

DATE ~~October 8~~ November 4, 2015
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Annexes to ~~the Offshore~~ Connection and Transmission Agreement

- Annex 1** Details of [Name of Connected Party]
- Annex 2** Description and technical specifications of the Connection, including drawings
- Annex 3** Technical terms and conditions for ~~offshore installations~~ the Platform
- Annex 4** Technical requirements applicable for the connection of Offshore Power Park Modules
- Annex 5** Compliance Activities: applicable Testing Rrequirements
- Annex 6** Operational arrangements and exchange of information
- Annex 7** ~~Insurance~~ Tariff sheet
- Annex 8** ~~Regulated tariff sheet~~

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[Connected Party]

Annex 1 Details of [Name of Connected Party]

General note

In this Annex the Parties capture data in good cooperation. This will take place in the bilateral consultations after the offshore wind subsidy tender (prior to concluding the Connection and Transmission Agreement). After reaching the milestone "Connection ready", an update is required to process the 'as built' data.

General details

EAN code of connection

EAN code(s) of power line(s) _____

Connected Party

Correspondence address + contact person

Postal code + city/town

Chamber of Commerce registration number

Commencement date

Invoice address _____

Order number / reference for invoicing purposes _____

Transmission details

Feed-in Transmission Capacity _____ (max 350 MW) _____ MW

Capacity according to permit for exploiting the Installation _____ (max 380) _____ MW

Initially contracted Transmission Capacity (offtake) _____ MW

Transmission tariff category (consumption)

kW_{max} category of operating time**Details of metering device**

Location of metering device

Voltage level of metering device 66 kV

Details metering (For instance: kWh and kVArh; both for offtake and feed-in)

Owner of metering device

Correction factor for cable losses Inapplicable

Correction factor for transformer losses Inapplicable

Programme-responsible party

Party with metering responsibility

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[Connected Party]

Annex 2 Description and technical specifications of the Connection, including ~~drawings~~
drawings

General note

In this Annex the Parties capture data in good cooperation. This will take place in the bilateral consultations after the offshore wind subsidy tender (prior to concluding the Connection and Transmission Agreement). After reaching the milestone "Connection ready", an update is required to process the 'as built' data.

Connection details

Connection capacity _____ MVA: cos phi _____

Physically connected to platform

Physically connected voltage level 66 kV

Bay name(s) _____ (TenneT will specify all bay names to be used by the Connected Party and TenneT before concluding the Realisation Agreement) _____

Substation (name and coordinates) _____ (TenneT will specify before concluding the Realisation Agreement) _____

Description of the Connection

(One or more 66kV bays, to be specified before concluding the Realisation Agreement)

Description of the Connection Points

Primary Connection Point The primary Connection Point between the Installation (~~o~~Offshore Power Park Module) and TenneT is specified at the ~~66kV--cable~~kV cable termination of the ~~66kV~~kV inter-array cables ~~and in~~ the ~~66kV~~kV switchgear installation on the ~~p~~Platform.

Secondary Connection Point(s) ~~clamps of~~ The secondary Connection Point(~~is~~) are defined at the terminals of the ~~measuring interface~~ cabinet, ~~see drawing [reference]~~ and it concerns all communication and control related interfaces.

Tertiary Connection Point(s) ~~are concern~~ all spatial ~~To be determined.~~ (The tertiary Connection Points ~~are~~ spatial boundaries at the Platform, where ownership and management transfer to the Parties.)

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Examples Explanation of Secondary Connection Points:-

Metering

Current transformer and voltage transformer measurements

The current and voltage measurements will be provided by TenneT and take place via the cabling in on the Platform to the clamp terminals of the measurement interface cabinet. The measurement interface cabinet is property of the Connected Party and is in accordance with the Meetcode. At the clamps of the measurement TenneT. At the terminals of the interface cabinet the transition of ownership is made from TenneT to the Connected Party, including the measurements for the accountable metering equipment of the Acknowledged Metering Responsible Party. The metering equipment will be according to the Metering Code.

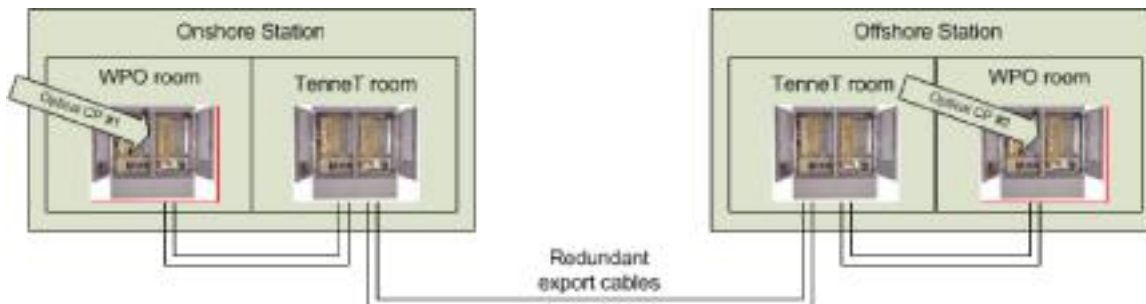
Explanation of Fibre optic cables connection points (Optical CP) as Secondary Connection Points

TenneT will shall install two redundant 220kV export cables from the onshore substation to the Platform (offshore platform). Fibre optic cables will be included in these cables. All of these fibre optic cables will end in a fibre optic patch panel in TenneT rooms, both on the onshore station as well as on the offshore station Platform.

From the TenneT room designated fibre optic cables will be installed and connected to a second patch panel in the Connected Party's room. The optic fibres designated to be used by the Connected Party will be 1:1 patched in the TenneT rooms and therefore create a "dark fibre" path from the Connected Party's room onshore to the Connected Party's room offshore (on the Platform).

TenneT will shall install the patch panel in the designated room of the Connected Party offshore. The patch panel placed in the Connected Party's room will be the Optical CP, meaning that the patch cable itself that will be plugged into the patch panel of the equipment will owned by the Connected Party.

The above design is depicted in the figure below:



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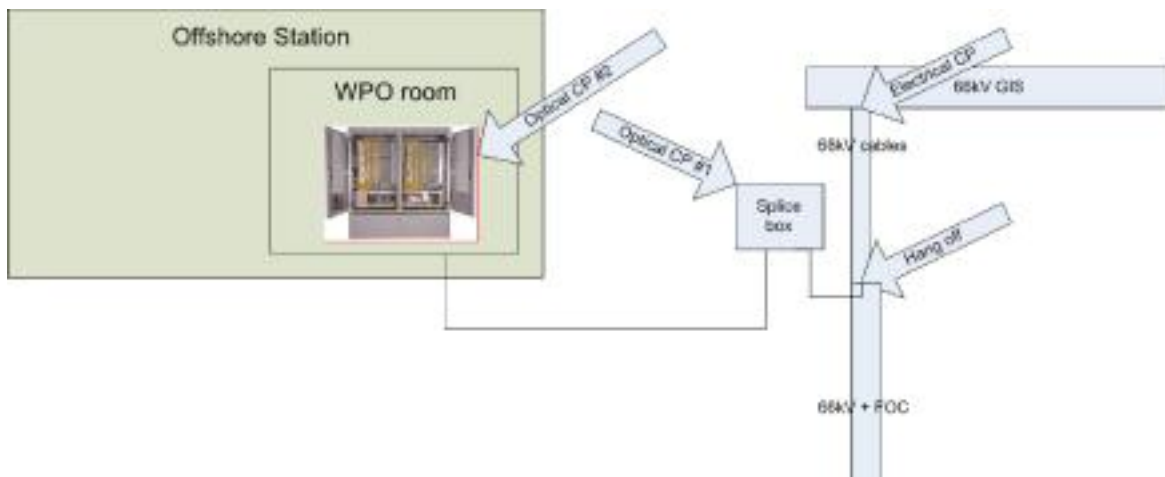
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[Connected Party]

Optical Connection Point #	Equipment	Installed by	Spliced by	Patched by
1	Patch panel in Connected Party's room	TenneT	TenneT	Connected Party
2	Patch panel in Connected Party's room	TenneT	TenneT	Connected Party

~~The 66kV cables which have their electrical Connection Point at the cable termination of the 66kV GIS, will be installed by the Connected Party.~~ At the cable hang off on the cable deck (or ~~possibly a different~~ such other location: ~~to be decided in agreement~~ as may be agreed upon between TenneT and the Connected Party), an optical cable splice box ~~will~~shall be installed by TenneT for each 66 kV cable.

From this splice box an Fibre Optic Core Cable (FOC) ~~will~~shall be installed by TenneT towards the fibre optic patch panel placed in the Connected Party's room. The fibre optic cores of the FOC will end in the fibre optic patch panel owned by TenneT. The other side will end in the splice box on the cable deck, the optical fibres ~~will~~shall be spliced by the Connected Party.



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Optical Connection Point #	Equipment	Installed by	Spliced by	Patched by
1	Splice box at cable deck	TenneT	Connected Party	-
2	Patch panel in Connected Party's room	TenneT	TenneT	Connected Party

Also the relevant tertiary connection point (e.g. power supply) is defined at the interface panel in the Connected Party's room.

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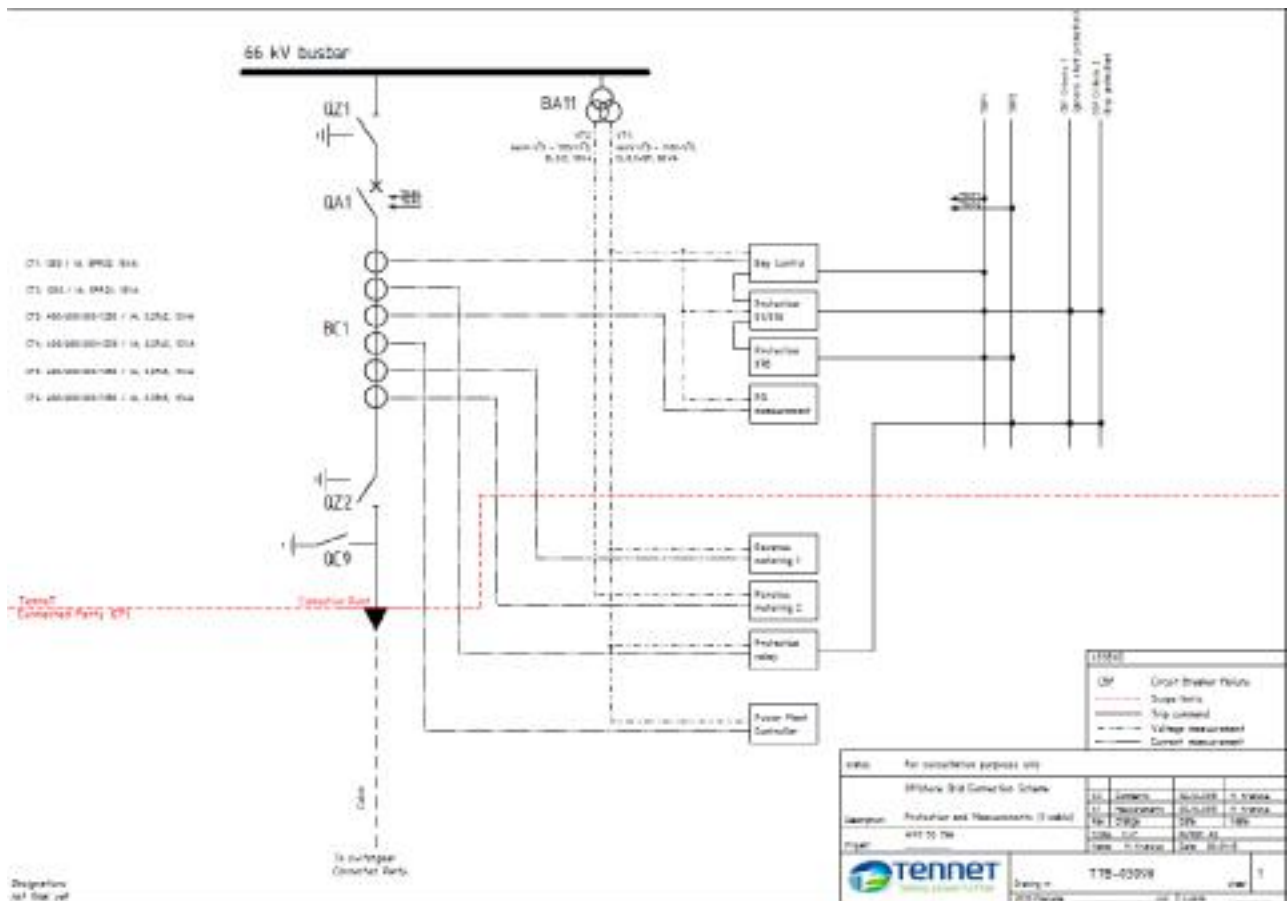
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~~{Connected}~~

