.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Most probably: Yes.
Hungary	MAVIR	Yes	Yes, it is mandatory at least in case of the main network equipments (Transformers, protection devices). Protection devices must be investigated and certified by the TSO.
Ireland	EirGrid	Yes	No but may be submitted by user if they wish.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	No
Netherlands	TenneT TSO	Yes	Optionally
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

Country	TSO	Approval for publication in the IMR	Answer
			No equipment certificates are requested today.

## 4.2.6 Do you request simulation models acc. to art. 24(3)(d)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	If requested by TSO.
Belgium	ELIA GROUP	Yes	Not determined yet.
Bulgaria	ESO EAD	Yes	If the equipment is of a new type, missing from the system operator's software library.
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	Yes and the simulation models will be required individually according to the parts and complexity of transmission connected demand facility, transmission connected distribution facility or transmission connected distribution system.
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Normally: No. But if non-linear or uneven loads are connected, this might be necessary.
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes, according to chapter 10.6, of VDE-AR-N 4120: <a href="https://www.vde-verlag.de/standards/0100493/vde-ar-n-4120-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100493/vde-ar-n-4120-anwendungsregel-2018-11.html</a>

Country	TSO	Approval for publication in the IMR	Answer
			Chapter 10.6, of VDE-AR-N 4130: <a href="https://www.vde-verlag.de/standards/0100494/vde-ar-n-4130-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100494/vde-ar-n-4130-anwendungsregel-2018-11.html</a> or Technical rules for operation and planning of electrical networks, Part 1: Interface between transmission and distribution systems: <a href="https://www.vde-verlag.de/standards/0100503/vde-ar-n-4141-1-anwendungsregel-2019-01.html">https://www.vde-verlag.de/standards/0100503/vde-ar-n-4141-1-anwendungsregel-2019-01.html</a>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes, EirGrid looks for a steady-state model, and a dynamic model (PSSE library model is preferred).
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	No
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet fully implemented the operational notification procedure according to NC DC. The implementation process is ongoing. Simulation models are to some extent already requested in the existing connection procedure and continuously in cooperation with the largest DSOs.

## 4.2.7 Do you request studies demonstrating steady-state and dynamic performance acc. to art. 24(3)(e)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	Yes	No
Bulgaria	ESO EAD	Yes	If necessary, protocols from the setting of relay protections and automatics are required.
Croatia	HOPS	Yes	Partially, steady-state obligatory, dynamic performance by request.
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	No
France	RTE	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes, for example this is explained in chapter 11.2 of VDE-AR-N 4130 but also in VDE-AR-N 4120. The links to the connection standards: <a href="https://www.vde-verlag.de/standards/0100494/vde-ar-n-4130-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100494/vde-ar-n-4130-anwendungsregel-2018-11.html</a> <a href="https://www.vde-verlag.de/standards/0100493/vde-ar-n-4120-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100493/vde-ar-n-4120-anwendungsregel-2018-11.html</a>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration.
Hungary	MAVIR	Yes	Steady-state and fault-ride-through performance.
Ireland	EirGrid	Yes	Yes, EirGrid looks for studies on reactive power capability, and on fast active power control.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	No
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing. In the existing connection procedure studies demonstrating expected reactive power capabilities are required in an early stage. Technical requirements for demand units with demand response very fast active power control are tested and verified during the pre-qualification process for FFR.

## 4.2.8 Do you request details of intended compliance tests acc. to art. 24(3)(f)?

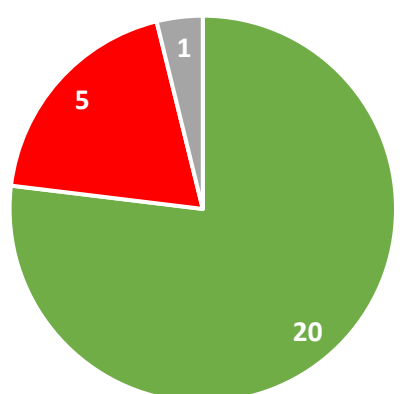
Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	Yes	Not determined yet.
Bulgaria	ESO EAD	Yes	Yes
Croatia	HOPS	Yes	Yes
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes, the tests are coordinated and agreed up to the ION. See in particular VDE-AR-N 4130, Chapter 4, Figure 1. Link to the connection standard: <a href="https://www.vde-verlag.de/standards/0100494/vde-ar-n-4130-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100494/vde-ar-n-4130-anwendungsregel-2018-11.html</a>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration.
Hungary	MAVIR	Yes	If the demand facility would like to participate on ancillary services first on the pre-defined accreditation test process must be accomplished.
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	No
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	Yes



Country	TSO	Approval for publication in the IMR	Answer
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

## 4.2.9 Is the information included in this section of the survey (Interim operational notification (ION)) publicly available in accordance with NC DC Article 22(3)?



■ Yes ■ No ■ Not published yet

## 4.3 Survey on the final operational notification for transmission-connected demand facilities, new transmission-connected distribution facilities and new transmission-connected distribution systems pursuant to NC DC art. 25

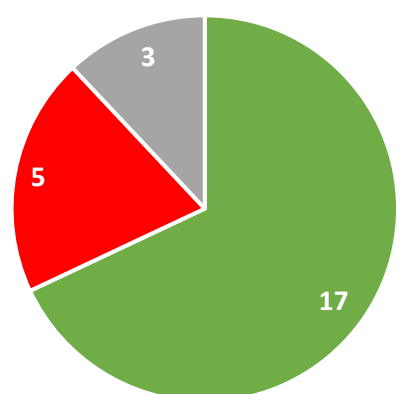
### 4.3.1 Is a derogation procedure foreseen if an incompatibility is identified in connection with issuing of the ION acc. to art. 25(4)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	Yes	Not decided yet.
Bulgaria	ESO EAD	Yes	There is no normatively justified practice for a system operator to grant a derogation to producers, in case of incompatibility with the requirements for parallel operation with the electricity system.
Croatia	HOPS	No	—
Czech Republic	ČEPS, a.s.	Yes	It will be agreed individually when any incompatibility is identified. We do not specify any criteria to allow a derogation procedure for issuing an ION acc. to art. 25(4).
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes, but have a look at the linked application rules of the VDE	Yes, see in particular VDE-AR-N 4130, Chapter 4, Figure 1 / Connection and commissioning process, à Prozess for limited type approval. Link: <a href="https://www.vde-verlag.de/standards/0100494/vde-ar-n-4130-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100494/vde-ar-n-4130-anwendungsregel-2018-11.html</a>

Country	TSO	Approval for publication in the IMR	Answer
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration.
Hungary	MAVIR	Yes	If the facility has not any negative effect on system safety it can connect and operate with ION.
Ireland	EirGrid	Yes	See CRU NC DC Derogation decision paper. <a href="https://www.cru.ie/wp-content/uploads/2017/07/CER17116-Derogation-paper-on-Criteria-re-Derogations-Pursuant-to-Articles-52-and-53-of-the-DCC.pdf">https://www.cru.ie/wp-content/uploads/2017/07/CER17116-Derogation-paper-on-Criteria-re-Derogations-Pursuant-to-Articles-52-and-53-of-the-DCC.pdf</a>
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	No	—
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	Derogation sub-procedure, which is developed in line with Art. 50 NC DC, was implemented directly in PSE operational notification procedure. The criteria for granting derogations pursuant to Articles 52 and 53 were specified by PL NRA <a href="https://www.ure.gov.pl/pl/urzed/informacje-ogolne/komunikaty-prezesa-ure/7241,Komunikat-nr-732017.html">https://www.ure.gov.pl/pl/urzed/informacje-ogolne/komunikaty-prezesa-ure/7241,Komunikat-nr-732017.html</a>
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Spain	Red Eléctrica de España	Yes	If any transient non-compliance is identified, then a LON is issued.
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

## 4.3.2 Is this information publicly available in accordance with NC DC Article 22(3)?



■ Yes ■ No ■ Not published yet

## 4.4 Survey on limited operational notification for transmission-connected demand facilities, new transmission-connected distribution facilities and new transmission-connected distribution systems pursuant to NC DC art. 26

### 4.4.1 In the case of a LON, will the unresolved issues justifying the granting of the LON clearly be identified acc. to art. 26(3)(a)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Did not happen yet. To be discussed with relevant parties (NRA, DSO or DF owner) if this happens.
Belgium	ELIA GROUP	Yes	Not decided yet.
Bulgaria	ESO EAD	Yes	Yes
Croatia	HOPS	No	–
Czech Republic	ČEPS, a.s.	Yes	Yes
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes, for the sake of good order. Normally this is part of the LON from the network operator to the connectee. It is generally assumed that defects will be corrected.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet

Country	TSO	Approval for publication in the IMR	Answer
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes within the individual LON.
Lithuania	LITGRID AB	Yes	Yes
Luxembourg	Creos Luxembourg S.A.	Yes	Individual treatment.
Netherlands	TenneT TSO	Yes	Case dependent.
Poland	PSE S.A.	Yes	In the case of a LON the unresolved issues justifying the granting of the LON shall be included in TC DF owner or TC DSO request for this Limited Operational Notification. LON shall contain that information based on the mentioned TC DF owner or TC DSO request.
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	Yes, however any LON for demand and distribution facilities has not been issued yet.
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

## 4.4.2 Do you define the deadline for the transmission connected demand facility owner or transmission connected distribution system operator to apply for a LON acc. to art. 26(2)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	Yes	Not decided yet.
Bulgaria	ESO EAD	Yes	No
Croatia	HOPS	No	—
Czech Republic	ČEPS, a.s.	Yes	No respected deadline has been specified. The relevant owner has to apply for a LON if the circumstances according to article 26(1) persist for more than three months.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	This depends on the project and the deadline is to be agreed individually. Non-compliance shall be eliminated. Compliance shall be demonstrated within the validity period of the interim type approval. This is the prerequisite for obtaining a FON. Where the prerequisites for maintaining the status of the interim type approval are not fulfilled or compliance is not demonstrated within the validity period of the interim type approval, the network operator is entitled to forbid the operation of the system (VDE AR-N 4130).

Country	TSO	Approval for publication in the IMR	Answer
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Yes, the deadline is 12 months long.
Ireland	EirGrid	Yes	Yes, 3 months as per NC DC.
Lithuania	LITGRID AB	Yes	Yes
Luxembourg	Creos Luxembourg S.A.	Yes	Individual treatment.
Netherlands	TenneT TSO	Yes	Case dependent.
Poland	PSE S.A.	Yes	Yes, it is defined in procedure for TC DF and TC DS. The TC DF owner or TC-DS operator shall apply to the relevant TSO for a limited operational notification (LON) as soon as possible when they expect the circumstances described in art. 26(1) could persist for more than three months. The deadline was set as three months after relevant TSO receives information from owner/ system operator (which shall be sent no later than 24 hours after the incident has occurred).
Romania	Transelectrica - TEL	Yes	No
Slovak Republic	SEPS	Yes	Yes
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	No



Country	TSO	Approval for publication in the IMR	Answer
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

## 4.4.3 Have you specified a default period for the LON (provide it) or is it set individually?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	12 months.
Belgium	ELIA GROUP	Yes	Not decided yet.
Bulgaria	ESO EAD	Yes	There is no normatively justified practice for a system operator to allow limited operation of demand facilities.
Croatia	HOPS	No	—
Czech Republic	ČEPS, a.s.	Yes	No, ČEPS hasn't specified a default period. It will be set individually but not longer than 12 months as prescribed by NC DC.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	<p>The connecting party shall apply for a limited operational notification (LON) from the relevant network operator if the connecting party reasonably expects the above mentioned circumstances to persist for more than 3 months. A LON shall be issued by the relevant network operator and shall contain the following information which shall be clearly identifiable:</p> <ul style="list-style-type: none"> <li>• The unresolved issues justifying the granting of the LON;</li> <li>• The responsibilities and timescales for the expected solution;</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>A maximum period of validity which shall not exceed 12 months.</li> </ul> <p>The initial period granted may be shorter with the possibility of an extension if evidence is submitted to the satisfaction of the relevant network operator demonstrating that substantial progress has been made towards achieving compliance.</p>
France	RTE	Yes	No default period ; set individually (DTR 5.3.2).
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	This is determined individually and depends on the project. The standard period is usually less than 12 months.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Default period is 12 months, could be shorter, in individual cases, too.
Ireland	EirGrid	Yes	Yes, period shall not exceed 12 months unless individually specified.
Lithuania	LITGRID AB	Yes	LON is defined the same as in regulation.
Luxembourg	Creos Luxembourg S.A.	Yes	Individually.
Netherlands	TenneT TSO	Yes	Case dependent.
Poland	PSE S.A.	Yes	In PSE procedure default period for a LON will be set individually within the range specified in NC DC ( $\leq 12$ months).
Romania	Transelectrica - TEL	Yes	NO, TEL did not specify a default period for a LON. The transmission connected demand facility owner or transmission connected distribution

Country	TSO	Approval for publication in the IMR	Answer
			system operator transmits to the TSO a request for the issuance of an LON if it is expected that the facility is temporary subject to either significant modification or loss of capability affecting its performance or equipment failure leading to non-compliance with some relevant requirements persisting for more than three months (art. 27 from Operational Notification Procedure – NRA Order no. 176/07.09.2019).
Slovak Republic	SEPS	Yes	Default period of 12 months.
Slovenia	ELES	Yes	It is set individually.
Spain	Red Eléctrica de España	Yes	No default period has been specified.
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

#### 4.4.4 Have you specified a shorter LON validity period than the maximum (<12 months) acc. to art. 26(3)(c)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	No
Belgium	ELIA GROUP	Yes	Not decided yet.
Bulgaria	ESO EAD	Yes	N/A
Croatia	HOPS	No	—

Country	TSO	Approval for publication in the IMR	Answer
Czech Republic	ČEPS, a.s.	Yes	No, ČEPS hasn't specified a shorter LON validity period. It will be set individually but not longer than 12 months as prescribed by NC DC.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	No
France	RTE	Yes	No
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	This depends on the project and is determined individually. Less than 12month is possible.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Based on individual consideration it could be shorter than 12 months.
Ireland	EirGrid	Yes	No
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	No
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	In PSE procedure validity period for a LON will be set individually within the range specified in NC DC ( $\leq 12$ months).

Country	TSO	Approval for publication in the IMR	Answer
Romania	Transelectrica - TEL	Yes	No
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

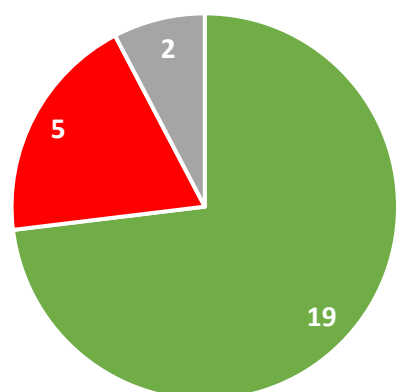
## 4.4.5 In case of a LON, have you defined the required responsibilities and timescales for the expected solution acc. to art. 26(3)(b)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	Yes
Belgium	ELIA GROUP	Yes	Not decided yet.
Bulgaria	ESO EAD	Yes	Yes
Croatia	HOPS	No	—
Czech Republic	ČEPS, a.s.	Yes	No ČEPS hasn't defined responsibilities and time-scales for the expected solution. It will be set individually according to the reason for issuing the LON and complexity of the appeared circumstances according to the article 26.1.

Country	TSO	Approval for publication in the IMR	Answer
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	This depends on the project and is determined individually. Normally this is part of the LON from the network operator to the connectee.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet
Hungary	MAVIR	Yes	Yes, it is mandatory part of the LON agreement.
Ireland	EirGrid	Yes	Done on an individual case-by-case basis.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	Individual treatment.
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	In PSE procedure required responsibilities and timescales for the expected solution are required in LON request. They will be defined individually.
Romania	Transelectrica - TEL	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	Yes, however any LON for demand and distribution facilities has not been issued yet.
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

## 4.4.6 Is the information included in this section of the survey (Limited operational notification) publicly available in accordance with NC DC Article 22(3)?