Find below the sSingle line diagram and all other important drawings and/or photographs, including the connection- and metering point(s), bay codes, etc.

[Drafting note: these drawings/photographs will be updated/completed before concluding the Agreement. The drawings below are examples realistic drafts for consultation purposes, not final drawings. These draft drawings are also uploaded as separate document for quality reasons.]

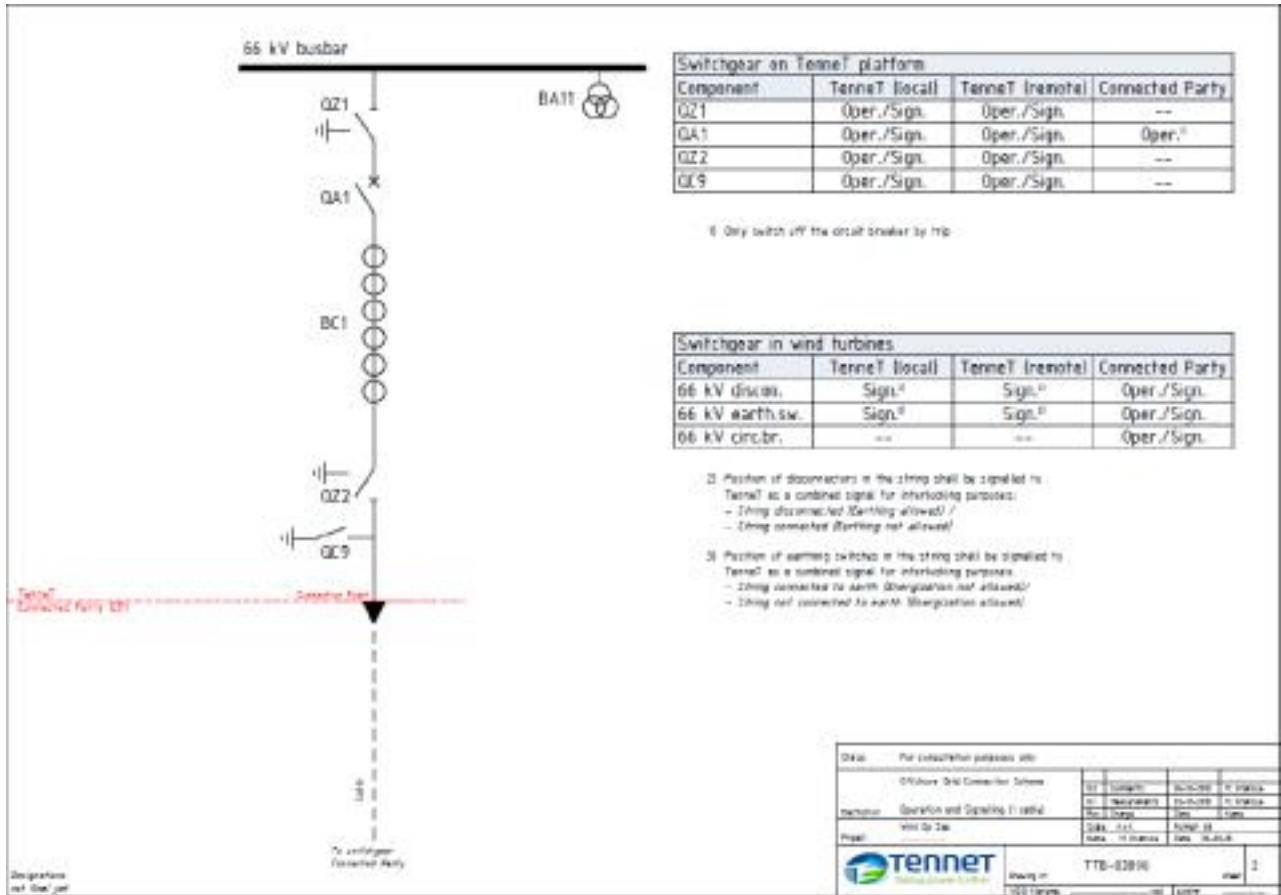
Examples Draft:



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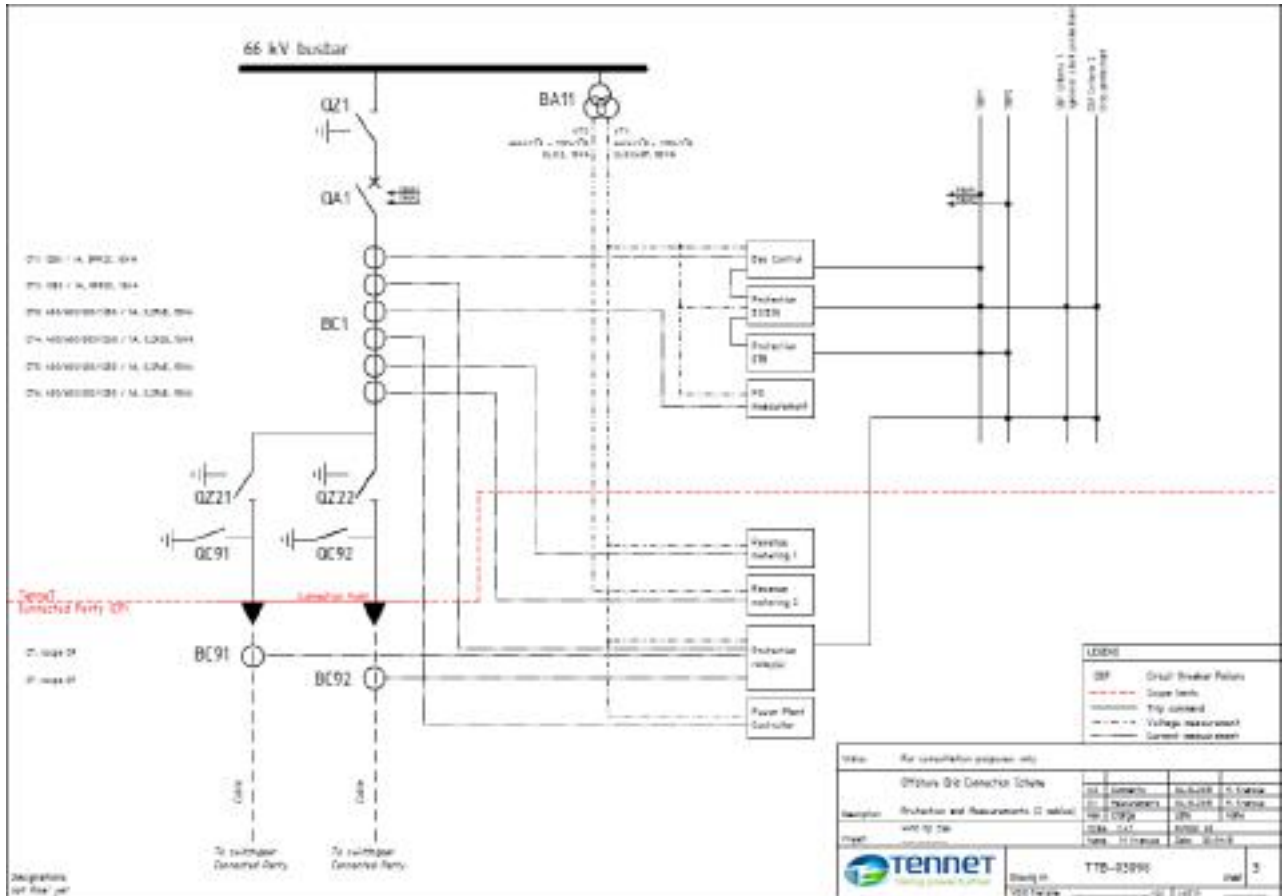
[Connected Party]



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[Connected Party]

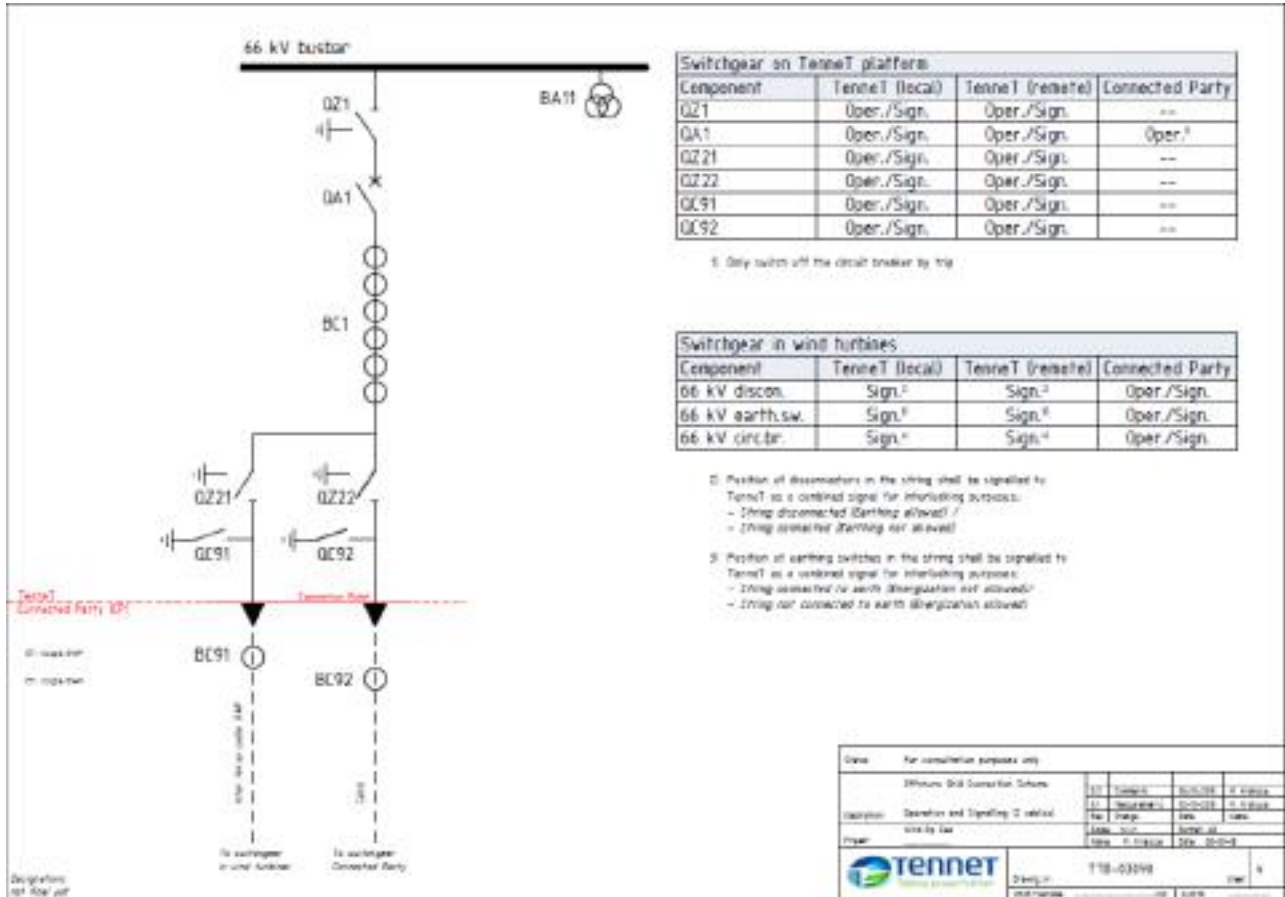


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[Connected Party]



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Annex 3 Technical terms and conditions for ~~offshore installations~~ the Platform

Drafting note: certain design parameters of the 66 kV equipment in this Annex are still subject to investigation and can be amended in the final version of the model Realisation Agreement.

1. General ~~note~~ system specifications

~~This Annex will be based on the outcome of the technical consultation and consist of those topics that are not included in legislation or codes yet and currently need to be laid down in the Agreement.~~

<u>Nominal frequency:</u>	<u>50 Hz</u>
<u>Nominal voltage:</u>	<u>66 kV +/- 10%</u>
<u>Maximum system voltage:</u>	<u>72,5 kV</u>
<u>Impedance earthed grid with</u>	
•	impedance <u>2A</u>
•	single circuit <u>1015A(max.06)</u>
•	earth voltage <u>12 (according to IEC 1 < c < 1,73)</u>
<u>Operating voltage:</u>	<u>66 kV +/- 1%</u>

2. Number of J-tubes and bays

The pPlatform will accommodate up to 8 (eight) J-tubes (inner diameter 450 mm) for use by the Connected Party. Each connection of a J-tube will be facilitated with a Primary Connection pPoint-of-common-coupling (PCC).

Six 66 kV bays will be available per Power Park Module (i.e. the Installation and any Power Park Module connected to the Platform). This results in four bays "one string – one bay" and two bays "two strings – one bay". In the case of two strings – one bay, this will be done with two separate cable disconnectors.

- Number of J-tubes 4
- Number of PCCs 8
- Maximum number of 66 kV GIS bays available per Power Park Module (350 MW) 6
- Maximum PCC Bay 15A

TenneT will define the final layout of the 66 kV switchgear installation and cable routing on the Platform in order to ensure a balanced distribution of power per switchgear section. It shall be possible to group all 66kV cables of the Connected Party into two sections. The maximum active power (P) for each section shall be less than 210 MW.

3. Secondary Connection Point-of-Common-Coupling

- ~~The current and voltage measurement will be brought via cabling in the Platform to the measurement cabinet of the Acknowledged Metering Responsible Party. The transition is made at the clamps of the measurement cabinet.~~
- The Secondary Connection Point is defined and explained in Annex 2;

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- Besides a metering system to be provided by the Acknowledged Metering Responsible Party under responsibility of the Connected Party, power quality components will be installed by TenneT to measure
 - ~~Besides a metering system, power quality components will be installed by TenneT to measure~~ and verify that the energy supplied is in accordance with ~~the~~ RfG requirements.;

Operation of bays

- A patch panel in the designated room for the Connected Party will be provided by TenneT facilitating the
fibre optic cable interface which is explained in detail in Annex 2;
- An interface cabinet for secondary equipment in the designated room for the Connected Party will be

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provided by TenneT in order to facilitate the other secondary Connection Points including a telecom interface (other than fibre optics) and other shared services (such as a weather station, CCTV, etc.).

4. Tertiary Connection Points

- The tertiary Connection Points are defined in Annex 2.
- The interface cabinet for secondary equipment in the designated room for the Connected Party shall also facilitate the 230 VAC (max 16 kW) power supply.

5. Operation of bays

TenneT will standardise the operation of bays for the ~~offshore~~ Platform. ~~The switchgear installation with~~ TenneT (NCC) shall make the standardised

procedure for operation of bays available for the Connected Party and the Offshore PPMs. The switchgear installation with connections to the Installation or the other eOffshore Power Park Module PPM is fully operated by TenneT, ~~as the~~ (owner of the switchgear.

Protection

of the switchgear). According to this procedure TenneT will contact the person responsible for the Installation of the Connected Party (see contact details in Annex 6) for all operation activities.

6. Protection

TenneT will standardise the protection equipment of the 66 kV cables that is situated on the ~~pPlatform of the offshore Power Park Module (PPM) inter-array cable strings to the TenneT offshore transformer platform.~~ TenneT will own, operate and maintain the protection system. TenneT will align with ~~[Name of the~~ Connected Party] and the other Offshore PPM on details of the protection system.

The following guidelines will apply to the protection system of the 66 kV cables on the Platform:

- the protection system will be based on a primary protection by two protection relays (max. 1-t, ANSI Code 51) in the outgoing feeder bays which each have either a different measuring principle or a different manufacturer; the protection system and its settings will be aligned with the Connected Party and the other Offshore PPM;
- in case two 66 kV cables are connected to one 66 kV bay, TenneT cannot distinct which of the two 66 kV cables is healthy or faulty if the protection trips. The Connected Party may install additional equipment to distinguish between the healthy and faulty 66kV cables, after cable installation;
- underneath the GIS cable termination box there will be enough space left for the Connected Party to install equipment to distinct the healthy 66 kV cable from the faulty 66 kV cable (e.g. current transformers or short circuit indicators). For practical reasons this equipment will be installed after cable termination (e.g. use of split core current transformers);
- the TenneT protection panel of each 66 kV cable allows for additional protection relays of the Connected Party, if desired. In such a case TenneT facilitates 2 slots for 19" racks and the Parties shall review the complete protection design;
- if the Connected Party desires an emergency "button" for tripping a particular 66 kV cable, TenneT facilitates such by connecting the "tripping contacts" to the tripping coil;
- fault ride through capability for any fault in the Offshore Transmission System (on 66 kV switchgear, in other 66 kV cables and in the step-up transformer and the Offshore Transmission System for electricity)

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- shall be according to curve as presented Annex 4;
the 66 kV system that is part of the Offshore Transmission System is impedance earthed by an earthing transformer; the protection system shall be aligned with this earthing method by providing earth fault current protection (I₀>).

Z. **Reactive power compensation**

During operation the ~~Power Park Module~~Connected Party shall absorb or inject reactive power on demand of TenneT between -0,1 pu and +0,1 pu (1 pu is full active power in MW independent of the numbers of ~~Wind Turbine Generators~~WTG in operation) at ~~PCC, as agreed in the~~ Primary Connection ~~and Transmission Agreement~~Point, without any right of financial compensation ~~to the Power Park Module~~.

If the reactive power capabilities of a specific ~~Wind Turbine Generator~~WTG cannot comply at very low active power (below 0,1 pu), then TenneT ~~will adjust their~~of the component set-up (reactors, capacitors) accordingly.

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The full reactive power capabilities of the ~~Power Park Module~~ Connected Party to absorb or inject reactive power on demand of TenneT are between -0,4 pu (absorption) and +0,35 pu (injection) at ~~PC~~ the Primary Connection Point (1 pu is full active power in MW dependent of the numbers of ~~Wind Turbine-Generators~~ WTG in operation).

8. SCADA, ~~G~~communication interface and data links

TenneT ~~will~~ shall make available to the Connected Party:

- ~~In at the offshore substation: a telecommunication room~~ Platform: a room designated for the Connected Party of ~20m² to install cabinets owned by the Connected Party. Following services are supplied by TenneT: sufficient CT/VT connections, Heating, Ventilation, Air Conditioning (HVAC); a redundant and uninterruptable power supply, fire detection and extinguishing;
- ~~A room in TenneT's~~ at the onshore substation: a room of ~48m² (~6mx~8m) with following services supplied by TenneT: Heating, Ventilation, Air Conditioning (HVAC); a redundant and uninterruptable power supply, fire detection (no fire extinguishing);
- ~~Sufficient~~ a patch panels ~~to connect the~~ at the Platform in the Connected Party's room for the optical fibres of all ~~array~~ 66 kV cable strings. The maximum amount is to be ~~determined~~ agreed upon by TenneT and the Connected Party. Patch panel capacity will be ~~at least~~ sufficient for 24 optical fibres per string. ~~If required, patch panels for array cable fibre optic cables may be installed in the room in TenneT's onshore substation. as a maximum:~~
- ~~S~~ sufficient optical fibre pairs in both export cables ~~to connect the main switches to the onshore communication interface point. Exact amount to be determined by TenneT and which will be made available in the patch panels in~~ the Connected Party's ; as an indication rooms at the Platform and in the onshore substation. Maximum amount of 24 optical fibres in each export cable ~~24 fibres will be available for the Connected Party.~~
- ~~O~~ Only in case of a firm and significant delay in realisation of such communication through the export cable fibres; ~~will~~ is ~~be~~ bound to install a wireless communication interface (emergency facility) between the ~~offshore substation~~ Platform and the onshore substation.

Curtailment Principles or Overplanting Capacity

Curtailment can be applied in the cases that (i) during the use of the Overplanting Capacity the 220 kV export cables reach their maximum allowable temperature limits or (ii) TenneT deems this necessary to maintain system security (onshore or offshore).