■ Yes ■ No ■ Not published yet

## 4.5 Survey on operational notification procedure for demand units used by a demand facility or a closed distribution system to provide demand response to system operators pursuant to NC DC art. 31

### 4.5.1 Please provide the link to the details of the operational notification procedure acc. to art. 31(4) for demand units used by a demand facility or a closed distribution system connected at a voltage level above 1000 V!

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	The relevant national grid code is currently under development.
Belgium	ELIA GROUP	Yes	Not available yet.
Bulgaria	ESO EAD	Yes	<a href="https://www.dker.bg/uploads/normative_documents/naredbi/Naredba_6_27092019.pdf">https://www.dker.bg/uploads/normative_documents/naredbi/Naredba_6_27092019.pdf</a>
Croatia	HOPS	Yes	Operational notification procedure is defined in Transmission System Grid Code (from 2017) and Amendments to the Transmission System Grid Code (from 2020) <a href="https://narodne-novine.nn.hr/clanci/sluzbeni/2017_07_67_1585.html">https://narodne-novine.nn.hr/clanci/sluzbeni/2017_07_67_1585.html</a> <a href="https://narodne-novine.nn.hr/clanci/sluzbeni/2020_11_128_2453.html">https://narodne-novine.nn.hr/clanci/sluzbeni/2020_11_128_2453.html</a> There are also available “Rules on connection to the transmission grid”: <a href="https://www.hops.hr/page-file/ovIVxjaJLKwhEgpQ0HGx03/popis-propisa-vezanih-za-prikljucenje-na-prijenosnu-mrezu/Pravila_o_priklju%C4%8Denju_na_prijenosnu_mre%C5%BEu-26-04-2018-sa_potpisom.pdf">https://www.hops.hr/page-file/ovIVxjaJLKwhEgpQ0HGx03/popis-propisa-vezanih-za-prikljucenje-na-prijenosnu-mrezu/Pravila_o_priklju%C4%8Denju_na_prijenosnu_mre%C5%BEu-26-04-2018-sa_potpisom.pdf</a>
Czech Republic	ČEPS, a.s.	Yes	No details have been specified.
Estonia	Elering AS	Yes	<a href="https://elering.ee/sites/default/files/public/Teenused/Liitumine/01%20-%20Standard%20terms%20and%20condition">https://elering.ee/sites/default/files/public/Teenused/Liitumine/01%20-%20Standard%20terms%20and%20condition</a>



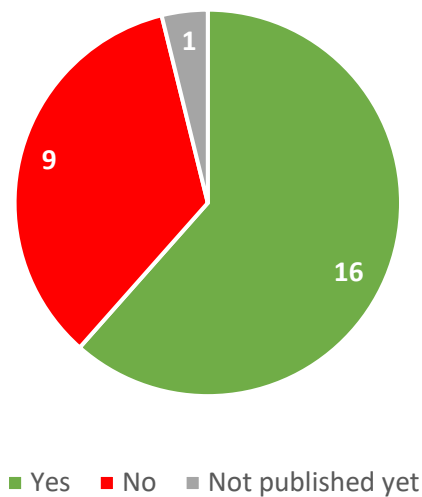
Country	TSO	Approval for publication in the IMR	Answer
			<a href="#">s%20of%20connection%20to%20the%20electricity%20transmission%20system%20of%20Elering%20AS_2021.01.11.pdf</a>
Finland	Fingrid	Yes	<a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/kulutuksen-jarjestelmatekniset-vaatimukset-kjv2018--en.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/kulutuksen-jarjestelmatekniset-vaatimukset-kjv2018--en.pdf</a>
France	RTE	Yes	No specific procedure added; refer to RTE market rules for further information. <a href="https://www.services-rte.com/fr/la-bibliotheque.html">https://www.services-rte.com/fr/la-bibliotheque.html</a>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	See in VDE-AR-N 4130, Chapter 4, Figure 1 (Connection and commissioning process). The links to the connection standards:  Technical requirements for the connection to and parallel operation with low-voltage distribution networks: <a href="https://www.vde-verlag.de/standards/0100492/vde-ar-n-4105-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100492/vde-ar-n-4105-anwendungsregel-2018-11.html</a>  Technical requirements for the connection and operation of customer installations to the medium voltage network: <a href="https://www.vde-verlag.de/standards/0100495/vde-ar-n-4110-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100495/vde-ar-n-4110-anwendungsregel-2018-11.html</a>  Technical requirements for the connection and operation of customer installations to the high voltage network: <a href="https://www.vde-verlag.de/standards/0100493/vde-ar-n-4120-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100493/vde-ar-n-4120-anwendungsregel-2018-11.html</a>  Where combined systems are connected to extra high-voltage networks wherein power consumption or power generating plants connected to customer-owned high-, medium- and/or low-voltage networks are operated, those power consumption and power generating plants are subject to the relevant requirements of the VDE application guide for the respective voltage level of the connection. In this case, the connection

Country	TSO	Approval for publication in the IMR	Answer
			owner demonstrates the abilities to the transmission system operator.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet
Hungary	MAVIR	Yes	Please find the link here (only Hungarian), see chapter 5 "IGÉNYBEJELENTÉS, TÁJÉKOZTATÁS" (Information on Application): <a href="https://www.eon.hu/content/dam/eon/eon-hungary/documents/hatarozatok-szabalyzatok-aram/EED/usz-2021/EED-elo-usz-torzs-H804-2021.pdf">https://www.eon.hu/content/dam/eon/eon-hungary/documents/hatarozatok-szabalyzatok-aram/EED/usz-2021/EED-elo-usz-torzs-H804-2021.pdf</a>
Ireland	EirGrid	Yes	This work is currently going through the DSO Distribution Code modification process. Details will be published in next version of the Distribution Code, following NRA approval.
Lithuania	LITGRID AB	Yes	Pending. Will be published later.
Luxembourg	Creos Luxembourg S.A.	Yes	<a href="https://www.creos-net.lu/particuliers/electricite/raccordement/vous-construisez-mt.html">https://www.creos-net.lu/particuliers/electricite/raccordement/vous-construisez-mt.html</a>
Netherlands	TenneT TSO	Yes	Website: <a href="https://www.netbeheernederland.nl/dossiers/regulering-20/documenten">https://www.netbeheernederland.nl/dossiers/regulering-20/documenten</a> Document: <a href="https://www.netbeheernederland.nl/_upload/Files/Regulering_20_f726bfa3d1.pdf">https://www.netbeheernederland.nl/_upload/Files/Regulering_20_f726bfa3d1.pdf</a>
Poland	PSE S.A.	Yes	PSE notification procedure for demand units (DU) used by a demand facility (DF) or a closed distribution system (CDS) to provide demand response services to TSO is publicly available on PSE website: <a href="https://www.pse.pl/documents/20182/d92bbc86-7543-4484-8ac0-93b2490e1ffc?">https://www.pse.pl/documents/20182/d92bbc86-7543-4484-8ac0-93b2490e1ffc?</a>  PSE cannot provide information about details of notification procedures for DU used by DFs or a

Country	TSO	Approval for publication in the IMR	Answer
			CDSs to provide demand response services to DSOs.
Romania	Transelectrica - TEL	Yes	Acc. to art. 31(4) TEL has the same operational notification procedure for demand units used by a demand facility or a closed distribution system connected at a voltage level above 1000 V as for the transmission connected demand facility or transmission connected distribution system operator: Operational Notification Procedure – approved by NRA Order no. 176/07.09.2019: <a href="https://www.transelectrica.ro/documents/10179/3992480/Ordinul+ANRE+nr.+176_07.08.2019+-+Procedura+de+notificare+a+locurilor+de+consum/1917d4e5-6295-46a4-a767-7f6ad9ea2d64">https://www.transelectrica.ro/documents/10179/3992480/Ordinul+ANRE+nr.+176_07.08.2019+-+Procedura+de+notificare+a+locurilor+de+consum/1917d4e5-6295-46a4-a767-7f6ad9ea2d64</a>
Slovak Republic	SEPS	Yes	N/A
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	Yes	N/A. It will be defined por each service, when service is established.
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet fully implemented the operational notification procedure according to NC DC. The implementation process is ongoing. Verification of technical requirements is done in the pre-qualification process for ancillary services.

## 4.5.2 Is the provision of the link publicly available in accordance with NC DC Article

22(3)?



## 4.6 Survey on operational notification procedure for demand units within a demand facility or a closed distribution system connected at a voltage level above 1000 V pursuant to NC DC art. 33

### 4.6.1 Has the TSO a statement of compliance simplified to a single operational procedure stage in the format of a DRUD acc. to 33(1)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	The relevant national grid code is currently under development.
Belgium	ELIA GROUP	Yes	Not decided yet.
Bulgaria	ESO EAD	Yes	Yes
Croatia	HOPS	Yes	Part of connection process for new demand facilities, defined in operational agreement for existing demand facilities.
Czech Republic	ČEPS, a.s.	Yes	No
Estonia	Elering AS	Yes	No
Finland	Fingrid	No	No
France	RTE	Yes	No specific procedure added; refer to RTE market rules for further information.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<p>No. This depends on the project. Links to the applicable national application rules of the VDE:</p> <p>Technical requirements for the connection to and parallel operation with low-voltage distribution networks</p> <p><a href="https://www.vde-verlag.de/standards/0100492/vde-ar-n-4105-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100492/vde-ar-n-4105-anwendungsregel-2018-11.html</a></p> <p>Technical requirements for the connection and operation of customer installations to the medium voltage network:</p>

Country	TSO	Approval for publication in the IMR	Answer
			<a href="https://www.vde-verlag.de/standards/0100495/vde-ar-n-4110-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100495/vde-ar-n-4110-anwendungsregel-2018-11.html</a> Technical requirements for the connection and operation of customer installations to the high voltage network: <a href="https://www.vde-verlag.de/standards/0100493/vde-ar-n-4120-anwendungsregel-2018-11.html">https://www.vde-verlag.de/standards/0100493/vde-ar-n-4120-anwendungsregel-2018-11.html</a> Where combined systems are connected to extra high-voltage networks wherein power consumption or power generating plants connected to customer-owned high-, medium- and/or low-voltage networks are operated, those power consumption and power generating plants are subject to the relevant require
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration.
Hungary	MAVIR	Yes	It is a part of the accreditation procedure for the Ancillary Services. Refert to the link (only Hungarian) here: <a href="https://www.mavir.hu/documents/10258/239609830/USz_M24.+kiad%C3%A1s_Mell%C3%A9klet_2021.04.27_clean.pdf/f83727b8-2196-1e7e-f1b4-e01c94a1cfd?t=1619605252601">https://www.mavir.hu/documents/10258/239609830/USz_M24.+kiad%C3%A1s_Mell%C3%A9klet_2021.04.27_clean.pdf/f83727b8-2196-1e7e-f1b4-e01c94a1cfd?t=1619605252601</a> See Chapter 9.1: "AKKREDITÁCIÓ RENDSZERSZINTŰ SZOLGÁLTATÁSHOZ" - Accreditation procedure for Ancillary Services.
Ireland	EirGrid	Yes	This work is currently going through the DSO Distribution Code modification process. Details will be published in next version of the Distribution Code, following NRA approval.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	No

Country	TSO	Approval for publication in the IMR	Answer
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	Will be defined por each service, when service is established.
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet fully implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

## 4.6.2 Has the TSO reduced the range of compliance requirements in articles 36 to 47 acc. to 33(1)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	The relevant national grid code is currently under development.
Belgium	ELIA GROUP	Yes	No
Bulgaria	ESO EAD	Yes	No

Country	TSO	Approval for publication in the IMR	Answer
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	No
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	No	—
France	RTE	Yes	No specific procedure added; see RTE market rules for further information.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	No. This depends on the project. Where combined systems are connected to extra high-voltage networks wherein power consumption or power generating plants connected to customer-owned high-, medium- and/or low-voltage networks are operated, those power consumption and power generating plants are subject to the relevant requirements of the VDE application guide for the respective voltage level of the connection. In this case, the connection owner demonstrates the abilities to the transmission system operator.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration.
Hungary	MAVIR	Yes	It is possible to require reduced range of compliance requirements.
Ireland	EirGrid	Yes	This work is currently going through the DSO Distribution Code modification process. Details will be published in next version of the Distribution Code, following NRA approval.
Lithuania	LITGRID AB	Yes	No



Country	TSO	Approval for publication in the IMR	Answer
Luxembourg	Creos Luxembourg S.A.	Yes	No
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet fully implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

## 4.6.3 Has the TSO differentiated the FON from art. 33 and FON from art. 25 acc. to 33(2)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	The relevant national grid code is currently under development.
Belgium	ELIA GROUP	Yes	Not decided yet.

Country	TSO	Approval for publication in the IMR	Answer
Bulgaria	ESO EAD	Yes	Yes
Croatia	HOPS	Yes	No
Czech Republic	ČEPS, a.s.	Yes	No
Estonia	Elering AS	Yes	No
Finland	Fingrid	No	–
France	RTE	Yes	No specific procedure added; see RTE market rules for further information.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	No. This depends on the projekt. Where combined systems are connected to extra high-voltage networks wherein power consumption or power generating plants connected to customer-owned high-, medium- and/or low-voltage networks are operated, those power consumption and power generating plants are subject to the relevant requirements of the VDE application guide for the respective voltage level of the connection. In this case, the connection owner demonstrates the abilities to the transmission system operator.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Yes, it is an individual agreement between TSO and the Demand Facility.
Ireland	EirGrid	Yes	This work is currently going through the DSO Distribution Code modification process. Details will be published in next version of the Distribution Code, following NRA approval.

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Country	TSO	Approval for publication in the IMR	Answer
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	No
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	No
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet fully implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

## 4.6.4 Has the TSO prepared separate FON documents for Demand Facilities & Closed Distribution Systems > 1kV in case of Demand Response Services acc. to 33(2)?

Country	TSO	Approval for publication in the IMR	Answer
Austria	Austrian Power Grid AG (APG)	Yes	The relevant national grid code is currently under development.
Belgium	ELIA GROUP	Yes	Not available yet.
Bulgaria	ESO EAD	Yes	No
Croatia	HOPS	Yes	No. No CDS in Croatia.
Czech Republic	ČEPS, a.s.	Yes	No
Estonia	Elering AS	Yes	No
Finland	Fingrid	No	—
France	RTE	Yes	No
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	No, this depends on the project. Where combined systems are connected to extra high-voltage networks wherein power consumption or power generating plants connected to customer-owned high-, medium- and/or low-voltage networks are operated, those power consumption and power generating plants are subject to the relevant requirements of the VDE application guide for the respective voltage level of the connection. In this case, the connection owner demonstrates the abilities to the transmission system operator.
Greece	Independent Power Transmission Operator S.A.	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet

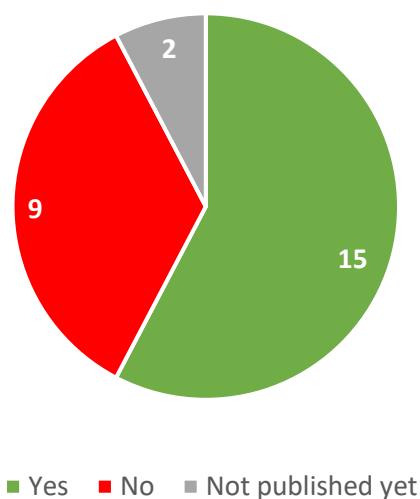
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Country	TSO	Approval for publication in the IMR	Answer
	(IPTO S.A.)		
Hungary	MAVIR	Yes	Yes, in all cases.
Ireland	EirGrid	Yes	This work is currently going through the DSO Distribution Code modification process. Details will be published in next version of the Distribution Code, following NRA approval.
Lithuania	LITGRID AB	Yes	No
Luxembourg	Creos Luxembourg S.A.	Yes	No
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	No
Slovak Republic	SEPS	Yes	No
Slovenia	ELES	Yes	No
Spain	Red Eléctrica de España	Yes	Not yet. Will be defined for each service, when service is established.
Sweden	Svenska Kraftnät	Yes	Svenska kraftnät has not yet fully implemented the operational notification procedure according to NC DC. The implementation process is ongoing.

4.6.5 Is the information included in this section of the survey (Operational notification procedure - connection above 1000V) publicly available in accordance with NC DC Article 22(3)?