With respect to maximum allowable temperature limits (i), TenneT in general identifies three levels in the 220

Shared Services

{under consultation}

Use of flexible transmission capacity, including curtailment principles

{under consultation}

Harmonic emission limits and transients study

{under consultation}

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kV export cable load management process, in order to ensure that the 220 kV export cable conductor temperature never reaches 90° Celsius:

1. Alignment of the Connected Party's generation forecasts to dynamic cable loading capabilities: the Connected Party is responsible for alignment of its forecasts to possible curtailment of the Installation or the other offshore PPM's output due to the temperature limit of the export cables (only if the Connected Party's output is higher than the Feed-in Transmission Capacity). To facilitate this alignment process, TenneT will provide:

- a. calculation results based on the best estimate of the soil condition for the 220 kV export cables, final design of the cable system and the voltage level of the system (updated to the as-built situation);
- b. the actual cable conductor temperature measurements (data format and frequency to be defined between TenneT, the Connected Party and the other Offshore PPM).

2. Actual curtailment of the power output of the Connected Party: if the conductor temperature reaches a certain threshold value (value to be determined per 220 kV export cable), the Connected Party receives a warning signal from TenneT. The Connected Party shall then start immediately with the curtailment of the Connected Party's output, down to the Feed-In Transmission Capacity. If this curtailment is not started and the conductor temperature reaches the second threshold value (close to, but below 90 degrees Celsius, to be determined per 220 kV export cable), the Connected Party will receive a second and final warning signal from TenneT.

3. Actual curtailment of the power output of the Connected Party by TenneT:

when the second warning signal has been released, TenneT may curtail below the Feed-In Transmission Capacity by switching off 66 kV cables of the Connected Party without any further notice.

The Connected Party acknowledges it cannot claim any rights under this Connection and Transmission Agreement in respect of the Overplanting Capacity or curtailment of any Overplanting Capacity (regardless whether this is related to maximum allowable temperature limits or to maintain system security).

9. Shared data

TenneT aims to share systems with the Connected Party where possible in order to save on space, weight and power consumption. The currently identified possibilities of data acquisition systems are summarized in table below. Final decisions about shared systems shall be elaborated with the Connected Party.

<u>Sensor</u>	<u>Owner</u>	<u>Shared</u>
<u>Shared sensors by Rijkswaterstaat (RWS)</u>		
<u>Meteo</u>	<u>RWS</u>	<u>Shared</u>
<ul style="list-style-type: none"> • <u>Wind speed & direction</u> • <u>Ceilometer (Cloud height)</u> • <u>Temperature and Humidity</u> • <u>Visibility</u> 		

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- Atmospheric pressure
- Rain Gauge

<u>Hydro</u> • <u>Temperature</u> • <u>Wave height</u>	<u>RWS</u>	<u>Shared</u>
<u>Radio</u> • <u>AIS (Bacon, Sender, Receiver)</u> • <u>VHF (Radio over IP)</u>	<u>RWS</u>	<u>Shared</u>
<u>Bird Radar</u>	<u>RWS</u>	<u>Shared</u>
<u>Nautical Radar</u>	<u>RWS</u>	<u>Shared</u>
<u>Bat detection (if required)</u>	<u>RWS</u>	<u>Shared</u>
<u>CCTV</u>	<u>RWS/TenneT</u>	<u>Shared</u>
<u>Hydro, Current (speed and direction)</u>	<u>RWS</u>	<u>Shared</u>
<u>4G</u>	<u>RWS/TenneT/Telecom Provider</u>	<u>Shared</u>

The Connected Party may install its own LIDAR and CCTV, including connection cables, on the Platform. For systems listed above that are decided not to be shared, TenneT will make available the provisions required for installation and operation of these systems, including mounting facilities, auxiliary services and telecommunication systems.

It is required that communication interface(s) of the shared systems mentioned are able to share the data with all parties involved (including the other Offshore PPM).

Costs regarding the procurement of shared data shall be born proportionally by each party that takes part in the sharing. Unless agreed otherwise, TenneT shall invoice the Connected Party, taking into account sufficient transparency, for its part in the shared data costs.

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[Connected Party]

Annex 4 Technical requirements applicable for the connection of Offshore Power Park Modules

General drafting note:

~~This Annex will be completed with the outcome of the technical consultation regarding harmonic emission limits, to be discussed 21 October 2015.~~

~~Drafting note:~~ This annex is based on the RfG version June 10, 2015. The latest version of the RfG can be found at the EU ~~website:~~

~~website:~~ <https://ec.europa.eu/energy/en/topics/wholesale-market/electricity-network-codes>

1. Introduction

~~The European Network Code Requirements for Generators (RfG), the Act, and relevant clauses of the current Electricity Grid Code (*Netcode Elektriciteit*) and the Electricity System Code (*Systeemcode Elektriciteit*) apply accordingly, unless indicated otherwise in this Annex.~~

The [Electricity Grid Code](#) (*Netcode Elektriciteit*) applies accordingly to the [Offshore Transmission System-at-sea](#),

except for the following provisions:

Article 2.1.1.1 – 2.1.2.6

Article 2.2.1.1 – 2.2.5.3

Article 2.4.1.1 – 2.4.5.3

Article 2.5.4.1

Article 2.5.4.2

Article 2.5.4.6

Article 2.7.1 – 2.9.10

Article 4.1.3.1

Article 4.1.4.1 – 4.1.4.10

Article 4.2.3.1 – 4.2.5.18

Article 5.4.1 – 7.3.12

[The Electricity System Code](#) (*Systeemcode Elektriciteit*) applies accordingly to the [Offshore Transmission](#)

~~The *Systeemcode Elektriciteit* applies accordingly to the transmission sSystem-at-sea~~, provided that for "netbeheerder van het landelijk hoogspanningsnet" should be read: "TenneT" and

except for the following provisions:

~~[exceptions follow]~~

[Article 2.1.3](#)

[Article 2.4.1.7](#)

2. Definition Applicability

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[Connected Party]

With respect to ~~the~~ RfG, ~~a~~the Connected Party is considered an Offshore ~~Power Park Module (definition-48)~~PPM,

which results in the applicability

of:

- Chapter 4 of title II: "Requirements for Offshore Power Park Modules",
- Chapter 4 of title IV: "Compliance testing for offshore power park modules", and
- Chapter 7 of title IV: "Compliance simulations for offshore power park modules".

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~~The~~ RfG specifies the general required capabilities of Offshore ~~Power Park Modules~~ PPM. Proceedings regarding compliance testing and compliance simulations related to the RfG requirements will be part of ~~CTA~~ the Connection and Transmission Agreement (Annex on ~~e~~ Compliance Activities; applicable testing requirements).

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3. Explanatory Notes to ~~the~~ RfG

1) Article 2: Definitions

Definition 2. The ~~e~~Offshore ~~t~~ransmission ~~s~~ystem is connected to the synchronous area of Continental Europe.

2) Article 2: Definitions

Definition 3. The nominal voltage of the Connection Point is 66 kV.

3) Article 5: Determination of significance

The Offshore ~~Power Park Module~~PPM connected to the Platform with a rated power > 75 MW is of type D, independent of the voltage level.

4) Article 13: Frequency requirements

Table 2 of ~~the~~ RfG for the Synchronous Area Continental Europe ~~will~~shall be replaced by table A below:

Table A: Minimum time periods for which ~~a power generating module~~an Offshore PPM has to be capable of operating on different frequencies, deviating from the nominal value, without disconnecting from the ~~network~~Offshore Transmission System.

Synchronous area	Frequency range	Time period for operation
Continental Europe	47.5 Hz – 48.5 Hz	30 minutes
	48.5 Hz – 49.0 Hz	30 minutes
	49.0 Hz – 51.0 Hz	Unlimited
	51.0 Hz – 51.5 Hz	30 minutes

5) Article 25: Voltage ranges

Table 10 of ~~the~~ RfG for the Synchronous Area Continental Europe shall be replaced by table B below:

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Table B: The table shows the minimum period during which an AC-connected ~~e~~Offshore ~~power park module~~ PPM must be capable of operating over different voltage ranges deviating from a nominal value without disconnecting.

Synchronous area	Voltage range	Time period for operation
Continental Europe	0.85 pu – 0.90 pu	60 minutes
	0.9 pu – 1.118 pu	Unlimited
	1.118 pu – 1.15 pu	60 minutes

6) Article 25 referring to Article 20: Voltage stability – fast fault current injection

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The requirements of Article 20-(2)(b) [RfG](#) are further detailed to:

- i. Additional reactive current injection shall be activated in the event of a voltage deviation of more than 10% of the effective value at the Connection Point of the [Power Park Module Offshore PPM](#). This 10% voltage deviation is called the dead band. The voltage control shall ensure the supply of additional reactive current, originating from the [Power Park Module Offshore PPM](#), of minimum 2% and maximum 10% of the rated current per percent of the voltage deviation, see Figure a. The full required reactive current must be available after $t_p = 40$ ms after the fault inception into the [Networkgrid](#), with a rise time (t_r) less than 30 ms, see Figure b.
- ii. Additional reactive current injection shall be supplied up to a voltage limit of minimal 120% rated [Power Park Module Offshore PPM](#) voltage.
- iii. After fault clearance stable operation must be pursued.

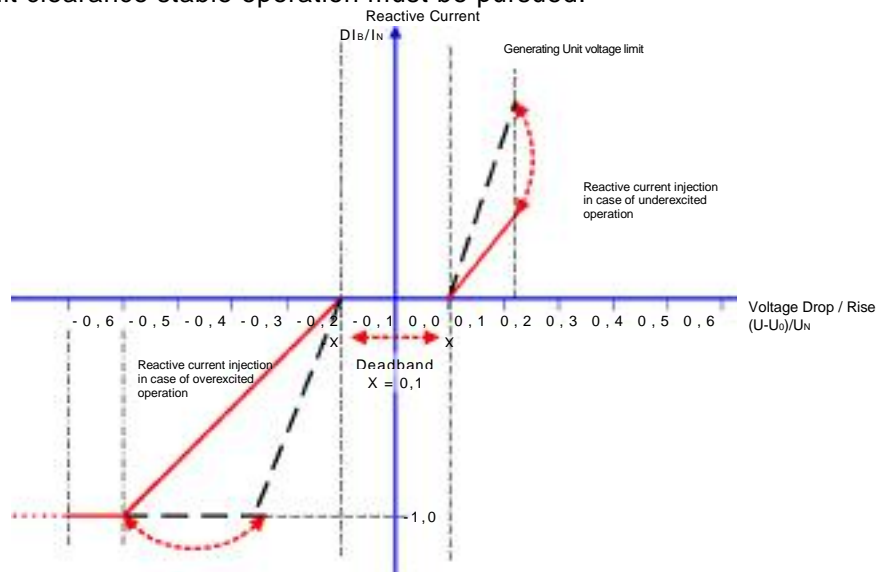


Figure a: Principle of voltage support by fast reactive current injection during faults. The redline represents the required minimum additional reactive current, expressed by the ratio of the additional

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reactive current and the rated current in per unit, against the voltage drop, expressed by the ratio of the actual voltage value and its pre-fault value in per unit at the Connection Point.

U_N : rated Voltage
 I_N : rated current
 U : Voltage during fault
 DI_B : additional reactive current during fault, $DI_B = I_B - I_{B0}$
 I_B : reactive current during fault
 I_{B0} : pre-fault reactive current
 U_0 : pre-fault Voltage
 $(U-U_0)/U_N$: Voltage Drop / Rise
 k : Additional reactive current Droop, red line: $k = (DI_B/I_N)/(U-U_0)/U_N$,
Adjustment range $2 \leq k \leq 10$, adjustment step less or equal to 0,01 pu,

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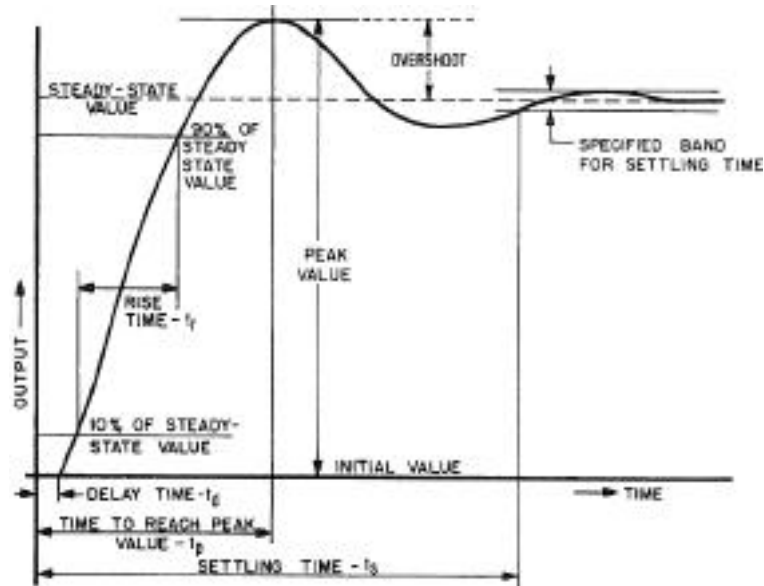


Figure b: Typical transient response of a feedback control system to a step change in input

7) Article 25 referring to Article 21: Reactive power capability and voltage stability requirements

The requirements of this Article apply to the steady state condition of the power system only, and do not apply to transient stability.

The inner profile of Figure 8 of the RfG is further specified by the red dashed line in Figure c below, while respecting the figures of Table 11.

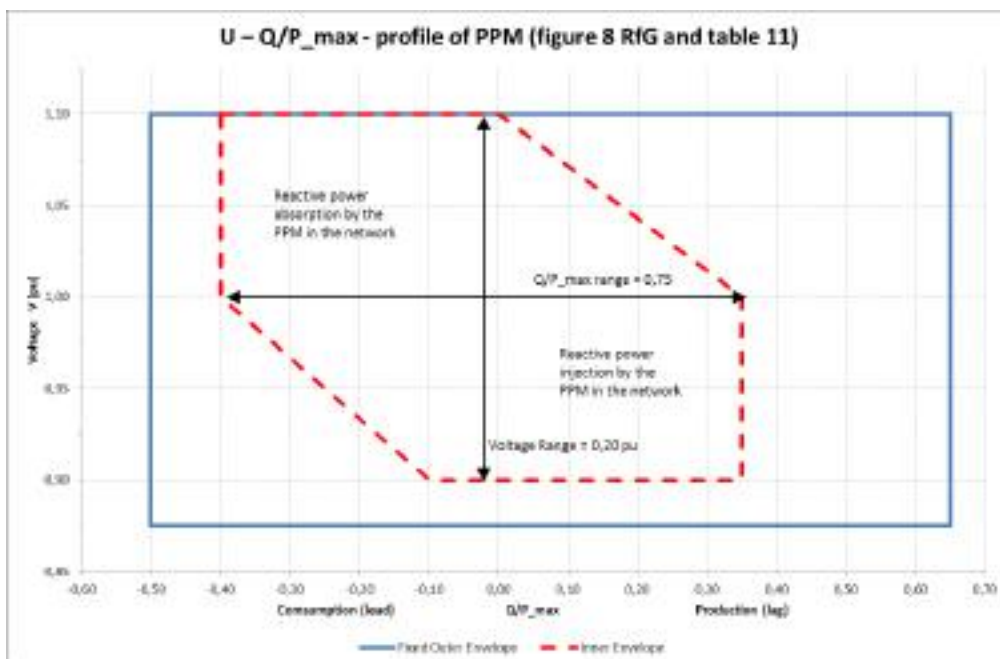
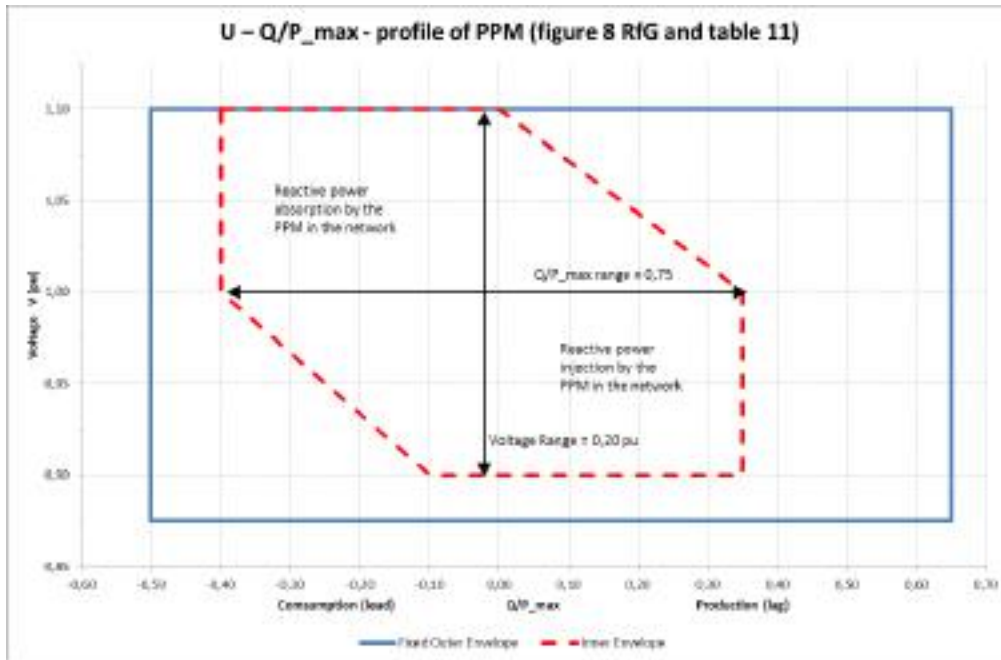


Figure c: The required U-Q/P_{max}-profile of an Offshore PPM at the Connection Point by the voltage

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The coordinates of the vertices of the red dashed profile of Figure c are: **The required U-Q/P_{max} profile of a Power Park Module at the connection point by the voltage**

Reactive power Q/P_{max} [pu]	Voltage V [pu]
-0.40	1.10
-0.40	1.00
-0.10	0.90
0.35	0.90
0.35	1.00
0.00	1.10

If a **Power Park Module** Offshore PPM has a reactive power capability beyond the minimum requirements, the capability shall not be deliberately limited.

The **Power Park Module** Offshore PPM shall be capable of providing reactive power automatically by either voltage control mode, reactive power control mode or power factor control mode.

The set points and slope (voltage droop) must be adjustable, during normal operation.

Set point values relate to the Connection Point of the **Power Park Module** Offshore PPM to the Offshore Transmission System.

The parameters of the control speed of the reactive power controller, will be mutually agreed by TenneT and the Connected Party at least 6 months prior to energisation, taking into account the actual local **Network**

grid

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characteristics.

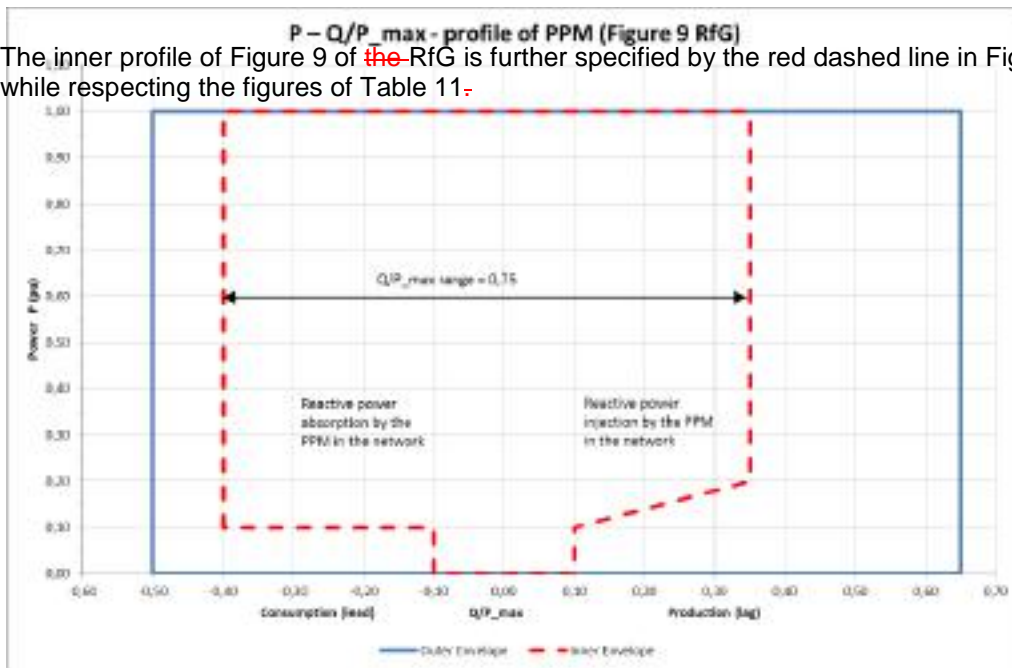
The reactive power control mode Voltage must result in a stable and damped behaviour of the voltage at the Connection Point of the Power Park Module Offshore PPM. If the reactive power control mode is Voltage, adjustment of the operating point of the slope must be possible within 15 minutes, to adjust the reactive power exchange at the Connection Point of Common Coupling.

In case the reactive power control mode is Reactive Power, adjustment of the set point must be within the frequency and accuracy definition of the Onshore Voltage Controller (which determines the Reactive Power Set point for the Offshore Power Park Module PPM at its Connection Point of Common Coupling).

8) Article 25 referring to Article 21: Reactive Power Capability

The requirements of this Article apply to the steady state condition of the power system only, and do not apply to transient stability.