## 5 NC HVDC Implementation

### 5.1 Survey on general provisions pursuant to NC HVDC art. 55

#### 5.1.1 Please provide the link to the details of the operational notification procedure acc. to art. 55(2)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	Operational notification procedure is defined in Transmission System Grid Code (from 2017) and Amendments to the Transmission System Grid Code (from 2020) <a href="https://narodne-novine.nn.hr/clanci/sluzbeni/2017_07_67_15_85.html">https://narodne-novine.nn.hr/clanci/sluzbeni/2017_07_67_15_85.html</a> <a href="https://narodne-novine.nn.hr/clanci/sluzbeni/2020_11_128_2_453.html">https://narodne-novine.nn.hr/clanci/sluzbeni/2020_11_128_2_453.html</a>
Estonia	Elering AS	Yes	<a href="https://elering.ee/sites/default/files/public/Teeused/Liitumine/01%20-%20Standard%20terms%20and%20conditions%20of%20connection%20to%20the%20electricity%20transmission%20system%20of%20Elering%20AS_2021.01.11.pdf">https://elering.ee/sites/default/files/public/Teeused/Liitumine/01%20-%20Standard%20terms%20and%20conditions%20of%20connection%20to%20the%20electricity%20transmission%20system%20of%20Elering%20AS_2021.01.11.pdf</a>
Finland	Fingrid	Yes	<a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/suurjannitteisten-tasahkojarjestelmien-jarjestelmatekniset-vaatimukset-hvdc2018.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/suurjannitteisten-tasahkojarjestelmien-jarjestelmatekniset-vaatimukset-hvdc2018.pdf</a> (available only in Finnish)
France	RTE	Yes	Chapter 4 of Article 8.24: <a href="https://www.services-rte.com/fr/la-bibliotheque.html">https://www.services-rte.com/fr/la-bibliotheque.html</a>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<a href="https://www.vde-verlag.de/standards/0100511/vde-ar-n-4131-anwendungsregel-2019-03.html">https://www.vde-verlag.de/standards/0100511/vde-ar-n-4131-anwendungsregel-2019-03.html</a>

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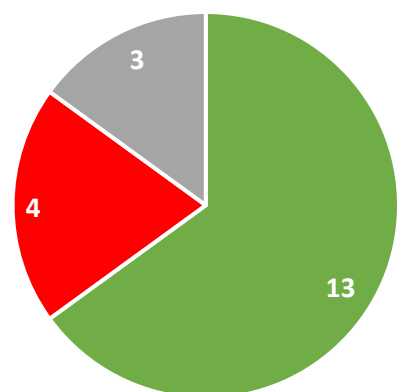
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Country	TSO	Approval for publication in the IMR	Answer
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032">https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032</a>
Ireland	EirGrid	Yes	Will be published in updated Grid Code once approved by RAs. Details of Grid Code modification paper under MPID 291. <a href="https://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-info/modifications/">https://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-info/modifications/</a>
Lithuania	LITGRID AB	Yes	<a href="https://www.litgrid.eu/uploads/files/dir519/dir25/dir1/4_0.php">https://www.litgrid.eu/uploads/files/dir519/dir25/dir1/4_0.php</a>
Netherlands	TenneT TSO	Yes	Website: <a href="https://www.netbeheernederland.nl/dossiers/regulering-20/documenten">https://www.netbeheernederland.nl/dossiers/regulering-20/documenten</a> Document: <a href="https://www.netbeheernederland.nl/upload/Files/Regulering_20_22096599dd.pdf">https://www.netbeheernederland.nl/upload/Files/Regulering_20_22096599dd.pdf</a>
Poland	PSE S.A.	Yes	PSE notification procedure for HVDC objects is publicly available on PSE website: <a href="https://www.pse.pl/documents/20182/233182e1-57d2-4c7a-8f91-f8e9415db57d?">https://www.pse.pl/documents/20182/233182e1-57d2-4c7a-8f91-f8e9415db57d?</a> Please note, that in PL there are 187 DSOs (they are listed on PL NRA site: <a href="https://rejestr.ure.gov.pl">https://rejestr.ure.gov.pl</a> ) and PSE cannot provide information about operational notifications for HVDC objects on behalf of them (it may differ between each PL DSO).
Romania	Transelectrica - TEL	Yes	Operational Notification Procedure – approved by NRA Order no. 220/11.12.2019: <a href="https://www.transelectrica.ro/documents/10179/3992482/Anexa+la+Ordin+ANRE+nr.+220+din+11.12.2019+Procedura+de+notificare+HVDC+si+a+centralei+formata+din+MGCC/C/50170796-3139-4b56-80a5-">https://www.transelectrica.ro/documents/10179/3992482/Anexa+la+Ordin+ANRE+nr.+220+din+11.12.2019+Procedura+de+notificare+HVDC+si+a+centralei+formata+din+MGCC/C/50170796-3139-4b56-80a5-</a>



Country	TSO	Approval for publication in the IMR	Answer
			<a href="#">d478fc3e5714</a>
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No HVDC converter units have been constructed since NC HVDC entered into force and the Operational Notification Procedure for HVDC Systems according to the NC HVDC have not yet been implemented. Connection procedures for HVDC Systems do exist, although they are internal and so far only applicable for HVDC Systems constructed and owned by Svenska kraftnät as TSO. The existing connection procedures are to be aligned and implemented according to the NC HVDC. Hence, no link is available today.

### 5.1.2 Is the provision of the link publicly available in accordance with NC HVDC Article 55(2)?



■ Yes ■ No ■ Not published yet

## 5.2 Survey on interim operational notification for HVDC systems pursuant to NC HVDC art. 57

### 5.2.1 What is the limited period of time (ION) for operation of the HVDC system or HVDC converter unit by using the grid connection acc. to art. 57(1)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	An ION is it set individually.
Estonia	Elering AS	Yes	2 years as for RfG.
Finland	Fingrid	Yes	24 months.
France	RTE	Yes	The limited period of time for ION is 24 months.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Without a derogation order, the maximum period for a connection owner to remain in the status of interim operational notification shall not exceed 24 months. The relevant system operator may specify a shorter validity period for the interim operational notification. The validity period of the interim operational notification shall be notified to the regulatory authority in accordance with the applicable national regulatory framework. A validity extension of the interim operational notification shall be granted only if the connection owner demonstrates substantial progress towards full compliance. At the time of extension of the validity of the interim operational notification, any remaining unresolved issues shall be explicitly identified. The maximum period for a connection owner to remain in the status of interim operational notification may be extended beyond 24 months upon request for a derogation made to the relevant system operator in accordance with the procedure in Title VII of the Regulation (EU) 2016/1447 (NC HVDC). The request shall be made prior to the expiry of the 24-month period.

Country	TSO	Approval for publication in the IMR	Answer
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032">https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032</a>
Ireland	EirGrid	Yes	No longer than 24 months.
Lithuania	LITGRID AB	Yes	ION time period is the same as in the Regulation.
Netherlands	TenneT TSO	Yes	Case dependent, to be specified by the RSO but no more than 24 months.
Poland	PSE S.A.	Yes	In PSE procedure validity period for ION is specified individually (in line with connection schedule specified in connection agreement), no longer than 24 months.
Romania	Transelectrica - TEL	Yes	Acc. to art. 57(1) the limited period of time (ION) for operation of the HVDC system or HVDC converter unit by using the grid connection is the maximum 24 months, but TSO is entitled to set a shorter validity period for ION (art. 15 from Operational Notification Procedure – approved by NRA Order no. 220/11.12.2019).
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	No	–
Sweden	Svenska Kraftnät	Yes	As only internal connection procedures of HVDC Systems exists today, this is not implemented.

## 5.2.2 Do you request an itemised statement of compliance acc. to art. 57(3)(a)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	In consideration of the fact that Croatian transmission system does not have any HVDC link with other transmission system of neighbor countries, Croatian TSO has not been requested an itemised statement of compliance so far.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Under development.
Lithuania	LITGRID AB	Yes	No
Netherlands	TenneT TSO	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	As only internal connection procedures of HVDC Systems exist today, this is not implemented.

## 5.2.3 Do you request detailed technical data of the HVDC system which is of relevance to the grid connection acc. to art. 57(3)(b)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—
Croatia	HOPS	Yes	So far, there have been no requisite to request detailed technical data of the HVDC system.
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT /	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
	TransnetBW / 50Hertz)		
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	Yes
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No HVDC converter units have been constructed since NC HVDC entered into force, and all recent HVDC Systems connected to Svenska kraftnät before NC HVDC are owned by Svenska kraftnät. Hence, of today, technical data are naturally obtained through contracts between Svenska kraftnät and HVDC manufactures.

## 5.2.4 Please list the requested technical data of the HVDC system of which is of relevance to the grid connection acc. to art. 57(3)(b)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	There is no such list at this time.
Estonia	Elering AS	Yes	<p>3 Content of the electrical part project</p> <p>3.1 The design of the consumption-oriented electrical part project must include the following:</p> <p>3.1.1 Primary part:</p> <p>3.1.1.1 The primary part of the electrical part project must include the following:</p> <p>3.1.1.1.1 General – short description;</p> <p>3.1.1.1.2 The primary scheme up to the connection point;</p> <p>3.1.1.1.3 A one-line diagram of the electrical installation up to the connection point, showing new and existing production units, reactive energy compensation devices, intermediate transformers, distribution and protection devices and cables and connections with nominal data;</p> <p>3.1.1.1.4 110 kV or 330 kV power transformers with basic parameters and a FAT report;</p> <p>3.1.1.1.5 Sections of the client's 110 kV or 330 kV bays and bus arrangements if the client's electrical installation is connected to the connection point of the TSO directly through bus arrangement;</p> <p>3.1.1.1.6 The results of measuring and calculating the contact voltage and step voltage (if the earthing loop of the client's electrical equipment is electrically connected to the earthing loop of the substation or line of the TSO). The source data (shortcircuit values) required for the calculations shall be provided by the TSO;</p> <p>3.1.1.1.7 When connecting to the 110-330 kV cable:</p> <p>3.1.1.1.7.1 Cable length;</p> <p>3.1.1.1.7.2 Longitudinal profile, including intersections with other structures;</p>



Country	TSO	Approval for publication in the IMR	Answer
			<p>3.1.1.1.7.3 Cable brand with electrical parameters;</p> <p>3.1.1.1.7.4 Drawing of the connection to the cable entry and connection point, also showing sections of the cable location;</p> <p>3.1.1.1.7.5 Position plan of the client's electrical installation in the protection zone of the TSO's electrical installation.</p> <p>3.1.1.1.8 When connecting to the 110-330 kV overhead line:</p> <p>3.1.1.1.8.1 Position plan and longitudinal profile of the client's electrical installation in the protection zone of the TSO's electrical installation;</p> <p>3.1.1.1.8.2 Support types (including support drawing);</p> <p>3.1.1.1.8.3 Line wire and lightning rope with electrical parameters;</p> <p>3.1.1.1.8.4 PSS/E model and PSCAD model shall be provided if the capacity of the electricity consumer to be connected to the single grid is over 10 MW.</p> <p>3.1.2 Secondary part:</p> <p>3.1.2.1 The secondary part of the project must include at least:</p> <p>3.1.2.1.1 A diagram of the arrangement of the main and reserve relays of an electrical installation with a voltage of 110 or 330 kV, including a power transformer, along with measuring transformers, where the connections between the devices and the types of relays are also shown;</p> <p>3.1.2.1.2 Relay protection and automatic system settings, which are needed to achieve cooperation of the client's and TSO's relays from the client's device to the connection point;</p> <p>3.1.2.1.3 Control and automation in accordance with the connection conditions guide 'Data exchange requirements related to the client's electrical installation';</p> <p>3.1.2.1.4 Data communication parameters, IP addresses (static VPN of the concentrator, IP (RTU etc. of the devices requested by SCADA) on the side of the energy system control centre (SCADA) with a communication connection diagram and an explanatory note;</p> <p>3.1.2.1.5 RTU data volumes (measurements,</p>

Country	TSO	Approval for publication in the IMR	Answer
			controls and position signals); 3.1.2.1.6 Guaranteed measurement accuracies. 3.2 When connecting power-generating modules and mixed installations and changing their consumption and/or production conditions, the client must submit a production-oriented electrical part project, in the frame of which the submitted consumption-oriented design has to be supplemented if due to the changes in the client's electrical installation the data submitted in the consumption-oriented project have changed. In addition, the production-oriented project must include the following: 3.2.1 An explanatory note if the submitted project has differences compared with the previously submitted consumption-oriented project; 3.2.2 A position plan with the coordinates of the client's energy park module (on a scale of 1:200)
Finland	Fingrid	Yes	See section 7, exact scope will be agreed based on the HVDC connection to be built.
France	RTE	Yes	Due to the large number of data, we provide the address of the file : « FICHE E3 : LISTE DES DONNEES », Article 8.24. , See: <a href="https://www.services-rte.com/fr/la-bibliotheque.html">https://www.services-rte.com/fr/la-bibliotheque.html</a>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<ul style="list-style-type: none"> <li>• Prerequisite for commissioning</li> <li>- proof of the energisation operational notification (EON)</li> <li>- commissioning programme and schedule</li> <li>- o system documentation (construction plans, circuit diagrams, documents for primary and secondary technology, etc.)</li> <li>- protection setting data, including back-up protection</li> <li>- test protocols and, if applicable, certificates</li> <li>- further official permits, if applicable</li> <li>- successful acceptance procedure and approval for commissioning (results of compliance testing)</li> <li>- ensuring a complete system documentation for the installations of the HVDC system (construction plans, circuit diagrams, documents for primary and secondary technology, etc.) at the connection point</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>Operating phase</li> <li>weekly notice of any unavailability of the HVDC system planned for the subsequent week</li> </ul>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032">https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032</a>
Ireland	EirGrid	Yes	Under development.
Lithuania	LITGRID AB	Yes	Nominal active and reactive power, nominal voltage.
Netherlands	TenneT TSO	Yes	a. Maximum HVDC active power transmission capacity or Maximum capacity b. Minimum and maximum active power production and consumption c. Maximum active power control velocity d. Minimum and maximum reactive power production and consumption e. Maximum reactive power control velocity f. Maximum voltage control velocity g. Priority for active or reactive power (if applicable) h. Filters topology, component parameters and control i. Reactive power topology, component parameters and control j. Frequency response k. Dynamic simulation parameters and models l. Short-circuit parameters m. Protection settings n. Transformer data
Poland	PSE S.A.	Yes	Requested data is site specific, so we did not provide list of requested technical data. These data should include: <ul style="list-style-type: none"> <li>converters data</li> <li>transformer data</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• HV line data</li> <li>• HV switchgear data</li> <li>• AUX system data</li> <li>• sensors data</li> <li>• control unit data</li> <li>• emergency power supply data</li> </ul>
Romania	Transelectrica - TEL	Yes	<p>The installation document (DI) include all technical data required (art. 9 from Operational Notification Procedure – approved by NRA Order no. 220/11.12.2019). The model of the DI document with all the requested technical data it is posted on the website:</p> <p><a href="https://www.transelectrica.ro/documents/10179/9805941/Modelul+DI_instalatia+HVDC/39ce685f-8e68-4b0d-84eb-0f24db3ad70d">https://www.transelectrica.ro/documents/10179/9805941/Modelul+DI_instalatia+HVDC/39ce685f-8e68-4b0d-84eb-0f24db3ad70d</a></p> <p>The technical documentation for HVDC system contains at least the following documents (Annex no. 1 from the Operational Notification Procedure – NRA Order no. 220/11.12.2019):</p> <ul style="list-style-type: none"> <li>- The expected date of the application of power for energizing;</li> <li>- Equipment certificates issued by an authorized certification body for the equipment used by the HVDC system, together with the test results;</li> <li>- The detailed technical data of the HVDC system, the auxiliary installations as well as the single line diagram of the substation and the power plant;</li> <li>- Mathematical models of HVDC system and its parameters:</li> <li>- Electrical parameters specific to all cables and lines: type (material), <math>R + [\Omega / \text{km}]</math>, <math>R_0 [\Omega / \text{km}]</math>, <math>R_{m0} [\Omega / \text{km}]</math>, <math>X_0 [\Omega / \text{km}]</math>, <math>X_0 [\text{Km} / \text{s}]</math>, <math>C_0 [\mu\text{F} / \text{km}]</math>, <math>C_0 [\mu\text{F} / \text{km}]</math>, <math>S [\text{mm}]</math>, <math>U_n [\text{kV}]</math>;</li> <li>- For transformer units JT / MT kV: rated winding power, nominal voltages, loose losses, copper losses, short-circuit voltage, idle current, connection group, voltage setting (type of adjustment, including the number of the nominal plot, the maximum plot number), neutral treatment;</li> <li>- Reactive power compensation data if the case;</li> <li>- Data required for calculations of protection settings;</li> <li>- Power quality measurement system in the connection point;</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			- The telecommunication project that provides the communication path used to integrate into DMS/EMS-SCADA.
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No HVDC converter units have been constructed since NC HVDC entered into force, and all recent HVDC Systems connected to Svenska kraftnät before NC HVDC are owned by Svenska kraftnät. Although the Operational Notification Procedure for HVDC Systems according to the NC HVDC have not yet been implemented, all technical data are naturally obtained through contracts between Svenska kraftnät and HVDC manufactures.

## 5.2.5 Do you request equipment certificates issued by an authorised certifier in respect of HVDC systems or HVDC converter units acc. to art. 57(3)(c)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—
Croatia	HOPS	Yes	Croatian TSO has not been requested equipment certificates issued by an authorized certifier so far.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	No
France	RTE	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	The connection owner shall provide to the relevant system operator equipment certificates of HVDC systems or HVDC converter units where these are relied upon as part of the evidence of compliance.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	No, but may be submitted by user if they wish.
Lithuania	LITGRID AB	Yes	No
Netherlands	TenneT TSO	Yes	Optional
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	As only internal connection procedures of HVDC Systems exists today, this is not implemented.

## 5.2.6 Please list the requested equipment certificates issued by an authorised certifier

in respect of HVDC systems or HVDC converter units acc. to art. 57(3)(c)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	There is no such list at this time.
Estonia	Elering AS	Yes	–
Finland	Fingrid	Yes	–
France	RTE	Yes	The processes of certification is mainly used for equipment compliance to the standards. See « FICHE E4 : QUALIFICATION DES MATERIELS ELECTRIQUES », Article 8.24: <a href="https://www.services-rte.com/fr/la-bibliotheque.htm">https://www.services-rte.com/fr/la-bibliotheque.htm</a>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	If applicable.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032">https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032</a>
Ireland	EirGrid	Yes	N/A
Lithuania	LITGRID AB	Yes	–

Country	TSO	Approval for publication in the IMR	Answer
Netherlands	TenneT TSO	Yes	Optional
Poland	PSE S.A.	Yes	<p>If it comes to PSE detailed information on equipment certificates for HVDC systems is specified in separate document “Procedure for testing HVDC systems with the division of responsibilities between the owner of the HVDC system and PSE S.A. for the purposes of testing and the conditions and procedure for the use of appropriate equipment certificates”</p> <p>(<a href="https://www.pse.pl/documents/20182/96bb9b8f-6849-4e65-91e8-c85554336115?">https://www.pse.pl/documents/20182/96bb9b8f-6849-4e65-91e8-c85554336115?</a>):</p> <ul style="list-style-type: none"> <li>• LFSM-O</li> <li>• LFSM-U</li> <li>• FRT</li> <li>• Fast Fault Current Injection</li> <li>• Post Fault Active Power Recovery</li> <li>• Frequency Ranges</li> <li>• ROCOF</li> </ul>
Romania	Transelectrica - TEL	Yes	<p>Acc. to art. 57(3)(c) the Equipment certificates must be issued by an accreditation certification body – authorised certifier. The Equipment certificates must contain test results. The Equipment certificates must include at least (Annex no. 1(6) from the Operational Notification Procedure – NRA Order no. 220/11.12.2019):</p> <p>The Equipment certificates must contain at least</p> <ul style="list-style-type: none"> <li>• checking the P - Q capability curve;</li> <li>• fault-ride-through with Fast fault current injection;</li> <li>• RoCoF;</li> <li>• LFSM;</li> <li>• FSM;</li> <li>• frequency range;</li> <li>• the capability of automatic reconnection of the HVDC systems or HVDC converter units at voltage variations;</li> <li>• electrical disturbances in accordance with EN 50160 in force;</li> <li>• the modality to respond to changes in active and reactive power setpoints.</li> </ul>



Country	TSO	Approval for publication in the IMR	Answer
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	No	–
Sweden	Svenska Kraftnät	Yes	Not applicable.

## 5.2.7 Do you request simulation models or a replica of the exact control system acc. to art. 57(3)(d)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	No
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A.	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.

Country	TSO	Approval for publication in the IMR	Answer
	(IPTO S.A.)		
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	Yes
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No HVDC converter units have been constructed since NC HVDC entered into force, and all recent HVDC Systems connected to Svenska kraftnät before NC HVDC are owned by Svenska kraftnät. Although the Operational Notification Procedure for HVDC Systems according to the NC HVDC have not yet been implemented, simulation models are requested through existing connection procedures and contracts with HVDC manufactures.

## 5.2.8 Please list the requested simulation models or a replica of the exact control system acc. to art. 57(3)(d)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	–
Estonia	Elering AS	Yes	PSSE, PSCAD
Finland	Fingrid	Yes	See section 15.
France	RTE	Yes	RTE requests phasor model (RMS), EMT model and replica.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<ul style="list-style-type: none"> <li>• Dynamic r.m.s. models (RMS models),</li> <li>• Electromagnetic transient models (EMT models),</li> <li>• Models for harmonic component examination:                             <ul style="list-style-type: none"> <li>- Model for steady-state harmonic component examinations (Model A),</li> <li>- Model for harmonic component stability (Model B).</li> </ul> </li> </ul>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032">https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032</a>
Ireland	EirGrid	Yes	EirGrid requests a steady-state model, an RMS model (full details or with Laplace diagrams) and a generic/library model. We also seek an EMT model in PSCAD, and a harmonics model in PowerFactory.
Lithuania	LITGRID AB	Yes	Detail mathematical model suitable for dynamics calculations is in format requested by the TSO (PSS/E format) shall be provided. The provided

Country	TSO	Approval for publication in the IMR	Answer
			model shall give the same control functions as control system.
Netherlands	TenneT TSO	Yes	<ul style="list-style-type: none"> <li>• HVDC converter unit models;</li> <li>• AC component models;</li> <li>• DC grid models;</li> <li>• Voltage and power controller;</li> <li>• Special control features if applicable e.g. power oscillation damping (POD) function, subsynchronous torsional interaction (SSTI) control;</li> <li>• Multi terminal control, if applicable;</li> <li>• HVDC system protection models as agreed between the relevant TSO and the HVDC system owner.</li> </ul>
Poland	PSE S.A.	Yes	<p>According to Art. 54 HVDC simulation models should shall contain the following sub-models, depending on the existence of the individual components:</p> <ul style="list-style-type: none"> <li>• HVDC converter unit models;</li> <li>• AC component models;</li> <li>• DC grid models;</li> <li>• Voltage and power controller;</li> <li>• Special control features if applicable e.g. power oscillation damping (POD) function, subsynchronous torsional interaction (SSTI) control;</li> <li>• Multi terminal control, if applicable;</li> <li>• HVDC system protection models as agreed between PSE and the HVDC system owner.</li> </ul>
Romania	Transelectrica - TEL	Yes	<p>Acc. to art. 57(3)(d) the requested simulation models or a replica of the exact control system are to completely simulate the behaviour of HVDC systems in steady-state and dynamic conditions, the power quality of electricity ensured at the connection point, inclusive:</p> <ul style="list-style-type: none"> <li>• The network study for calculating the reactive power requirement at the connection point to meet the reactive power requirements at the connection point;</li> <li>• Studies on coordination of protection, with RSO agreement on the protection schemes at the connection point (Annex no. 1(9) from the Operational Notification Procedure – NRA Order no. 220/11.12.2019).</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	<p>No HVDC converter units have been constructed since NC HVDC entered into force, and all recent HVDC Systems connected to Svenska kraftnät before NC HVDC are owned by Svenska kraftnät. Although the Operational Notification Procedure for HVDC Systems according to the NC HVDC have not yet been implemented, the following simulation models are normally requested through existing connection procedures and contracts with HVDC manufactures:</p> <ul style="list-style-type: none"> <li>- Detailed PSCAD-model (EMT-model), possibly blackboxed</li> <li>- Open PSCAD-model (EMT-model), not blackboxed</li> <li>- Detailed PSSE-model (RMS-model), possibly blackboxed</li> <li>- Open PSSE-model (RMS-model), not blackboxed</li> <li>- Harmonic impedance model/characteristic</li> </ul>

## 5.2.9 Do you request studies demonstrating steady-state and dynamic performance acc. to art. 57(3)(e)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—
Croatia	HOPS	Yes	No
Estonia	Elering AS	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Most probably yes
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	No
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	No	—

Country	TSO	Approval for publication in the IMR	Answer
Sweden	Svenska Kraftnät	Yes	No HVDC converter units have been constructed since NC HVDC entered into force, and all recent HVDC Systems connected to Svenska kraftnät before NC HVDC are owned by Svenska kraftnät. Although the Operational Notification Procedure for HVDC Systems according to the NC HVDC have not yet been implemented, studies demonstrating steady-state and dynamic performance are requested through existing connection procedures and contracts with HVDC manufactures.

## 5.2.10 Please list the requested studies demonstrating steady-state and dynamic performance acc. to art. 57(3)(e)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—
Croatia	HOPS	Yes	
Estonia	Elering AS	Yes	<p>6.1 to analyse the behaviour of the electrical installation and assess the ability of the power-generating module to meet the established requirements;</p> <p>5.6.2 to analyse the cooperation and interaction of the power-generating module with nearby electrical installations.</p> <p>5.7 Studies covered by the report (this list is not exhaustive):</p> <p>5.7.1 An overview of the connected electrical installation;</p> <p>5.7.2 The possibility of loading the electrical installation based on the ambient temperature and other temperatures;</p> <p>5.7.3 The active and reactive power flows of the power-generating module occur at different operating points and the accompanying voltage changes in the internal network of the production unit and at the connection point;</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>5.7.4 PQ curves for the power-generating module and production unit;</p> <p>5.7.5 Simulation of different points on the U-Q/Pmax graph according to RfG requirements;</p> <p>5.7.6 A description of control functions;</p> <p>5.7.7 Frequency control capability;</p> <p>5.7.8 Active power control capability;</p> <p>5.7.9 Voltage control capability;</p> <p>5.7.10 Reactive power control capability;</p> <p>5.7.11 The effect of the excitation controller;</p> <p>5.7.12 Power system stabiliser adjustment and operation;</p> <p>5.7.13 The ability to pass the fault-ride;</p> <p>5.7.14 An analysis of the electricity quality of the power-generating module and compliance with the limit values;</p> <p>5.7.15 An analysis of harmonics according to the impedance characteristics issued by the TSO;</p> <p>5.7.16 Selection of filter parameters, impact analysis (if filters are used to attenuate harmonics);</p> <p>5.7.17 Mains overvoltages;</p> <p>5.7.18 Transient and temporary overvoltages;</p> <p>5.7.19 Lightning surges;</p> <p>5.7.20 Ferroresonance;</p> <p>5.7.21 Insulation coordination;</p> <p>5.7.22 Sub-synchronous oscillation processes, possible countermeasures;</p> <p>5.7.23 Blind start analysis;</p> <p>5.7.24 The effect of relay protection and automation;</p> <p>5.7.25 Noise study.</p> <p>5.8 The exact scope of the study will depend on the technology and location of the connected installation in the electricity system and will be agreed with the TSO.</p>
Finland	Fingrid	Yes	See section 15.
France	RTE	Yes	RTE requests simulation studies for hyposynchronous oscillation, restoration, islanding, harmonics and validation of RMS and EMT models.



Country	TSO	Approval for publication in the IMR	Answer
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<ul style="list-style-type: none"> <li>• Stability Study</li> <li>• Evidence of system conformity onshore and off-shore (in case of an offshore connection)</li> <li>• Steady State Harmonic Study</li> <li>• Harmonic Stability Study</li> <li>• Sub-Synchronous Torsional Interaction Study</li> <li>• Electromagnetic Interaction Study</li> <li>• Loss Determination</li> <li>• Interaction study with nearby converters</li> <li>• Insulation Coordination Study</li> <li>• Main Circuit Parameters</li> </ul>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Precise list is under consideration.
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032">https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032</a>
Ireland	EirGrid	Yes	Fault Ride Through, Fast Fault Current, Active Power Recovery, Reactive Capability, Power Oscillation Damping, Active Power Modification, Active Power Reversal.
Lithuania	LITGRID AB	Yes	–
Netherlands	TenneT TSO	Yes	Reactive power capability Fast acting additional reactive current injection Fault-ride-through capability Post fault active power recovery Power Oscillation Damping Control (POD) Active power modification in case of disturbance Fast active power reversal Power quality Insulation coordination Interaction between HVDC systems or other plants and equipment Subsynchronous torsional interaction damping capability
Poland	PSE S.A.	Yes	Requested studies demonstrating steady-state and dynamic performance are in line with Chapter 3 of Title VI HVDC for HVDC systems:

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• fast fault current injection simulation</li> <li>• FRT capability simulation:</li> <li>• post fault active power recovery simulation</li> <li>• reactive power capability simulation</li> <li>• power oscillations damping control simulation</li> <li>• active power modification in case of disturbance simulation</li> <li>• fast active power reversal simulation</li> </ul>
Romania	Transelectrica - TEL	Yes	<p>Acc. to art. 57(3)(e) the requested studies demonstrating steady-state and dynamic performance are listed in the Annex 1 (9, 10, 12, 13) from Operational Notification Procedure – NRA Order no. 220/11.12.2019) as follows:</p> <ul style="list-style-type: none"> <li>- the network study for calculating the reactive power requirement at the connection point to meet the reactive power requirements at the connection point;</li> <li>- the dynamic regime study to determine the measures to avoid or assure island operation, as it is request;</li> <li>- studies on coordination of protection, with RSO agreement on the protection schemes at the connection point.</li> </ul>
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	No	–
Sweden	Svenska Kraftnät	Yes	<p>No HVDC converter units have been constructed since NC HVDC entered into force, and all recent HVDC Systems connected to Svenska kraftnät before NC HVDC are owned by Svenska kraftnät. Although the Operational Notification Procedure for HVDC Systems according to the NC HVDC have not yet been implemented, the following studies demonstrating steady-state and dynamic performance are normally requested through existing connection procedures and contracts with HVDC manufactures:</p> <p>Design Studies, 01 Main Component Circuit Rating and Design, Main Circuit Component Design</p> <p>Design Studies, 01 Main Component Rating and</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>Design, Transient currents</p> <p>Design Studies, 02 Harmonic Performance and Component Studies, Harmonic Performance and rating Study</p> <p>Design Studies, 02 Harmonic Performance and Component Studies, Test Procedure for Harmonic Performance Measurements</p> <p>Design Studies, 03 Radio Interference, Radio Interference</p> <p>Design Studies, 03 Radio Interference, Test specification for RI measurements</p> <p>Design Studies, 04 Transient Overvoltage Studies, TOV Study</p> <p>Design Studies, 04 Transient Overvoltage Studies, AC Breaker Requirements</p> <p>Design Studies, 05 Insulation Coordination Study, Insulation Coordination</p> <p>Design Studies, 06 Protection Setting and Coordination Studies, Protection Coordination Study</p> <p>Design Studies, 07 Reliability and Availability Study, Reliability, Availability and Maintainability</p> <p>Design Studies, 08 Loss Evaluation Study, Loss Evaluation</p> <p>Design Studies, 09 Site Audible Sound Level Study, Sound Propagation Study</p> <p>Design Studies, 09 Site Audible Sound Level Study, Test Procedure for Audible Measurements</p> <p>Design Studies, 10 Grounding Study, Step and touch voltage calculation</p> <p>Design Studies, 11 Magnetic Field Studies, Magnetic Field</p> <p>Design Studies, 11 Magnetic Field Studies, Electrical Field</p> <p>Performance Studies, 01 Verification of Grid Models and Equivalents, Network Equivalent model</p> <p>Performance Studies, 02 Dynamic Performance Studies, Control Interaction Screening Report</p> <p>Performance Studies, 02 Dynamic Performance Studies, Study Report on Benchmarking PSCAD model with real control system in RTDS setup</p> <p>Performance Studies, 02 Dynamic Performance Studies, Dynamic Performance Study (PSCAD)</p> <p>Performance Studies, 03 Subsynchronous</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>Torsional Interaction Study Screening studie</p> <p>Performance Studies, 04 Pre-insertion Resistor Study</p> <p>Performance Studies, 05 Protection Design and Coordination, Protection design and coordination</p> <p>Performance Studies, 06 Control Philosophy and Design, Control Strategy Report and Switching Sequence and interlocking</p> <p>Performance Studies, 07 Power oscillation damping study</p> <p>Performance Studies, 08 Limitation of the use of power modulations</p> <p>Performance Studies, 09 Islanding detection, Islanded Operation</p> <p>Performance Studies, 10 Black network start up, Black Start</p> <p>Performance Studies, 11 Island Operation, Islanded Operation</p>

## 5.2.11 Do you request details of intended compliance tests acc. to art. 57(3)(f)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	Croatian TSO does not request details of intended compliance tests.
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes
Germany	Representation of all German TSO's (Amprion /	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
	TenneT / TransnetBW / 50Hertz)		
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	Yes
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No HVDC converter units have been constructed since NC HVDC entered into force, and all recent HVDC Systems connected to Svenska kraftnät before NC HVDC are owned by Svenska kraftnät. Although the Operational Notification Procedure for HVDC Systems according to the NC HVDC have not yet been implemented, compliance tests are requested through existing connection procedures and contracts with HVDC manufactures.