The inner profile of Figure 9 of the RfG is further specified by the red dashed line in Figure d below, while respecting the figures of Table 11-



The coordinates of the vertices of the red dashed profile of Figure d are:

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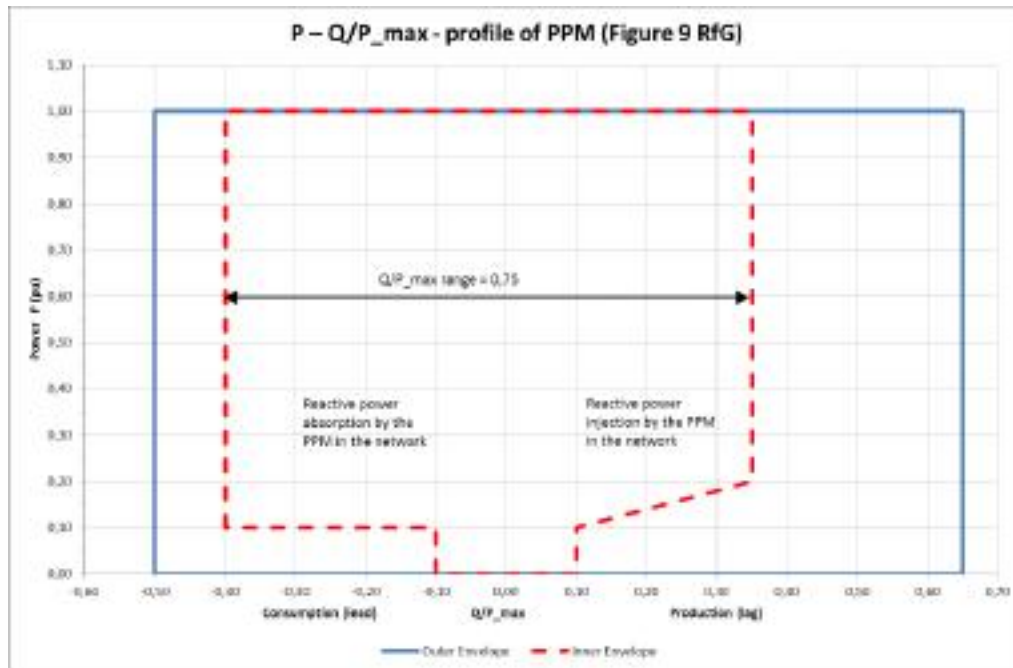


Figure d: The required P-Q/P_{max}-profile of a power park module an Offshore PPM at the eConnection pPoint by the active power The coordinates of the vertices of the red dashed profile of Figure d are:

Reactive power Q/P_{max} [pu]	Power P [pu]
-0.40	1.00
-0.40	0.10
-0.10	0.10
-0.10	0.00

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0.10	0.00
0.10	0.10
0.35	0.20
0.35	1.00

In case a ~~Power Park Module~~ Offshore PPM has a reactive power capability beyond the voltage range specified the capability shall not be deliberately limited.

Limitation of reactive power capability based on the number of generating units in service may not influence the behaviour of the reactive power controller within these limited capabilities.

~~During operation the PPM shall absorb or inject reactive power on demand of TenneT between -0,1 pu and +0,1 pu (1 pu is full active power in MW independent of the numbers of WTGs in operation) at PCC, as agreed in the CTA. If the reactive power capabilities of a specific WTG cannot comply at very low active power (below 0.1 pu), then TenneT will adjust their component set-up (reactors, capacitors) accordingly.~~

~~The full reactive power capabilities of the PPM to absorb or inject reactive power on demand of TenneT are between -0,4 pu (absorption) and +0,35 pu (injection) at PCC (1 pu is full active power in MW dependent of the numbers of WTGs in operation).~~

~~In addition to Article 25 and 21 of the RfG, Article 5.2.2.1 of the Dutch grid code (*Netcode Elektriciteit*) is also applicable:~~

~~5.2.2 Spannings- en blindvermogensregeling~~

~~5.2.2.1 De netbeheerder bepaalt de instelling van de statiek en de referentiewaarde van de primaire spanningsregeling. Indien een productie-eenheid niet bijdraagt aan de blindvermogenshuishouding in de normale bedrijfstoestand moet de referentiewaarde 15 minuten na constatering van een afwijking naar een uitwisseling van 0 Mvar worden teruggebracht, tenzij anders is overeengekomen.~~

9) Article 26 referring to Article 16: Fault ride through capability

The fault ride through capability as laid down in Figure 3 and Table 3.2 of ~~the~~ RfG is further detailed in Figure e below.

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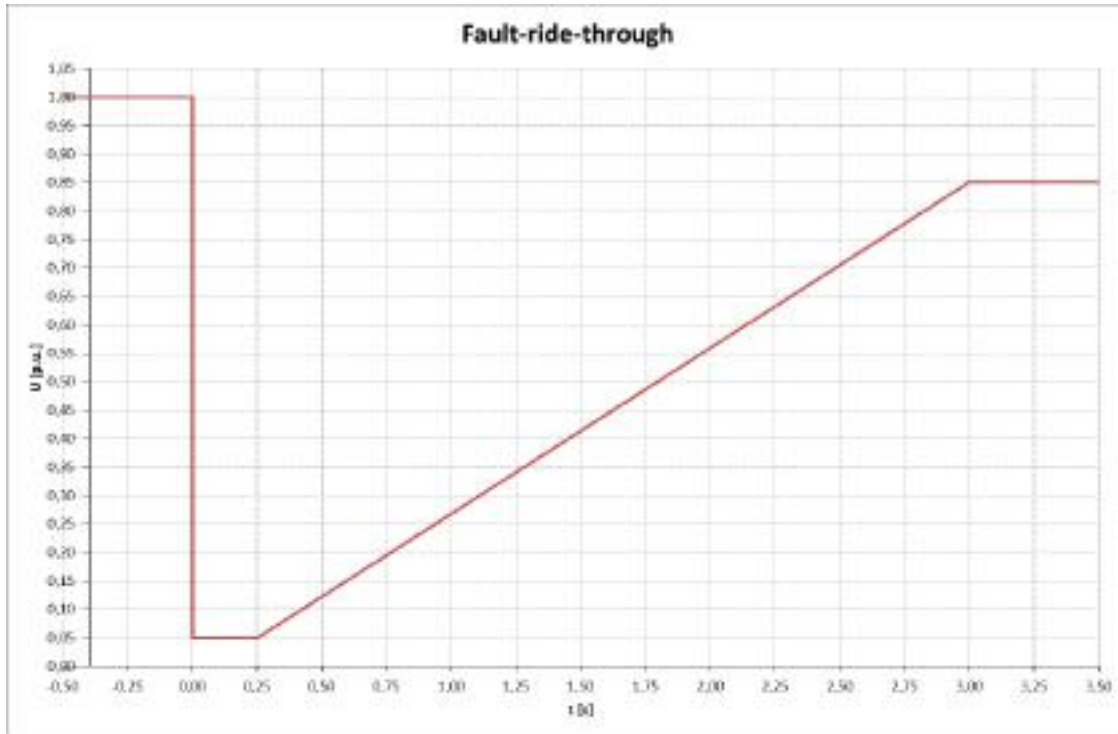


Figure e: The fault-ride through capability of Power Park Module

The coordinates of the vertices of the curve of Figure e are:

Time t [s]	Voltage V [pu]
0.00	1.00
0.00	0.05
0.25	0.05
3.00	0.85

10) Article 27 referring to Article 15: System restoration

Black start capability is not required of Offshore PPMs.

4. Harmonic emission limits

The Connected Party is responsible for the fulfilment of the requirements with respect to the total harmonic distortion and the emission limits. TenneT shall specify the maximum allowed harmonic distortion at the 66 kV Primary Connection Point. If more than one Offshore PPM is connected to one single 66 kV bus bar, the emission planning level will be distributed proportional to the rated power of each Offshore PPM.

The Connected Party is responsible for taking necessary measures in order to fulfil the requirements with respect to the harmonic distortion, at its own cost.

TenneT shall define the planning levels of the harmonic emission limits at 66 kV level, which shall be further allocated to the individual Offshore PPMs based on the capacity according to the Wind Farm Permit and the

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Annex 5 Compliance Testing Requirements

General note

~~This Annex will be drafted once the outcome of the technical consultation of topic T.17 Compliance Testing has been finalised. A position paper on this topic will be published on TenneT's consultation website prior to the technical consultation on 21 October 2015.~~

equivalent permit of the other Offshore PPM. All Offshore PPMs shall plan for and take measures to fulfil the requirements, and be accountable for the fulfillment of its requirements at its own costs.

At 66 kV level, the defined offshore compatibility and planning levels of the Total Harmonic Distortion (THD) are:

- Compatibility level:
 - THD < 5% for 95% of the ten minutes average measurements of one week;
 - THD < 6% for 99,9% of the ten minutes average measurements of one week.
- Planning level:
 - THD < 3%, for 95% of the ten minutes average measurements of one week;
 - THD < 3,6%, for 99,9% of the ten minutes average measurements of one week.

1. The Connected Party and other Offshore PPM shall not exceed the harmonic emission limits as specified by TenneT.

Since, without detailed information of the Offshore Transmission System, it is not possible yet to define concrete and complete requirements with respect to the harmonic emission limits, the following approach on the definition of these requirements will be followed:

- a. TenneT specifies the maximum contribution of individual harmonic voltages to the THD of each 66 kV cable with turbines; TenneT will provide later the root loci of the applicable Offshore Transmission System's grid impedance at the Platform.
- b. The Connected Party shall deliver their offshore grid specifications and the contribution of the injected individual harmonic currents at the Connection Point as a percentage of the current of the connected rated power per 66 kV cable (95% and 99,9% percentile values). The Connected Party shall prove through calculation that it's Installation complies with the requirements. The Connected Party shall consult TenneT if compliance cannot be achieved without the installation of filter equipment. As part of this consultation the Connected Party shall specify the root loci for which compliance can be achieved without filters.
- c. An independent third party, to be assigned by TenneT, will perform an overall harmonic study to verify that the planning levels at the Platform are not exceeded. This study will investigate the harmonic behaviour of the grid including all connected Offshore PPMs to the Platform (including the Connected Party). All parties shall make the necessary information for these studies available and share it with the independent third party without restrictions, although based on a non-disclosure agreement. The study will be part of the compliance verification process
- d. After realisation of the Connection, as part of the compliance activities, the amplitude of the harmonic current injected by the WTG's at the Connection Point will be measured. Compliance shall be assessed by comparison of measured currents against the values guaranteed by the Connected

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Party during the design stage.

2. Regarding the responsibility for maintaining power quality:

- TenneT is responsible for undoing, at the onshore connection of the Platform to the onshore transmission system, the impact of the total Offshore Transmission System (export cabling and 66 kV cables) to the onshore transmission system for electricity with respect to the harmonic amplification;
- The design criteria for the Connected Party and the other Offshore PPM shall be based on the compliancy and planning levels of the THD at the 66 kV busbar.

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Annex 5 Compliance Activities; applicable testing requirements

Drafting note: this Annex 5 is based on the current applicable document SO-SOC 13-141, (version 3.0 Compliance Activities) which will be replaced by version 4 (planned to be published before December 1st, 2015). The new version 4 will contain the TenneT Requirements for testing as described in this Annex.

Scope

The document "Compliance activities", with reference SO-SOC 13-141, version 3.0 January 2014 applies to Connected Parties. [Drafting note: to be replaced by version 4.]

Introduction

The commissioning will be divided into two main consecutive activities. First the Site Acceptance Test (SAT) activities, followed by the compliance testing activities.

1. Site Acceptance Test (SAT) activities:

- Responsibility of the Connected Party and the Connected Party shall mitigate any risk that the energisation of its Installation jeopardises the Transmission System.
- SAT program of the Connected Party shall be approved by, and scheduled in cooperation with TenneT.