## 5.2.12 Please list the requested details of intended compliance tests acc. to art. 57(3)(f)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	There is no such list at this time.
Estonia	Elering AS	Yes	<a href="https://elering.ee/sites/default/files/public/Teeused/Liitumine/07%20-%20Requirements%20for%20the%20testing%20of%20and%20preparation%20of%20a%20testing%20plan%20for%20the%20power-generating%20modules%20of%20clients.pdf">https://elering.ee/sites/default/files/public/Teeused/Liitumine/07%20-%20Requirements%20for%20the%20testing%20of%20and%20preparation%20of%20a%20testing%20plan%20for%20the%20power-generating%20modules%20of%20clients.pdf</a>
Finland	Fingrid	Yes	See section 14.
France	RTE	Yes	Reactive power requirement, primary voltage control, secondary voltage control, active power control, frequency control (FSM, LFSMO and LFSMU), quick start, testing IT/communication, connection to the network, power quality and automatic control to solve network constraints.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<ul style="list-style-type: none"> <li>• Reactive power supply test</li> <li>• Voltage control mode test</li> <li>• Reactive power control mode test</li> <li>• Power factor control mode test</li> <li>• FSM response test</li> <li>• LFSM-O response test</li> <li>• LFSM-U response test</li> <li>• Active power controllability test</li> <li>• Ramping rate modification test</li> <li>• Black start test</li> <li>• Measurement of harmonic component emissions</li> <li>• Automation system test</li> </ul>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/23">https://www.mavir.hu/documents/10258/23</a>

Country	TSO	Approval for publication in the IMR	Answer
			<a href="https://www.entsoe.eu/9793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032">9793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032</a>
Ireland	EirGrid	Yes	Under Development.
Lithuania	LITGRID AB	Yes	The compliance tests shall fully demonstrate connection to the grid requirements. FCR test, Voltage and reactive power control test, PQ capabilities test, Power oscillation damping efficiency test, Emergency power control test.
Netherlands	TenneT TSO	Yes	<p>Reactive power capability</p> <ul style="list-style-type: none"> <li>• At the Connection Point: power (P, Q), Voltage (V), current (I)</li> <li>• At the HVDC system terminals (primary and secondary side of HVDC system transformer): power (P, Q), Voltage (V), current (I)</li> <li>• Tap changer positions of transformers</li> <li>• At reactive power compensation equipment if applicable: Switching on/off position, Q, V, I</li> <li>• Check calculated parameters against protection settings (Voltage, Current, Power) at HVDC system terminals and Connection Point.</li> </ul> <p>Voltage control mode</p> <ul style="list-style-type: none"> <li>• Setpoint voltage</li> <li>• Setpoint additional instructed reactive power component</li> </ul> <p>HVDC system voltage and reactive power</p> <ul style="list-style-type: none"> <li>• Connection point voltage and reactive power</li> </ul> <p>Reactive power control mode</p> <ul style="list-style-type: none"> <li>• Setpoint reactive power</li> <li>• Setpoint additional instructed reactive power component</li> </ul> <p>HVDC system voltage and reactive power</p> <ul style="list-style-type: none"> <li>• Connection point voltage and reactive power</li> </ul> <p>Power factor control mode</p> <ul style="list-style-type: none"> <li>• setpoint power factor</li> <li>• HVDC system voltage, active power and reactive power</li> <li>• Connection point voltage, active power and reactive power</li> <li>• LFSM-O response</li> <li>• Maximum HVDC active power transmission capacity</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• Active Power set point for each test</li> <li>• The simulated frequency shall be measured as function of the time</li> <li>• P, Q, V shall be measured as function of the time at the Connection Point and at valve side of converter transformer;</li> <li>• Transient registration of P at valve side of converter transformer and injected frequency signal;</li> <li>• Record the initial delay time (t1) and time for full activation of the frequency response (t2);</li> <li>• Applied settings of HVDC system controller including frequency droop setting;</li> <li>• A measuring error of max. +/- 5% of the measured value will be accepted.</li> <li>• LFSM-U response</li> <li>• Maximum HVDC active power transmission capacity</li> <li>• Active Power set point for each test</li> <li>• The simulated frequency shall be measured as function of the time</li> <li>• P, Q, V shall be measured as function of the time at the Connection Point and at valve side of converter transformer;</li> <li>• Transient registration of P at valve side of converter transformer and injected frequency signal;</li> <li>• Record the initial delay time (t1) and time for full activation of the frequency response (t2);</li> <li>• Applied settings of HVDC system controller including frequency droop setting;</li> <li>• A measuring error of max. +/- 5% of the measured value will be accepted.</li> <li>• FSM response</li> <li>• maximum HVDC active power transmission capacity</li> <li>• Active Power set point for each test</li> <li>• The simulated frequency shall be measured as function of the time</li> <li>• P, Q, V shall be measured as function of the time at the Connection Point and at valve side of converter transformer;</li> <li>• Transient registration of P at valve side of converter transformer and injected frequency signal;</li> <li>• Applied settings of HVDC system controller including frequency droop setting;</li> </ul>



Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• A measuring error of max. +/- 5% of the measured value will be accepted.</li> <li>• Active power controllability</li> <li>• P, Q, V shall be measured as function of the time at the Connection Points of all HVDC converter stations</li> <li>• Received instructions</li> <li>• Active power setpoints</li> <li>Ramping rate modification</li> <li>• P, Q, V shall be measured as function of the time at the Connection Points of all HVDC converter stations</li> <li>• Received instructions</li> <li>• Ramping rate setpoints</li> <li>• Active power setpoints</li> <li>• Black start</li> <li>• Phasor angle, frequency, voltage, active and reactive power of both HVDC system converter stations Connection Points;</li> <li>• Voltage, phasor angle and frequency at the Connection Point;</li> <li>• Time to energise the HVDC system;</li> <li>• Time to energise the remote AC substation.</li> </ul>
Poland	PSE S.A.	Yes	<p>In PSE procedure detailed information on planned compliance tests for HVDC systems are specified in separate document "Procedure for testing HVDC systems with the division of responsibilities between the owner of the HVDC system and PSE S.A. for the purposes of testing and the conditions and procedure for the use of appropriate equipment certificates</p> <p>(<a href="https://www.pse.pl/documents/20182/96bb9b8f-6849-4e65-91e8-c85554336115?">https://www.pse.pl/documents/20182/96bb9b8f-6849-4e65-91e8-c85554336115?</a>)</p> <p>including the test schedule.</p>
Romania	Transelectrica - TEL	Yes	<p>Acc. to art. 57(3)(f), regarding the intended compliance tests, TSO requests verification tests relating to connection point, after commissioning. Tests refer to:</p> <ul style="list-style-type: none"> <li>• P - Q – U diagram in connection point;</li> <li>• voltage, reactive power and active power control in connection point to different setpoint values;</li> <li>• LFSM;</li> </ul>

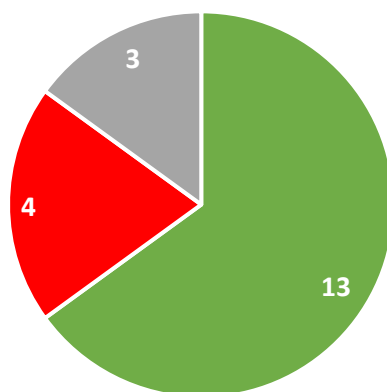
Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• FSM;</li> <li>• the capability of automatic reconnection if the case;</li> <li>• measurements of power quality in accordance with EN 50160.</li> </ul>
Slovenia	ELES	Yes	N/A
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	<p>No HVDC converter units have been constructed since NC HVDC entered into force, and all recent HVDC Systems connected to Svenska kraftnät before NC HVDC are owned by Svenska kraftnät. Although the Operational Notification Procedure for HVDC Systems according to the NC HVDC have not yet been implemented, the following compliance tests are normally requested through existing connection procedures and contracts with HVDC manufactures:</p> <ul style="list-style-type: none"> <li>- Type test certificates</li> <li>- Factory Acceptance Testing</li> <li>- Site Acceptance Testing</li> </ul>

## 5.2.13 What is the maximum period during which the HVDC system owner or HVDC converter unit owner can maintain an ION acc. to art. 57(4)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	In compliance with the Transmission System Grid Code and connection requirements.
Estonia	Elering AS	Yes	2 years.
Finland	Fingrid	Yes	24 months.
France	RTE	Yes	The limited period of time for ION is 24 months.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Without a derogation order, the maximum period for a connection owner to remain in the status of interim operational notification shall not exceed 24 months. The maximum period for a connection owner to remain in the status of interim operational notification may be extended beyond 24 months upon request for a derogation made to the relevant system operator in accordance with the procedure in Title VII of the Regulation (EU) 2016/1447 (NC HVDC). The request shall be made prior to the expiry of the 24-month period.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032">https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032</a>
Ireland	EirGrid	Yes	Shall not be longer than 24 months.

Country	TSO	Approval for publication in the IMR	Answer
Lithuania	LITGRID AB	Yes	ION time period is the same as in the Regulation.
Netherlands	TenneT TSO	Yes	24 months.
Poland	PSE S.A.	Yes	According to HVDC provisions maximum ION period is set as 24 months (without using the NRA derogation).
Romania	Transelectrica - TEL	Yes	Acc. to art. 57(4) the maximum period during which the HVDC system owner or HVDC converter unit owner can maintain ION status is 24 months (art. 15 (1) from Operational Notification Procedure – NRA Order no. 220/11.12.2019).
Slovenia	ELES	Yes	24 months.
Spain	Red Eléctrica de España	No	–
Sweden	Svenska Kraftnät	Yes	As only internal connection procedures of HVDC Systems exists today, this is not implemented.

5.2.14 Is the information included in this section of the survey (Interim operational notification for HVDC systems) publicly available in accordance with NC HVDC Article 55(2)?



■ Yes ■ No ■ Not published yet

## 5.3 Survey on final operational notification for HVDC systems pursuant to NC HVDC art. 58

### 5.3.1 Is a derogation procedure foreseen if an incompatibility is identified in connection with issuing of the ION acc. to art. 58(4)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	No	–
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes
France	RTE	Yes	Yes, but in our technical documentation RTE does not introduce a derogation process. If it happens, RTE will follow the derogation procedure of CN HVDC.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Yes. Please see CRU decision paper: <a href="https://www.cru.ie/document_group/eu-electricity-network-codes/">https://www.cru.ie/document_group/eu-electricity-network-codes/</a>
Lithuania	LITGRID AB	Yes	No

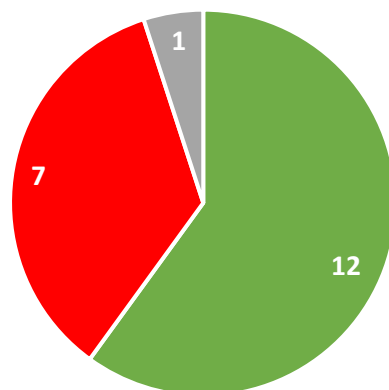
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Country	TSO	Approval for publication in the IMR	Answer
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	Derogation sub-procedure, which is developed in line with Art. 79 & 80 NC HVDC, was implemented directly in PSE operational notification procedure. The criteria for granting derogations pursuant to Article 78 NC HVDC were specified by PL NRA ( <a href="https://www.ure.gov.pl/pl/urzad/informacje-ogolne/komunikaty-prezesa-ure/7242,Komunikat-nr-742017.html">https://www.ure.gov.pl/pl/urzad/informacje-ogolne/komunikaty-prezesa-ure/7242,Komunikat-nr-742017.html</a> )
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	Yes	This will be defined individually on a project basis.
Sweden	Svenska Kraftnät	Yes	As only internal connection procedures of HVDC Systems exists today, this is not implemented.

### 5.3.2 Is this information publicly available in accordance with NC HVDC Article 55(2)?



■ Yes ■ No ■ Not published yet



## 5.4 Survey on limited operational notification for HVDC systems pursuant to NC HVDC art. 59

### 5.4.1 In the case of a LON, will the unresolved issues justifying the granting of the LON clearly be identified acc. to art. 59(3)(a)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	No
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes
France	RTE	Yes	In our technical documentation, RTE does not introduce an LON process. If it happens, RTE will follow the LON procedure of CN HVDC.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Shall not exceed 12 months or otherwise individually specified.
Lithuania	LITGRID AB	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	According to PSE procedure, required responsibilities and timescales for the expected solution are required in LON request - they will be defined individually.
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	No	This will be defined individually on a project basis.
Sweden	Svenska Kraftnät	Yes	As only internal connection procedures of HVDC Systems exists today, this is not implemented.

## 5.4.2 In the case of a LON, are the responsibilities and timescales for the expected solution clearly identified acc. to art. 59(3)(b)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	No
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes

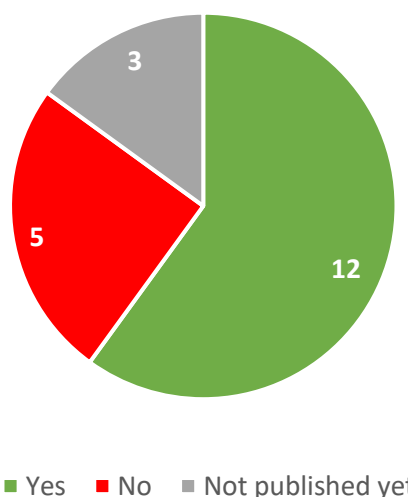
Country	TSO	Approval for publication in the IMR	Answer
France	RTE	Yes	In our technical documentation, RTE does not introduce an LON process. If happen, RTE will follow the LON procedure of CN HVDC.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Shall not exceed 12 months or otherwise individually specified.
Lithuania	LITGRID AB	Yes	Yes
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	According to PSE procedure, required responsibilities and timescales for the expected solution are required in LON request - they will be defined individually.
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	Yes
Spain	Red Eléctrica de España	No	This will be defined individually on a project basis.
Sweden	Svenska Kraftnät	Yes	As only internal connection procedures of HVDC Systems exists today, this is not implemented.

## 5.4.3 In the case of a LON, what is the initial period granted acc. to art. 59(3)(c)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	The initial period granted is set individually.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	12 months.
France	RTE	Yes	In the technical documentation, RTE does not introduce an LON process. If happen, RTE will follow the LON procedure of CN HVDC.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Yes
Ireland	EirGrid	Yes	Defined on a case-by-case basis.
Lithuania	LITGRID AB	Yes	The same as in the Regulation.
Netherlands	TenneT TSO	Yes	Case dependent.
Poland	PSE S.A.	Yes	In PSE ON procedure there is no default period for a LON. LON period will be set individually within the range specified in NC HVDC(≤12

Country	TSO	Approval for publication in the IMR	Answer
			months).
Romania	Transelectrica - TEL	Yes	According to art. 59(3)(c) the validity period granted for LON may not exceed 12 months. The duration of the LON granted may be shorter, with the possibility of extension, if any evidence is considered satisfactory by the TSO, which proves that it has been registered substantial progress towards full compliance (art. 26(2)(c) and (3) from Operational Notification Procedure – NRA Order no. 176/07.09.2019).
Slovenia	ELES	Yes	12 months.
Spain	Red Eléctrica de España	No	–
Sweden	Svenska Kraftnät	Yes	As only internal connection procedures of HVDC systems exists today, this is not implemented.

## 5.4.4 Is the information included in this section of the survey (Limited operational notification for HVDC systems) publicly available in accordance with NC HVDC Article 55(2)?



## 5.5 Survey on general provisions pursuant to NC HVDC art. 60

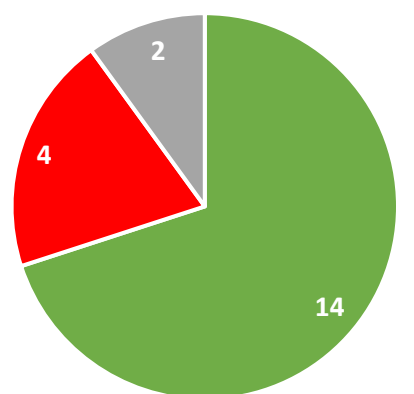
### 5.5.1 Please provide the link to the details of the operational notification procedure acc. to art. 60(3)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	In compliance with the Transmission System Grid Code and connection requirements.
Estonia	Elering AS	Yes	<a href="https://elering.ee/sites/default/files/public/Teeused/Liitumine/01%20-%20Standard%20terms%20and%20conditions%20of%20connection%20to%20the%20electricity%20transmission%20system%20of%20Elering%20AS_2021.01.11.pdf">https://elering.ee/sites/default/files/public/Teeused/Liitumine/01%20-%20Standard%20terms%20and%20conditions%20of%20connection%20to%20the%20electricity%20transmission%20system%20of%20Elering%20AS_2021.01.11.pdf</a>
Finland	Fingrid	Yes	<a href="https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/suurjannitteisten-tasasahkojarjestelmien-jarjestelmatekniset-vaatimukset-hvdc2018.pdf">https://www.fingrid.fi/globalassets/dokumentit/en/customers/grid-connection/suurjannitteisten-tasasahkojarjestelmien-jarjestelmatekniset-vaatimukset-hvdc2018.pdf</a>
France	RTE	Yes	The operational notification procedure is described in Article 8.24, see : <a href="https://www.services-rte.com/fr/la-bibliotheque.html">https://www.services-rte.com/fr/la-bibliotheque.html</a>
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<a href="https://www.vde-verlag.de/standards/0100511/vde-ar-n-4131-anwendungsregel-2019-03.html">https://www.vde-verlag.de/standards/0100511/vde-ar-n-4131-anwendungsregel-2019-03.html</a>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	<a href="https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032">https://www.mavir.hu/documents/10258/239793359/Grid_Code_Article5_ConnectionRules_ENG.pdf/87a1217e-c22f-61d0-7706-6d84d9134a5b?t=1624890704032</a>

Country	TSO	Approval for publication in the IMR	Answer
Ireland	EirGrid	Yes	Will be published in updated Grid Code once approved by RAs. Details of Grid Code modification paper under MPID 292. <a href="https://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-info/modifications/">https://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-info/modifications/</a>
Lithuania	LITGRID AB	Yes	<a href="https://www.litgrid.eu/uploads/files/dir519/dir25/dir1/4_0.php">https://www.litgrid.eu/uploads/files/dir519/dir25/dir1/4_0.php</a>
Netherlands	TenneT TSO	Yes	Website: <a href="https://www.netbeheernederland.nl/dossiers/regulering-20/documenten">https://www.netbeheernederland.nl/dossiers/regulering-20/documenten</a> Document: <a href="https://www.netbeheernederland.nl/_upload/Files/Regulering_20_22096599dd.pdf">https://www.netbeheernederland.nl/_upload/Files/Regulering_20_22096599dd.pdf</a>
Poland	PSE S.A.	Yes	PSE notification procedure for HVDC objects is publicly available on PSE website: <a href="https://www.pse.pl/documents/20182/233182e1-57d2-4c7a-8f91-f8e9415db57d?">https://www.pse.pl/documents/20182/233182e1-57d2-4c7a-8f91-f8e9415db57d?</a>  Please note, that in PL there are 187 DSOs (they are listed on PL NRA site: <a href="https://rejestr.ure.gov.pl/">https://rejestr.ure.gov.pl/</a> ) and PSE cannot provide information about operational notifications for HVDC objects on behalf of them (it may differ between each PL DSO).
Romania	Transelectrica - TEL	Yes	Acc. to art. 60(3) we have the same operational notification procedure for the DC-connected power park modules - Operational Notification Procedure – approved by NRA Order no. 220/11.12.2019: <a href="https://www.transelectrica.ro/documents/10179/3992482/Anexa+la+Ordin+ANRE+nr.+220+din+11.12.2019+Procedura+de+notificare+HVDC+si+a+centralei+formata+din+MGCC+C/50170796-3139-4b56-80a5-d478fc3e5714">https://www.transelectrica.ro/documents/10179/3992482/Anexa+la+Ordin+ANRE+nr.+220+din+11.12.2019+Procedura+de+notificare+HVDC+si+a+centralei+formata+din+MGCC+C/50170796-3139-4b56-80a5-d478fc3e5714</a>
Slovenia	ELES	Yes	N/A

Country	TSO	Approval for publication in the IMR	Answer
Spain	Red Eléctrica de España	Yes	DC-connected PPMs will be dealt in the same manner as AC-connected (RfG). Link: <a href="https://www.ree.es/sites/default/files/01_ACTIVIDADES/Documentos/AccesoRed/Guia_descriptiva_del_procedimiento_de_puesta_en_servicio_V9_ene21.docx">https://www.ree.es/sites/default/files/01_ACTIVIDADES/Documentos/AccesoRed/Guia_descriptiva_del_procedimiento_de_puesta_en_servicio_V9_ene21.docx</a>
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented. Hence, no link is available today.

## 5.5.2 Is the provision of the link publicly available in accordance with NC HVDC Article 55(2)?



■ Yes ■ No ■ Not published yet



## 5.6 Survey on interim operational notification for DC-connected power park modules pursuant to NC HVDC art. 62

### 5.6.1 What is the limited period of time (ION) for operation of the DC-connected power park module by using the grid connection acc. to art. 62(1)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	An ION is it set individually.
Estonia	Elering AS	Yes	2 years.
Finland	Fingrid	Yes	24 months.
France	RTE	Yes	RTE does not describe in the technical documentation the case of a DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	The maximum period for the connection owner to remain in the status of interim operational notification shall not exceed 24 months. The relevant system operator may specify a shorter validity period for the interim operational notification. The validity period of the interim operational notification shall be notified to the regulatory authority in accordance with the applicable national regulatory framework. A validity extension of the interim operational notification shall be granted only if the connection owner demonstrates substantial progress towards full compliance. At the time of extension of the validity of the interim operational notification, any remaining unresolved issues shall be explicitly identified. The maximum period for a connection owner to remain in the status of interim operational notification may be extended beyond 24 months upon request for a derogation made to the relevant system operator in accordance with the procedure in Title VII of Regulation (EU) 2016/1447 (NC HVDC).

Country	TSO	Approval for publication in the IMR	Answer
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	No longer than 24 months.
Lithuania	LITGRID AB	Yes	The limited period of time (ION) is the same as in the Regulation.
Netherlands	TenneT TSO	Yes	Case dependent.
Poland	PSE S.A.	Yes	In PSE procedure validity period for ION is specified individually (in line with connection schedule specified in connection agreement), no longer than 24 months.
Romania	Transelectrica - TEL	Yes	Acc. to art. 62(1) the limited period of time (ION) for operation of the DC-connected power park module by using the grid connection is 24 months (art. 40(1) from Operational Notification Procedure – NRA Order no. 176/07.09.2019).
Slovenia	ELES	Yes	Do not have such connection.
Spain	Red Eléctrica de España	No	–
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented.

## 5.6.2 Do you request an itemised statement of compliance acc. to art. 62(3)(a)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	In consideration of the fact that Croatian transmission system does not have any DC-connected power park module, Croatian TSO has not been requested an itemised statement of compliance so far.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes
France	RTE	Yes	RTE does not describe in our technical documentation the case of a DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Most probably yes.
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	Under development.
Lithuania	LITGRID AB	Yes	Yes
Netherlands	TenneT TSO	Yes	Yes

Country	TSO	Approval for publication in the IMR	Answer
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	ELES does not have such connections.
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented.

## 5.6.3 Do you request detailed technical data of the DC-connected power park module of relevance to the grid connection acc. to art. 62(3)(b)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—
Croatia	HOPS	Yes	So far, there have been no requisite to request detailed technical data of the DC-connected power park module.
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	RTE does not describe in our technical documentation the case of DC-connected power park modules.

Country	TSO	Approval for publication in the IMR	Answer
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Precise list under consideration.
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	Yes
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	Do not have such connection.
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented.

## 5.6.4 Please list the requested technical data of the DC-connected power park module of relevance to the grid connection acc. to art. 62(3)(b)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	There is no such list at this time.
Estonia	Elering AS	Yes	<p>3 Content of the electrical part project</p> <p>3.1 The design of the consumption-oriented electrical part project must include the following:</p> <p>3.1.1 Primary part:</p> <p>3.1.1.1 The primary part of the electrical part project must include the following:</p> <p>3.1.1.1.1 General – short description;</p> <p>3.1.1.1.2 The primary scheme up to the connection point;</p> <p>3.1.1.1.3 A one-line diagram of the electrical installation up to the connection point, showing new and existing production units, reactive energy compensation devices, intermediate transformers, distribution and protection devices and cables and connections with nominal data;</p> <p>3.1.1.1.4 110 kV or 330 kV power transformers with basic parameters and a FAT report;</p> <p>3.1.1.1.5 Sections of the client's 110 kV or 330 kV bays and bus arrangements if the client's electrical installation is connected to the connection point of the TSO directly through bus arrangement;</p> <p>3.1.1.1.6 The results of measuring and calculating the contact voltage and step voltage (if the earthing loop of the client's electrical equipment is electrically connected to the earthing loop of the substation or line of the TSO). The source data (shortcircuit values) required for the calculations shall be provided by the TSO;</p> <p>3.1.1.1.7 When connecting to the 110-330 kV cable:</p> <p>3.1.1.1.7.1 Cable length;</p> <p>3.1.1.1.7.2 Longitudinal profile, including intersections with other structures;</p> <p>3.1.1.1.7.3 Cable brand with electrical</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>parameters;</p> <p>3.1.1.1.7.4 Drawing of the connection to the cable entry and connection point, also showing sections of the cable location;</p> <p>3.1.1.1.7.5 Position plan of the client's electrical installation in the protection zone of the TSO's electrical installation.</p> <p>3.1.1.1.8 When connecting to the 110-330 kV overhead line:</p> <p>3.1.1.1.8.1 Position plan and longitudinal profile of the client's electrical installation in the protection zone of the TSO's electrical installation;</p> <p>3.1.1.1.8.2 Support types (including support drawing);</p> <p>3.1.1.1.8.3 Line wire and lightning rope with electrical parameters;</p> <p>3.1.1.1.8.4 PSS/E model and PSCAD model shall be provided if the capacity of the electricity consumer to be connected to the single grid is over 10 MW.</p> <p>3.1.2 Secondary part:</p> <p>3.1.2.1 The secondary part of the project must include at least:</p> <p>3.1.2.1.1 A diagram of the arrangement of the main and reserve relays of an electrical installation with a voltage of 110 or 330 kV, including a power transformer, along with measuring transformers, where the connections between the devices and the types of relays are also shown;</p> <p>3.1.2.1.2 Relay protection and automatic system settings, which are needed to achieve cooperation of the client's and TSO's relays from the client's device to the connection point;</p> <p>3.1.2.1.3 Control and automation in accordance with the connection conditions guide 'Data exchange requirements related to the client's electrical installation';</p> <p>3.1.2.1.4 Data communication parameters, IP addresses (static VPN of the concentrator, IP (RTU etc. of the devices requested by SCADA) on the side of the energy system control centre (SCADA) with a communication connection diagram and an explanatory note;</p> <p>3.1.2.1.5 RTU data volumes (measurements, controls and position signals);</p>

Country	TSO	Approval for publication in the IMR	Answer
			<p>3.1.2.1.6 Guaranteed measurement accuracies.</p> <p>3.2 When connecting power-generating modules and mixed installations and changing their consumption and/or production conditions, the client must submit a production-oriented electrical part project, in the frame of which the submitted consumption-oriented design has to be supplemented if due to the changes in the client's electrical installation the data submitted in the consumption-oriented project have changed. In addition, the production-oriented project must include the following:</p> <p>3.2.1 An explanatory note if the submitted project has differences compared with the previously submitted consumption-oriented project;</p> <p>3.2.2 A position plan with the coordinates of the client's energy park module (on a scale of 1:200)</p>
Finland	Fingrid	Yes	Please see section 7.
France	RTE	Yes	RTE does not describe in the technical documentation the case of DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<ul style="list-style-type: none"> <li>• Prerequisite for commissioning <ul style="list-style-type: none"> <li>- proof of the energisation operational notification (EON) in accordance with this Technical Application Guide</li> <li>- commissioning programme and schedule</li> <li>- system documentation (construction plans, circuit diagrams, documents for primary and secondary technology, etc.)</li> <li>- protection setting data, including back-up protection</li> <li>- test protocols and, if applicable, certificates</li> <li>- further official permits, if applicable</li> <li>- successful acceptance procedure and approval for commissioning</li> <li>- ensuring complete system documentation for the components of the power generating plants (construction plans, circuit diagrams, documents for primary and secondary technology, etc.) at the connection point</li> </ul> </li> <li>• Operating phase</li> </ul>



Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>- online-notification of the operational availability of all power generating units and of any applicable feed-in restrictions in the 15-min grid pattern</li> <li>- weekly notice of any unavailability of the power generating units planned for the subsequent week in the 15-min grid pattern</li> </ul>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	Under development.
Lithuania	LITGRID AB	Yes	The main technical parameters: nominal active and full power, nominal reactive power, nominal voltage.
Netherlands	TenneT TSO	Yes	<ul style="list-style-type: none"> <li>a. Maximum HVDC active power transmission capacity or Maximum capacity</li> <li>b. Minimum and maximum active power production and consumption</li> <li>c. Maximum active power control velocity</li> <li>d. Minimum and maximum reactive power production and consumption</li> <li>e. Maximum reactive power control velocity</li> <li>f. Maximum voltage control velocity</li> <li>g. Priority for active or reactive power (if applicable)</li> <li>h. Filters topology, component parameters and control</li> <li>i. Reactive power topology, component parameters and control</li> <li>j. Frequency response</li> <li>k. Dynamic simulation parameters and models</li> <li>l. Short-circuit parameters</li> <li>m. Protection settings</li> <li>n. Transformer data</li> </ul>
Poland	PSE S.A.	Yes	Requested data is site specific, so PSE did not provide the template of this list.