2. Compliance testing activities:

- as described in RfG, chapter 4 of Title IV "Compliance testing for offshore power park modules" apply, and
- are further detailed in Compliance activities in relation to Connection Requirements Wind Farms System Operations - Version V3.0 January 2014 - with the additions as noted below:

Notifications

- An Energisation Operational Notification (EON) issued by TenneT is needed before energizing the Connection, the windfarm grid and the windfarm auxiliaries (Offshore PPM).
- A first Interim Operational Notification (ION1) issued by TenneT is needed before taking in operation the first WTG below 60 MW capacity. No later than 3 months before connection of the first WTG, an intemised statement of compliance shall be issued by the Connected Party.
- A second Interim Operational Notification (ION2) issued by TenneT is needed after reaching 60 MW WTG-capacity. No later than 3 months after reaching WTG-capacity of 60 MW, an intemised statement of compliance shall be issued by the Connected Party.
- A Final Operational Notification (FON) issued by TenneT is needed after reaching full capacity. No later than 3 months after reaching full WTG capacity, an intemised statement of compliance shall be issued by Connected Party.

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In order to remain system stability TenneT is entitled to:

- o refuse to close the Connection in case of EON cannot be granted;
- o order to stop WTG production in case of ION1 cannot be granted ultimately 2 months before connection of the first WTG;
- o order to stop WTG production in case of ION2 cannot be granted ultimately 4 months after reaching WTG-capacity of 60 MW;
- o order to stop WTG production in case of FON cannot be granted ultimately 4 months after reaching full WTG capacity.

Further detailed commissioning planning

Because the Offshore PPM Installation will consist of several physical cable connections, which might be commissioned separately, a further detailed commissioning planning shall be agreed upon by the Parties. The SAT and commissioning could then be done per 66 kV cable with connected WTGs, where the requirements will be assessed proportionally in respect with the technical capabilities per connected 66 kV cable.

It is acknowledged by the Parties that necessary information for compliance testing activities shall be made available and shared without restrictions.

Applicable testing requirements

Furthermore, the TenneT document "Compliance activities in relation to Connection Requirements Wind Farms System Operations - Version V3.0 January 2014 –" should be read as follows:

Chapter 1 Scope

The activities shall be based on the requirements described in RfG, further detailed in Annex 4 of the REA. The requirements are to be called 'TenneT Requirements' ('TR'). The TenneT document "Wind farm Connection Requirements version 5.7" is not applicable.

Clause 3.2.2.2 bullet 4 and 5

- Test reports for short and long term operation during over and under frequency according to Article 24 RfG;
- Test reports for short and long term operation during over and under voltage according to Article 25 RfG;

Clause 3.2.2.2

The section "All in this section mentioned measurements and tests shall be performed and witnessed by an independent party" will not be applicable.

Clause 4.2

The reference to section 2.2 of the TR is replaced by the reference to Article 25 RfG.

Clause 4.3

The reference to section 2.3 of the TR is replaced by the reference to Article 25 RfG.

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Clause 4.4

The reference to section 2.4 of the TR is replaced by the reference to Article 25 RfG.

Clause 4.5

The reference to section 2.5 of the TR is replaced by the reference to Article 25 RfG.

Clause 4.6

The reference to section 2.6 of the TR is replaced by the reference to Article 26 RfG.

Clause 4.7

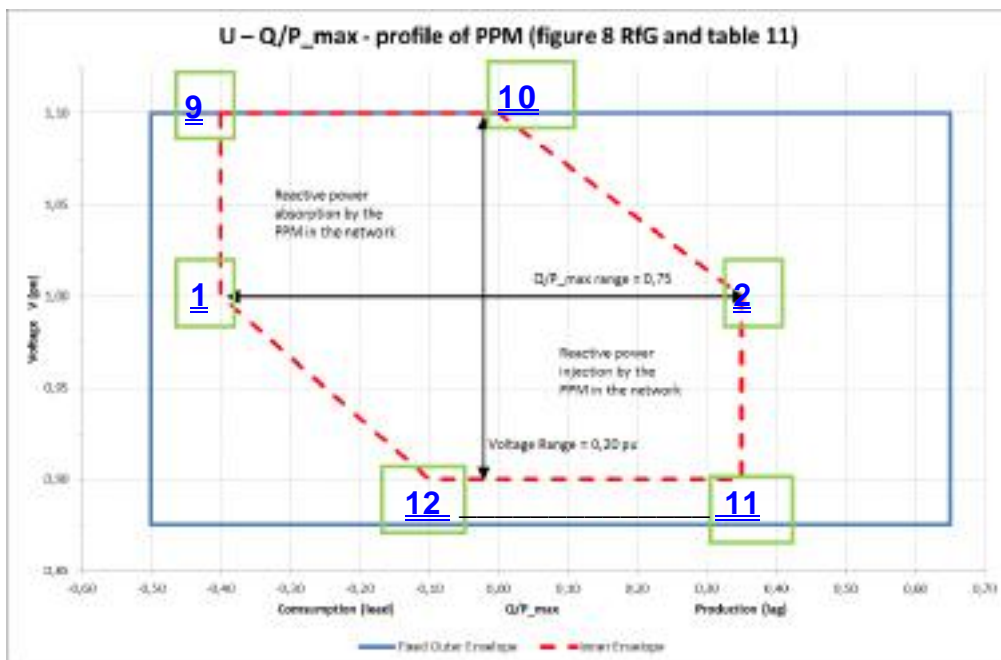
The reference to section 3.1 of the TR is replaced by the reference to Article 24 RfG.

Clause 4.8

The reference to section 3.2 of the TR is replaced by the reference to Article 24 RfG.

Clause 5.1.1

The reference to section 2.5 and 2.6 of the TR is replaced by the reference to Articles 25 and 26 RfG.



Clause 5.2

Figure 1 shall be replaced by the applicable figures 'c' and 'd' of Annex 4 of the Realisation Agreement.

Figure 'c'

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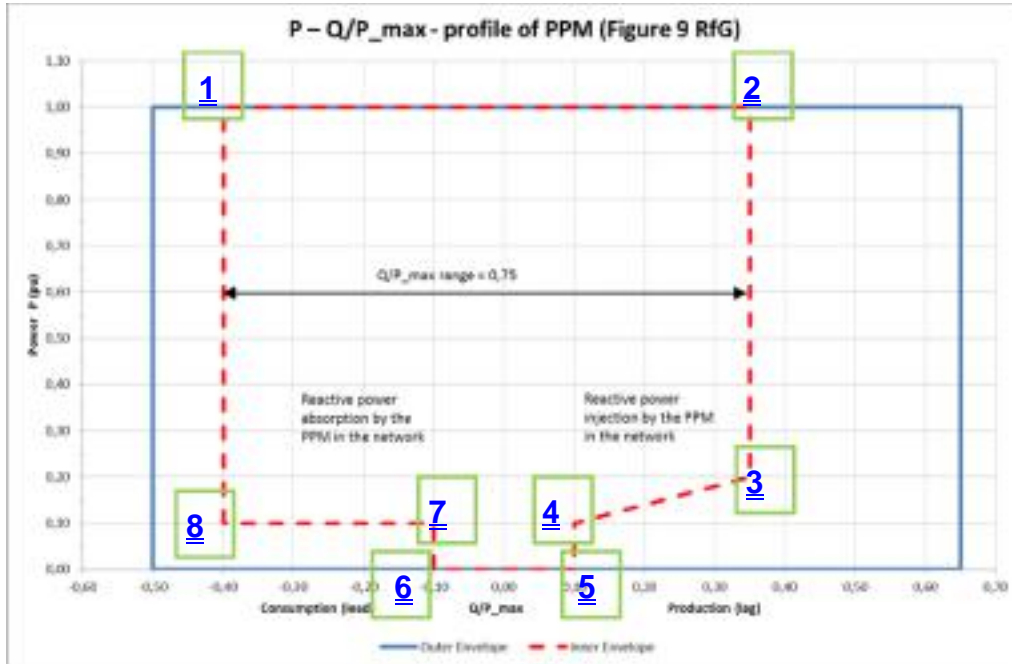


Figure 'd'.

First bullet "Procedure", the text shall be replaced by:

- Load flow calculations shall reproduce the in Table 2 mentioned scenarios at the Connection Point considering the reactive power capability of the WTGs. Table 2 visualizes this calculations cases referring to P - Q/Pmax profile and V - Q/Pmax according to Article 25 RfG.

Table 2 shall be replaced by:

<u>Calculation case</u>	<u>U</u>	<u>P</u>	<u>Q</u>	<u>Reference</u>
<u>1</u>	<u>100%</u>	<u>100% Pmax</u>	<u>Q/Pmax=-0.4</u>	<u>Article 25</u> <u>(P - Q/Pmax profile)</u>
<u>2</u>	<u>100%</u>	<u>100% Pmax</u>	<u>Q/Pmax=0.35</u>	<u>Article 25</u> <u>(P - Q/Pmax profile)</u>
<u>3</u>	<u>100%</u>	<u>20% Pmax</u>	<u>Q/Pmax=0.35</u>	<u>Article 25</u> <u>(P - Q/Pmax profile)</u>
<u>4</u>	<u>100%</u>	<u>10% Pmax</u>	<u>Q/Pmax=0.10</u>	<u>Article 25</u> <u>(P - Q/Pmax profile)</u>
<u>5</u>	<u>100%</u>	<u>0</u>	<u>Q/Pmax=0.10</u>	<u>Article 25</u> <u>(P - Q/Pmax profile)</u>
<u>6</u>	<u>100%</u>	<u>0</u>	<u>Q/Pmax=-0.10</u>	<u>Article 25</u> <u>(P - Q/Pmax profile)</u>

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<u>7</u>	<u>100%</u>	<u>10% Pmax</u>	<u>Q/Pmax=-0.10</u>	<u>Article 25</u> <u>(P - Q/Pmax profile)</u>
<u>8</u>	<u>100%</u>	<u>10% Pmax</u>	<u>Q/Pmax=-0.10</u>	<u>Article 25</u> <u>(P - Q/Pmax profile)</u>
<u>9</u>	<u>110%</u>	<u>100% Pmax</u>	<u>Q/Pmax=-0.40</u>	<u>Article 25</u> <u>(V - Q/Pmax profile)</u>
<u>10</u>	<u>110%</u>	<u>100% Pmax</u>	<u>Q/Pmax=0</u>	<u>Article 25</u> <u>(V - Q/Pmax profile)</u>
<u>11</u>	<u>90%</u>	<u>100% Pmax</u>	<u>Q/Pmax=0,35</u>	<u>Article 25</u> <u>(V - Q/Pmax profile)</u>
<u>12</u>	<u>90%</u>	<u>100% Pmax</u>	<u>Q/Pmax=-0,10</u>	<u>Article 25</u> <u>(V - Q/Pmax profile)</u>
<u>13</u>	<u>80%</u>	<u>100% Pmax</u>	<u>open</u>	<u>Article 24</u>
<u>14</u>	<u>115 %</u>	<u>100% Pmax</u>	<u>open</u>	<u>Article 24</u>

First bullet "Evaluation Criteria", text is replaced by:

- Requirements as specified in Article 50 RfG including the following issues:

Clause 5.3

Text "section 2.5 of the TR" is replaced by "Article 25 RfG"

Text "section 2.6 of the TR" is replaced by "Article 26 RfG"

Clause 5.4

"Procedure", text is replaced by:

- Starting point for the following 4 tests is normal operation. This means the unit is in steady state operation with a power factor at the Connection Point as determined by TenneT.
- The set-point of reactive power control mode may be adjusted locally in the park-controller in case no remote control available.
- While executing the tests, the active power output of the wind park shall be more than 20% Pmax.
- Tests shall be executed by step-changing the set-point in both directions in full range until one of the following restrictions applies
 - min. or max. set-point position is reached
 - max. absorbed or injected reactive power is reached according to P - Q/Pmax and V - Q/Pmax profiles in Articles 24 and 25 RfG.
 - one of the operational limits of the Transmission System is reached. This restriction needs to be determined in advance and real time by TenneT. Usually an operated voltage range of 95-105% of rated voltage applies.
- Max. and min. reached set-point shall be maintained for at least 10 minutes.
- Voltage control mode:
 - Voltage set point shall be step-wise changed by 1% steps in both directions until one of above mentioned restrictions applies;

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- Q_{ref} set point be step-wise changed by 1% steps in both directions until one of above mentioned restrictions applies.
- ⋮ Power factor control mode:
 - Power factor set point shall be step-wise changed by 0.01 steps in both directions until one of above mentioned restrictions applies.
- ⋮ Reactive power control mode:
 - Reactive power set point shall be step-wise changed by 10% steps in both directions until one of above mentioned restrictions applies.