Country	TSO	Approval for publication in the IMR	Answer
			<p>These data should include:</p> <ul style="list-style-type: none"> <li>a) generator data (for DC-PPMs)</li> <li>b) converter data</li> <li>c) transformer data</li> <li>d) HV line data</li> <li>e) HV switchgear data</li> <li>f) AUX system data</li> <li>g) sensors data</li> <li>h) control unit data</li> <li>i) emergency power supply data</li> </ul>
Romania	Transelectrica - TEL	Yes	<p>The DC-connected power park module document (DUG) include all technical data required (art. 34 from Operational Notification Procedure – approved by NRA Order no. 220/11.12.2019). The model of the DUG document with all the requested technical data it is posted on the website:</p> <p><a href="https://www.transelectrica.ro/documents/10179/9805941/Modelul+DUG_centrala+format+din+MGCCC/c853c9f9-9f4b-4250-aada-916dd65a6bad">https://www.transelectrica.ro/documents/10179/9805941/Modelul+DUG_centrala+format+din+MGCCC/c853c9f9-9f4b-4250-aada-916dd65a6bad</a></p> <p>The technical documentation for DC-connected power park module contains at least the following documents (Annex no. 2 from the Operational Notification Procedure – NRA Order no. 220/11.12.2019):</p> <ul style="list-style-type: none"> <li>- the connection point;</li> <li>- the expected date of the application of energizing;</li> <li>- equipment certificates issued by an approved certification body for the equipment used by the DC-connected power park module, together with the test results;</li> <li>- the detailed technical data of DC-connected power park module, the auxiliary installations as well as the single line diagram of the substation and the power plant;</li> <li>- mathematical models of DC-connected power park module and parameters:</li> <li>- electrical parameters specific to all cables and lines: type (material), <math>R + [\Omega / \text{km}]</math>, <math>R_0 [\Omega / \text{km}]</math>, <math>R_{m0} [\Omega / \text{km}]</math>, <math>X_0 [\Omega / \text{km}]</math>, <math>X_0 [\text{Km} / \text{s}]</math>, <math>C_0 [\mu\text{F} / \text{km}]</math>, <math>C_0 [\mu\text{F} / \text{km}]</math>, <math>S [\text{mm}]</math>, <math>U_n [\text{kV}]</math>;</li> <li>- for transformer units JT / MT kV: rated winding</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			power, nominal voltages, loose losses, copper losses, short-circuit voltage, idle current, connection group, voltage setting (type of adjustment, including the number of the nominal plot, the maximum plot number), neutral treatment; - reactive power compensation data if the case; - data required for calculations of protection settings; - power quality measurement system in the connection point; - the telecommunication project that provides the communication path used to integrate into DMS/EMS-SCADA.
Slovenia	ELES	Yes	Do not have such connection.
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	Not applicable.

## 5.6.5 Do you request equipment certificates issued by an authorised certifier in respect of DC-connected power park modules acc. to art. 62(3)(c)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—
Croatia	HOPS	Yes	Croatian TSO has not been requested equipment certificates issued by an authorized certifier so far.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	No

Country	TSO	Approval for publication in the IMR	Answer
France	RTE	Yes	RTE does not describe in the technical documentation the case of DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	No
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Most probably yes.
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	No, but can be submitted by user.
Lithuania	LITGRID AB	Yes	No
Netherlands	TenneT TSO	Yes	Optional
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	ELES does not have such connection.
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented.

## 5.6.6 Please list the requested equipment certificates issued by an authorised certifier in respect of DC-connected power park modules acc. to art. 62(3)(c)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	There is no such list at this time.
Estonia	Elering AS	Yes	–
Finland	Fingrid	Yes	–
France	RTE	Yes	RTE does not describe in the technical documentation the case of DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	–
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	N/A
Lithuania	LITGRID AB	Yes	–

Country	TSO	Approval for publication in the IMR	Answer
Netherlands	TenneT TSO	Yes	Optionally.
Poland	PSE S.A.	Yes	<p>Detailed information on equipment certificates for DC-PPM is specified in separate document “DC-connected power park module testing procedure with division of responsibilities between the DC-connected power park module owner and PSE S.A. for testing purposes, and the conditions and procedure for the use of relevant equipment certificates”</p> <p>(<a href="https://www.pse.pl/documents/20182/96c4e7e2-0182-498d-a76c-3650a8c09fca?">https://www.pse.pl/documents/20182/96c4e7e2-0182-498d-a76c-3650a8c09fca?</a>):</p> <ul style="list-style-type: none"> <li>• LFSM-O</li> <li>• LFSM-U</li> <li>• FSM</li> <li>• FRT</li> <li>• Fast Fault Current Injection</li> <li>• Post Fault Active Power Recovery</li> <li>• Frequency Ranges</li> <li>• ROCOF</li> </ul>
Romania	Transelectrica - TEL	Yes	<p>Acc. to art. 62(3)(c) the Equipment certificates must be issued by an accreditation certification body – authorised certifier. The Equipment certificates must contain test results. The Equipment certificates must include at least (Annex no. 2(6) from the Operational Notification Procedure – NRA Order no. 220/11.12.2019):</p> <ul style="list-style-type: none"> <li>• Checking the P - Q capability curve;</li> <li>• Fault-ride-through with Fast fault current injection;</li> <li>• RoCoF;</li> <li>• LFSM;</li> <li>• FSM;</li> <li>• Frequency range;</li> <li>• The capability of automatic reconnection of the DC-connected power park modules at voltage variations;</li> <li>• Electrical disturbances in accordance with EN 50160 in force;</li> <li>• The mode of responding to changes in active and reactive power setpoints.</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
Slovenia	ELES	Yes	ELES does not have such connections.
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	Not applicable.

## 5.6.7 Do you request simulation models acc. to art. 62(3)(d)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—
Croatia	HOPS	Yes	No
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	RTE does not describe in the technical documentation the case of a DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Most probably yes.

Country	TSO	Approval for publication in the IMR	Answer
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	Yes
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	Do not have such connection.
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented.

## 5.6.8 Please list the requested simulation models acc. to art. 62(3)(d)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—



Country	TSO	Approval for publication in the IMR	Answer
Croatia	HOPS	Yes	–
Estonia	Elering AS	Yes	PSSE PSCAD
Finland	Fingrid	Yes	Please see section 15.
France	RTE	Yes	RTE does not describe in the technical documentation the case of DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<ul style="list-style-type: none"> <li>• Root mean square value model (RMS)</li> <li>• Electromagnetic transient model (EMT)</li> <li>• Models for harmonic component examinations: <ul style="list-style-type: none"> <li>o Model for steady-state harmonic component examinations (Model A),</li> <li>o Model for harmonic component stability (Model B).</li> </ul> </li> </ul>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	EirGrid requests a steady-state model, an RMS model (full details or with Laplace diagrams) and a generic/library model. EirGrid also seeks an EMT model in PSCAD, and a harmonics model in PowerFactory.
Lithuania	LITGRID AB	Yes	Detail mathematical model suitable for dynamics calculations which is in format requested by the TSO (PSS/E format) shall be provided. The provided model shall reflect the same control functions as control system.
Netherlands	TenneT TSO	Yes	<ul style="list-style-type: none"> <li>• HVDC converter unit models;</li> <li>• AC component models;</li> <li>• DC grid models;</li> <li>• Voltage and power controller;</li> <li>• Special control features if applicable e.g. power</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			oscillation damping (POD) function, subsynchronous torsional interaction (SSTI) control; <ul style="list-style-type: none"> <li>• Multi terminal control, if applicable;</li> <li>• HVDC system protection models as agreed between the relevant TSO and the HVDC system owner.</li> </ul>
Poland	PSE S.A.	Yes	According to HVDC simulation models should contain the following sub-models, depending on the existence of the individual components: <ul style="list-style-type: none"> <li>• Alternator and prime mover</li> <li>• Speed and power control</li> <li>• Voltage control, including, if applicable, power system stabiliser ('PSS') function and excitation control system</li> <li>• Power-generating module protection models, as agreed between the relevant system operator and the power-generating facility owner</li> <li>• Converter models for power park modules.</li> </ul>
Romania	Transelectrica - TEL	Yes	Acc. to art. 62(3)(d) the requested simulation models are to completely simulate the behavior of DC-connected power park modules in steady-state and dynamic conditions, the power quality of electricity ensured at the connection point, inclusive: <ul style="list-style-type: none"> <li>• The network study for calculating the reactive power requirement at the connection point to meet the reactive power requirements at the connection point.</li> <li>• Studies on coordination of protection, with RSO agreement on the protection schemes at the connection point (Annex no. 2(9) from the Operational Notification Procedure – NRA Order no. 220/11.12.2019).</li> </ul>
Slovenia	ELES	Yes	ELES does not have such connections.
Spain	Red Eléctrica de España	No	–

Country	TSO	Approval for publication in the IMR	Answer
Sweden	Svenska Kraftnät	Yes	Not applicable.

## 5.6.9 Do you request studies demonstrating steady-state and dynamic performance acc. to art. 62(3)(e)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	No
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	RTE does not describe in the technical documentation the case of DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Yes, precise list under consideration.
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.

Country	TSO	Approval for publication in the IMR	Answer
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	No
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	ELES does not have such connections.
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented.

## 5.6.10 Please list the requested studies demonstrating steady-state and dynamic performance acc. to art. 62(3)(e)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—
Croatia	HOPS	Yes	—

Country	TSO	Approval for publication in the IMR	Answer
Estonia	Elering AS	Yes	<p>5.7 Studies covered by the report (this list is not exhaustive):</p> <p>5.7.1 An overview of the connected electrical installation;</p> <p>5.7.2 The possibility of loading the electrical installation based on the ambient temperature and other temperatures;</p> <p>5.7.3 The active and reactive power flows of the power-generating module occur at different operating points and the accompanying voltage changes in the internal network of the production unit and at the connection point;</p> <p>5.7.4 PQ curves for the power-generating module and production unit;</p> <p>5.7.5 Simulation of different points on the U-Q/Pmax graph according to RfG requirements;</p> <p>5.7.6 A description of control functions;</p> <p>5.7.7 Frequency control capability;</p> <p>5.7.8 Active power control capability;</p> <p>5.7.9 Voltage control capability;</p> <p>5.7.10 Reactive power control capability;</p> <p>5.7.11 The effect of the excitation controller;</p> <p>5.7.12 Power system stabiliser adjustment and operation;</p> <p>5.7.13 The ability to pass the fault-ride;</p> <p>5.7.14 An analysis of the electricity quality of the power-generating module and compliance with the limit values;</p> <p>5.7.15 An analysis of harmonics according to the impedance characteristics issued by the TSO;</p> <p>5.7.16 Selection of filter parameters, impact analysis (if filters are used to attenuate harmonics);</p> <p>5.7.17 Mains overvoltages;</p> <p>5.7.18 Transient and temporary overvoltages;</p> <p>5.7.19 Lightning surges;</p> <p>5.7.20 Ferroresonance;</p> <p>13</p> <p>5.7.21 Insulation coordination;</p> <p>5.7.22 Sub-synchronous oscillation processes, possible countermeasures;</p> <p>5.7.23 Blind start analysis;</p> <p>5.7.24 The effect of relay protection and automation;</p> <p>5.7.25 Noise study.</p>

Country	TSO	Approval for publication in the IMR	Answer
			5.8 The exact scope of the study will depend on the technology and location of the connected installation in the electricity system and will be agreed with the TSO.
Finland	Fingrid	Yes	Please see section 15.
France	RTE	Yes	RTE does not describe in the technical documentation the case of a DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<p>The tasks to be carried out during the steady-state examinations are subdivided as follows:</p> <ul style="list-style-type: none"> <li>• Power flow calculation for different switching states and operating points;</li> <li>• Short-circuit current calculation for different switching states.</li> </ul> <p>Dynamic calculations:</p> <ul style="list-style-type: none"> <li>• Dynamic behaviour of the active power control</li> <li>• Dynamic behaviour of the reactive power control</li> <li>• Dynamic behaviour in relation to active power oscillations</li> <li>• Verification of fast signal response</li> <li>• Verification of the correct functionality of automation systems</li> </ul> <p>Calculation of transient processes:</p> <ul style="list-style-type: none"> <li>• Transient start-up behaviour</li> <li>• Transient behaviour at longitudinal faults, shut-down processes and load shedding</li> <li>• Dynamic behaviour at transverse faults and voltage step changes at the connection point</li> </ul> <p>Steady-state harmonic components and harmonic component stability.</p>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	Fast Fault Current (DC PPM), Active Power Recovery (DC PPC), Reactive Capability (DC PPM),

Country	TSO	Approval for publication in the IMR	Answer
			Reactive Capability (remote end HVDC), Power Oscillation Damping (DC PPM), Fault Ride Through (DC PPM).
Lithuania	LITGRID AB	Yes	–
Netherlands	TenneT TSO	Yes	<ul style="list-style-type: none"> <li>• Reactive power capability;</li> <li>• Fast acting additional reactive current injection;</li> <li>• Fault-ride-through capability;</li> <li>• Post fault active power recovery;</li> <li>• Power Oscillation Damping Control (POD);</li> <li>• Power quality;</li> <li>• Insulation coordination.</li> </ul>
Poland	PSE S.A.	Yes	<p>Requested studies demonstrating steady-state and dynamic performance are in line with chapter 3 of Title VI HVDC.</p> <p>For DC-connected power park modules and remote-end HVDC converter units:</p> <ul style="list-style-type: none"> <li>• Fast fault current injection simulation;</li> <li>• Post fault active power recovery simulation;</li> <li>• Reactive power capability simulation;</li> <li>• Power oscillations damping control simulation;</li> <li>• FRT capability simulations.</li> </ul>
Romania	Transelectrica - TEL	Yes	<p>Acc. to art. 62(3)(e) the requested studies demonstrating steady-state and dynamic performance are listed in the Annex 2 (9, 10, 12, 13) from Operational Notification Procedure – NRA Order no. 220/11.12.2019) as follows:</p> <ul style="list-style-type: none"> <li>• The network study for calculating the reactive power requirement at the connection point to meet the reactive power requirements at the connection point;</li> <li>• The dynamic regime study to determine the measures to avoid or assure island operation, as it is request;</li> <li>• Studies on coordination of protection, with RSO agreement on the protection schemes at the connection point.</li> </ul>
Slovenia	ELES	Yes	ELES does not have such connections.

Country	TSO	Approval for publication in the IMR	Answer
Spain	Red Eléctrica de España	No	–
Sweden	Svenska Kraftnät	Yes	Not applicable.

## 5.6.11 Do you request details of intended compliance tests acc. to art. 62(3)(f)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	No
Estonia	Elering AS	Yes	Yes
Finland	Fingrid	Yes	Yes
France	RTE	Yes	RTE does not describe in the technical documentation the case of a DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	Under consideration.
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.



Country	TSO	Approval for publication in the IMR	Answer
Ireland	EirGrid	Yes	Yes
Lithuania	LITGRID AB	Yes	Yes
Netherlands	TenneT TSO	Yes	Yes
Poland	PSE S.A.	Yes	Yes
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	ELES does not have such connections.
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented.

## 5.6.12 Please list the requested details of intended compliance tests acc. to art. 62(3)(f)!

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—
Croatia	HOPS	Yes	—

Country	TSO	Approval for publication in the IMR	Answer
Estonia	Elering AS	Yes	<a href="https://elering.ee/sites/default/files/public/Teeused/Liitumine/07%20-%20Requirements%20for%20the%20testing%20of%20and%20preparation%20of%20a%20testing%20plan%20for%20the%20power-generating%20modules%20of%20clients.pdf">https://elering.ee/sites/default/files/public/Teeused/Liitumine/07%20-%20Requirements%20for%20the%20testing%20of%20and%20preparation%20of%20a%20testing%20plan%20for%20the%20power-generating%20modules%20of%20clients.pdf</a>
Finland	Fingrid	Yes	Please see section 14.
France	RTE	Yes	RTE does not describe in the technical documentation the case of a DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<ul style="list-style-type: none"> <li>• Reactive power supply test;</li> <li>• Voltage control mode test;</li> <li>• Reactive power control mode test;</li> <li>• Power factor control mode test;</li> <li>• LFSM-O response;</li> <li>• LFSM-U response;</li> <li>• Active power controllability;</li> <li>• FSM response;</li> <li>• Fast signal response;</li> <li>• Measurement of harmonic component emissions.</li> </ul>
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	N/A
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	Under development.
Lithuania	LITGRID AB	Yes	The compliance tests shall fully demonstrate connection to the grid requirements. FCR test, voltage and reactive power control test, PQ capabilities test, Power oscillation damping efficiency test. Step response tests.
Netherlands	TenneT TSO	Yes	Reactive power capability: <ul style="list-style-type: none"> <li>• At the Connection Point: power (P, Q): Voltage (V), current (I);</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• At the DC-connected PPM terminals (primary and secondary side of transformer): power (P, Q), Voltage (V), current (I);</li> <li>• Tap changer positions of transformers;</li> <li>• At reactive power compensation equipment if applicable: Switching on/off position, Q, V, I;</li> <li>• Check calculated parameters against protection settings (Voltage, Current, Power) at DC-connected PPM terminals and Connection Point.</li> </ul> <p>Voltage control mode:</p> <ul style="list-style-type: none"> <li>• Setpoint voltage;</li> <li>• Setpoint additional instructed reactive power component;</li> <li>• DC-connected PPM voltage and reactive power;</li> <li>• Connection point voltage and reactive power.</li> </ul> <p>Reactive power control mode:</p> <ul style="list-style-type: none"> <li>• Setpoint reactive power;</li> <li>• Setpoint additional instructed reactive power component;</li> <li>• DC-connected PPM voltage and reactive power;</li> <li>• Connection point voltage and reactive power.</li> </ul> <p>Power factor control mode:</p> <ul style="list-style-type: none"> <li>• Setpoint power factor;</li> <li>• DC-connected PPM voltage, active power and reactive power;</li> <li>• Connection point voltage, active power and reactive power.</li> </ul> <p>LFSM-O response:</p> <ul style="list-style-type: none"> <li>• Maximum Capacity;</li> <li>• Active Power set point for each test;</li> <li>• The simulated frequency shall be measured as function of the time;</li> <li>• P, Q, V shall be measured as function of the time at the Connection Point and at valve side of converter transformer;</li> <li>• Transient registration of P at valve side of converter transformer and injected frequency signal;</li> <li>• Record the initial delay time (t1) and time for full activation of the frequency response (t2);</li> <li>• Applied settings of DC-connected PPM's controller including frequency droop setting;</li> <li>• A measuring error of max. +/- 5% of the measured value will be accepted.</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<p>LFSM-U response:</p> <ul style="list-style-type: none"> <li>• Maximum Capacity;</li> <li>• Active Power set point for each test;</li> <li>• The simulated frequency shall be measured as function of the time;</li> <li>• P, Q, V shall be measured as function of the time at the Connection Point and at valve side of converter transformer;</li> <li>• Transient registration of P at valve side of converter transformer and injected frequency signal;</li> <li>• Record the initial delay time (t1) and time for full activation of the frequency response (t2);</li> <li>• Applied settings of DC-connected PPM's controller including frequency droop setting;</li> <li>• A measuring error of max. +/- 5% of the measured value will be accepted.</li> </ul> <p>FSM response:</p> <ul style="list-style-type: none"> <li>• Maximum Capacity;</li> <li>• Active Power set point for each test;</li> <li>• The simulated frequency shall be measured as function of the time;</li> <li>• P, Q, V shall be measured as function of the time at the Connection Point and at valve side of converter transformer;</li> <li>• Transient registration of P at valve side of converter transformer and injected frequency signal;</li> <li>• Applied settings of DC-connected PPM controller including frequency droop setting;</li> <li>• A measuring error of max. +/- 5% of the measured value will be accepted.</li> </ul> <p>Frequency restoration control:</p> <ul style="list-style-type: none"> <li>• The grid frequency or turbine speed;</li> <li>• The frequency change injection signal;</li> <li>• The active power setpoint;</li> <li>• The active power at the Connection Point.</li> </ul> <p>Active power controllability:</p> <ul style="list-style-type: none"> <li>• P, Q, V shall be measured as function of the time at the Connection Point and/or at valve side of converter transformer;</li> <li>• Registration of P at valve side of converter transformer;</li> <li>• Received instructions;</li> </ul>

Country	TSO	Approval for publication in the IMR	Answer
			<ul style="list-style-type: none"> <li>• Active power setpoints;</li> <li>• Applied settings of DC-connected PPM controllers.</li> </ul> <p>Fast signal response:</p> <ul style="list-style-type: none"> <li>• Maximum Capacity;</li> <li>• Active Power set point for each test;</li> <li>• The fast frequency signal shall be recorded as function of the time;</li> <li>• The fast active power setpoint signal shall be recorded as function of the time;</li> <li>• P, Q, V shall be measured as function of the time at the Connection Point;</li> <li>• Received instructions;</li> <li>• Active power setpoints;</li> <li>• Applied settings of DC-connected PPM controllers.</li> </ul>
Poland	PSE S.A.	Yes	<p>In PSE procedure detailed information on planned compliance tests for DC-PPM is specified in separate document “DC-connected power park module testing procedure with division of responsibilities between the DC-connected power park module owner and PSE S.A. for testing purposes, and the conditions and procedure for the use of relevant equipment certificates”</p> <p>(<a href="https://www.pse.pl/documents/20182/96c4e7e2-0182-498d-a76c-3650a8c09fca?">https://www.pse.pl/documents/20182/96c4e7e2-0182-498d-a76c-3650a8c09fca?</a>), including the test schedule.</p>
Romania	Transelectrica - TEL	Yes	<p>Acc. to art. 62(3)(f), regarding the intended compliance tests, TSO requests verification tests relating to connection point, after commissioning.</p> <p>Tests refer to:</p> <ul style="list-style-type: none"> <li>• P - Q – U diagram in connection point;</li> <li>• Voltage, reactive power and active power control in connection point to different setpoint values;</li> <li>• LFSM;</li> <li>• FSM;</li> <li>• The capability of automatic reconnection if the case;</li> <li>• Measurements of power quality in accordance with EN 50160.</li> </ul>

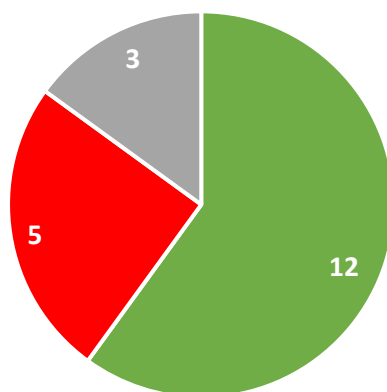
Country	TSO	Approval for publication in the IMR	Answer
Slovenia	ELES	Yes	ELES does not have such connections.
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	Not applicable.

## 5.6.13 What is the maximum period of time during which the DC-connected power park module owner can maintain an ION acc. to art. 62(4)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—
Croatia	HOPS	Yes	In compliance with the Transmission System Grid Code and connection requirements.
Estonia	Elering AS	Yes	2 years
Finland	Fingrid	Yes	12 months
France	RTE	Yes	RTE does not describe in the technical documentation the case of DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	<p>The maximum period for the connection owner to remain in the status of interim operational notification shall not exceed 24 months.</p> <p>The maximum period for a connection owner to remain in the status of interim operational notification may be extended beyond 24 months upon request for a derogation made to the relevant system operator in accordance with the procedure in Title VII of Regulation (EU) 2016/1447 (NC</p>

Country	TSO	Approval for publication in the IMR	Answer
			HVDC).
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	24 months, as per the code.
Lithuania	LITGRID AB	Yes	The maximum period of time is the same as in the Regulation.
Netherlands	TenneT TSO	Yes	24 months.
Poland	PSE S.A.	Yes	According to NC HVDC provisions maximum ION period is set as 24 months (without using the NRA derogation).
Romania	Transelectrica - TEL	Yes	Acc. to art. 62(4) the maximum period during which the DC-connected power park module owner can maintain ION status is 24 months (art. 40 (1) from Operational Notification Procedure – NRA Order no. 220/11.12.2019).
Slovenia	ELES	Yes	ELES does not have such connections.
Spain	Red Eléctrica de España	No	–
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented.

5.6.14 Is the information included in this section of the survey (Interim operational notification for DC-connected power park modules) publicly available in accordance with NC HVDC Article 55(2)?



■ Yes ■ No ■ Not published yet



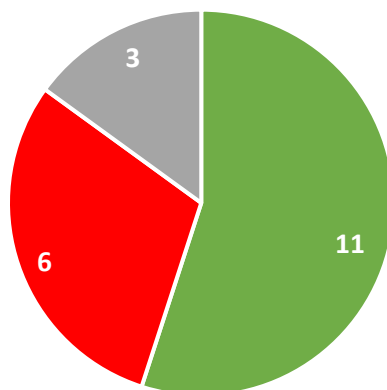
## 5.7 Survey on final operational notification for DC-connected power park modules pursuant to NC HVDC art. 63

### 5.7.1 Is a derogation procedure foreseen if an incompatibility is identified in connection with issuing of the ION acc. to art. 63(4)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	In compliance with the Transmission System Grid Code and connection requirements.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes
France	RTE	Yes	RTE does not describe in our technical documentation the case of DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	Yes. Please see CRU decision paper: <a href="https://www.cru.ie/document_group/eu-electricity-network-codes/">https://www.cru.ie/document_group/eu-electricity-network-codes/</a>
Lithuania	LITGRID AB	Yes	No

Country	TSO	Approval for publication in the IMR	Answer
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	Derogation sub-procedure, which is developed in line with Art. 79 & 80 NC HVDC, was implemented directly in PSE operational notification procedure. The criteria for granting derogations pursuant to Article 78 NC HVDC were specified by PL NRA ( <a href="https://www.ure.gov.pl/pl/urzad/informacje-ogolne/komunikaty-prezesa-ure/7242,Komunikat-nr-742017.html">https://www.ure.gov.pl/pl/urzad/informacje-ogolne/komunikaty-prezesa-ure/7242,Komunikat-nr-742017.html</a> ).
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	ELES does not have such connections.
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented.

### 5.7.2 Is this information publicly available in accordance with NC HVDC Article 55(2)?



■ Yes ■ No ■ Not published yet

## 5.8 Survey on limited operational notification for DC-connected power park modules pursuant to NC HVDC art. 64

### 5.8.1 In the case of a LON, will the unresolved issues justifying the granting of the LON clearly be identified acc. to art. 64(3)(a)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	In compliance with the Transmission System Grid Code and connection requirements.
Estonia	Elering AS	Yes	No
Finland	Fingrid	Yes	Yes
France	RTE	Yes	RTE does not describe in the technical documentation the case of DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	Yes, will be published once Grid Code modification is approved by RA. Please see CC.15.23 under MPID292. <a href="https://www.eirgridgroup.com/site-files/library/EirGrid/MPID292_Incorporation_HVDC-Operational_Notification_Process_DCconnected_PPMs.pdf">https://www.eirgridgroup.com/site-files/library/EirGrid/MPID292_Incorporation_HVDC-Operational_Notification_Process_DCconnected_PPMs.pdf</a>

Country	TSO	Approval for publication in the IMR	Answer
Lithuania	LITGRID AB	Yes	Yes
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	According to PSE procedure, required responsibilities and timescales for the expected solution are required in LON request - they will be defined individually.
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	ELES does not have such connections.
Spain	Red Eléctrica de España	No	—
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented.

## 5.8.2 In the case of a LON, are the responsibilities and timescales for the expected solution clearly identified acc. to art. 64(3)(b)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	—
Croatia	HOPS	Yes	In compliance with the Transmission System Grid Code and connection requirements.
Estonia	Elering AS	Yes	No

Country	TSO	Approval for publication in the IMR	Answer
Finland	Fingrid	Yes	Yes
France	RTE	Yes	RTE does not describe in the technical documentation the case of DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	Yes
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	Defined on a case-by-case basis.
Lithuania	LITGRID AB	Yes	Yes
Netherlands	TenneT TSO	Yes	No
Poland	PSE S.A.	Yes	According to PSE procedure, required responsibilities and timescales for the expected solution are required in LON request - they will be defined individually.
Romania	Transelectrica - TEL	Yes	Yes
Slovenia	ELES	Yes	ELES does not have such connections.
Spain	Red Eléctrica de España	No	—

Country	TSO	Approval for publication in the IMR	Answer
Sweden	Svenska Kraftnät	Yes	No DC Connected Power Park Modules have been constructed since NC HVDC entered into force and the Operational Notification Procedure for DC Connected Power Park Modules according to the NC HVDC are to be implemented.

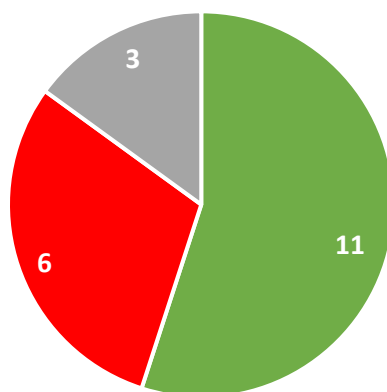
## 5.8.3 In the case of a LON, what is the initial period granted acc. to art. 64(3)(c)?

Country	TSO	Approval for publication in the IMR	Answer
Belgium	ELIA GROUP	No	–
Croatia	HOPS	Yes	In compliance with the Transmission System Grid Code and connection requirements.
Estonia	Elering AS	Yes	No time period defined.
Finland	Fingrid	Yes	Max. 12 months.
France	RTE	Yes	RTE does not describe in our technical documentation the case of a DC-connected power park modules.
Germany	Representation of all German TSO's (Amprion / TenneT / TransnetBW / 50Hertz)	Yes	A limited operational notification shall be issued by the relevant system operator with a clear identification of a maximum period of validity which shall not exceed 12 months. The initial period granted may be shorter with the possibility for extension if evidence to the satisfaction of the relevant system operator demonstrates that substantial progress has been made towards achieving full compliance.
Greece	Independent Power Transmission Operator S.A. (IPTO S.A.)	Yes	IPTO's compliance scheme is still under consideration, no specific operational notification procedures are specified yet.

Country	TSO	Approval for publication in the IMR	Answer
Hungary	MAVIR	Yes	Not applicable in Hungary. By individual agreement.
Ireland	EirGrid	Yes	Defined on a case-by-case basis.
Lithuania	LITGRID AB	Yes	The initial period of LON is the same as in the Regulation.
Netherlands	TenneT TSO	Yes	Case dependent.
Poland	PSE S.A.	Yes	In PSE procedure there is no default period for a LON. LON period will be set individually within the range specified in NC HVDC(≤12 months).
Romania	Transelectrica - TEL	Yes	According to art. 64(3)(c) the valid period granted for LON may not exceed 12 months. The duration of the LON granted may be shorter, with the possibility of extension, if any evidence is considered satisfactory by the TSO, which proves that it has been registered substantial progress towards full compliance (art. 51(2)(c) and (3) from Operational Notification Procedure – NRA Order no. 176/07.09.2019).
Slovenia	ELES	Yes	ELES does not have such connections.
Spain	Red Eléctrica de España	No	–
Sweden	Svenska Kraftnät	Yes	Not applicable.



5.8.4 Is the information included in this section of the survey (Limited operational notification for DC-connected power park modules) publicly available in accordance with NC HVDC Article 55(2)?



■ Yes ■ No ■ Not published yet

## 6 Conclusion

The 2021 Implementation Monitoring Report reflects the national implementation status of the Operational Notification Procedure. The data were received from each Member State TSO in 2021.

For NC RfG the IMR focuses on Articles 29 to 37 of the Operational Notification Procedure for Connection, as detailed in chapter 3 (**NC RfG Implementation**).

For NC DC the IMR focuses on Articles 22 to 26 and Articles 31 to 33 of the Operational Notification Procedure, as detailed in chapter 4 (**NC DC Implementation**).

In NC HVDC, as detailed in chapter 5 (**NC HVDC Implementation**) the Operational Notification Procedure is split into two parts. Article 55(1), Chapter 1 Title V details the Operational Notification Procedure for HVDC Systems and Article 60(2) Chapter 2 Title V details the Operational Notification Procedure for DC Connected Power Park Modules.

Information which was released for publication by the relevant Transmission System Operators is publicly shared in this Implementation Monitoring Report and listed in the relevant columns.

For the sake of completeness graphical evaluations as pie chart presentations offer a statistical overview of the public availability of the requested information in accordance with NC RfG Article 29(2), respectively in accordance with NC DC Article 22(3), respectively in accordance with NC HVDC Article 55(2).