"Evaluation Criteria"

Text "section 2.4 of the TR" shall be replaced by "Article 25 RfG"

Clause 5.4

First bullet "**Procedure**"

Text "reactive power injection" shall be replaced by "park in Voltage Control Mode, Q_{ref} = 0 Mvar"

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[Connected Party]

Annex 6 Operational arrangements and exchange of information

General note

In this Annex the Parties capture data in good cooperation. This will take place in the bilateral consultations after the tender and prior to concluding the aAgreements.

~~This Annex will be completed with the outcome of the technical consultation on on Access to platform, installation interface management and O&M interface management.~~

1. Scope

This Annex 7 describes the operational arrangements agreed between Connected Party and TenneT. The following details are specified:

- a. The contact persons of the two Parties,
- b. The content of the operational arrangements,
- c. The procedure for resolving failures, and
- d. The exchange of information.

2. Contact details

2.1 Contact details for operational matters

Operations

Operations at Connected Party will be performed by*:

Organisation:

Location:

Person responsible:

Telephone:

Fax:

E-mail:

Operations at TenneT will be performed by the following National Control Centre (NCC):

Arnhem for voltages of 380/220 kV

Telephone: +31 26 373 12 41; fax: +31 26 445 26 97; e-mail:@tennet.eu

* If the Connected Party outsources operational management to a third party, this third party will act as the contact person on behalf of the Connected Party.

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[Connected Party]

2.2 Contact details for planning the availability of the TenneT transmission grid

Planned Unavailability

On working days, [Name of Connected Party]'s contact person for matters concerning Planned Unavailability within the meaning of Article 6 of the General Terms and Conditions will be:

Organisation: _____

Location: _____

Person responsible: _____

Telephone: _____

Fax: _____

E-mail: _____

On working days, TenneT's Operational Support department (Planned Unavailability group) can be reached in the following ways:

Telephone: +31 26 373 17 61

Fax: +31 26 373 24 53

E-mail: groepvnb@tennet.eu

2.3 Changes to contact details

~~Changes to details~~

[Name of Connected Party] shall ensure that changes to contact details are notified to TenneT by:

Organisation: _____

Location: _____

Person responsible: _____

Telephone: _____

Fax: _____

E-mail: _____

Correspondence address: _____

The TenneT Customer Relationship Manager will be responsible for changing the contact details:

Name: _____

Telephone: +31 26 373

E-mail: ...@tennet.eu

Correspondence address: _____

Signed for approval:

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[Connected Party]

TenneT TSO B.V.

Customers & Markets department

Postbus 718

[NL-6800 AS Arnhem](#)

Signed for approval:

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[Connected Party]

~~NL-6800-AS Arnhem~~

3. Content of arrangements

3.1 Access to ~~offshore substation~~ the Platform

TenneT will allow access for ~~[Name-of-the~~ Connected Party] representative(s) to the ~~offshore substation~~ Platform without accompaniment. Only specific rooms (general room and the equipment room of ~~[Name-of-the~~ Connected Party]) will be accessible. This will be done under safety and operational regulations and requirements, as determined by TenneT. All persons requesting access to the Platform minimally need to be qualified for accessing high voltage premises.

In case ~~[Name-of-the~~ Connected Party] requires access to other areas (e.g. switchgear rooms where ~~inter-array~~ 66 kV cables are connected, own equipment installed elsewhere on the Platform or shared services devices), accompaniment by (a) TenneT representative(s) is required. TenneT and ~~[Name-of-the~~ Connected Party] ~~will~~ shall make operational agreements regarding response time of accompanying staff.

Boat landing and Walk to Work (W2W) solutions are the standard access method. The Platform will be equipped with a hoisting facility. In case of emergency response and if allowed by authorities, helicopter hoisting will be used.

3.2 ~~Control-work~~ Installation Interface Management

~~Control-work must be performed in conformity with relevant (international) standards and guidelines and falls under the operational decision-making authority of the operational managers of each Party. As a basic principle, each Party shall control the components that fall under its responsibility in accordance with the arrangements agreed for the Connection Point (see **Fout! Verwijzingsbron niet gevonden.**). Any exceptions to these arrangements are stated in the table below.~~

~~Component~~

~~Control~~

~~Responsibilit~~

TenneT will manage interfaces by involving the selected Connected Party as early in the project as possible and to define clear roles for major interfaces. The following main technical interfaces have been identified:

1. 66 kV cable route starting at the entry of the platform safety zone (500m) up to the 66 kV switchgear;
2. 66 kV switchgear at the Platform;
3. telecommunication and fibre optic infrastructure;

4. Connected Party's equipment located on TenneT infrastructure (offshore and onshore).

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Each technical interface and the associated sub interfaces are defined in the next paragraphs. For each sub interface a functional role is assigned to TenneT and to the Connected Party. One of the parties (mainly TenneT) will have the responsible (R) and accountable (A) role whereas the other party (Connected Party) will have either a supportive (S), consulting (C) or informative (I) role. The responsible Party may transfer the 'responsible' part of the interface (execution) to a third party (contractor). Further details of these interfaces shall be determined in mutual agreement between the Connected Party and TenneT.

3.2.1 66 kV cable route from platform safety zone up to the 66 kV switchgear

In the table below, high level interfaces for the 66 kV cable route from entry of the platform safety zone (500 m) up to the 66 kV switchgear are listed with for each interface the role of the two main stakeholders.

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[Connected Party]

High level interfaces on 66 kV cable route from platform safety zone up to the 66 kV switchgear

Interface

Design: Cable field layout in the direct vicinity of the platform (< 500 m)

Design: Cable approach from burial to J-tube including scour protection and cable protection system

Design: Scour protection of the jacket (if applicable)

Design: J-tube with a bell mouth

Design: Cable hang-offs

Design: Cable route from hang-off to 66 kV switchgear

Design: Cable pull-in methodology (basic design/philosophy)

Design: Cable pull-in method (detailed design)

Construction & installation of the platform

Procurement of HV Cable trays

Procurement of Cable specific items (terminals, cable termination, etc.)

Installation: 66kV Cable pull-in and routing works

Installation: 66kV Cable termination and connection works

Cable testing

Energising of cable

¹ The cable field layout shall be approved by TenneT.

² Accountable here means: the Connected Party will give clearance to TenneT to energise the cable.

Design

Design of the cable pulling methodology (basic design/philosophy) will take into account the following factors:

- dimensioning and load restrictions (e.g. J-tubes);
- locations for winches;
- temporary storage area + facilities (scaffolding) on the cable deck in case the cables are stored before the topside is installed on top;
- working area on the cable deck for cable works;
- pull-in and routing of cables up to the 66 kV switchgear without joints or junction boxes on the cable deck.

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[Connected Party]

TenneT	C.P
A ⁽¹⁾	R
C	R / A
R / A	C
R / A	C
C	R / A
R / A	C
R / A	C
C	R / A
R / A	I
R / A	I
	R / A
S	R / A
S	R / A
C	R / A
R	A ⁽²⁾

Based on the generic cable pulling methodology, the Connected Party shall consult TenneT on detailed design for the cable pulling and installation method. With respect to the J-tubes, they have a fixed position on

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jacket which is determined in the basic design. The angle of the J-tube may however be (slightly) adapted as long as there are no conflicts with neighbouring cables or J-tubes. TenneT has to be consulted in this design process and has to approve the method.

Procurement for items of the 66kV Cable route

TenneT will, after detailed design by the Connected Party, procure the cable trays for the main cable route. All components which are cable specific (eg; terminals, wall penetrations, etc) will be procured by the Connected Party.

Installation of 66 kV Cables

The Connected Party is responsible for installation of cable protection (if applicable), the actual cable pull-in, cable storage (if any), J-Tube pigging (adjustment of the J-tube bell mouth angle will be very limited), cable routing, cable fastening and termination works making use of equipment such as pulling winch, hang-offs, pull-in wire, etc.

TenneT will facilitate these activities of the Connected Party with regards to the Platform structure itself. The Connected Party will get the possibility to install pull-in equipment on the Platform while it is under construction onshore.

Testing and commissioning of 66 kV cables

After installation, the Connected Party shall be responsible for testing of the 66 kV cables, including HV tests, phase checks, sheath testing and OTDR tests on optical fibres.

For commissioning of the 66 kV cables, TenneT will be responsible for energising of the 66 kV cables and TenneT will execute actual switching operation, after clearance is given by the Connected Party. For the testing and commissioning phase agreements shall be made between TenneT and the Connected Party including agreements on installation responsibility (nominated person¹) and LOTO (Lock-out, Tag-out) principles.

Depending on the testing equipment needed, the equipment may be placed in vicinity of the GIS equipment or on the top deck of the Platform. The Connected Party may need HV cables and terminations to connect the test equipment to the 66 kV cable bay.

3.2.2 66 kV switchgear (feeder bays for 66 kV cables of the Connected Party)

In the table below, high level interfaces for the 66 kV switchgear (feeder bays for 66 kV cables of the Connected Party) are listed with for each interface the role of the two main stakeholders.

¹ Nominated person: the person responsible for the electrical safety of an electrical system. In Dutch: "installatieverantwoordelijke".

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High level interfaces on 66 kV switchgear (feeder bays for 66 kV cables of the Connected Party)

<u>Interface</u>	<u>TenneT</u>	<u>CP</u>
<u>Design: 66kV GIS</u>	<u>R/A</u>	<u>!</u>
<u>Design: switchgear control</u>	<u>R/A</u>	<u>!</u>
<u>Design: protection of 66 kV feeder bays</u>	<u>R/A</u>	<u>C</u>
<u>Installation of switchgear on platform (+ P&C cabinets)</u>		<u>=</u>

Design / installation on to the platform

TenneT intends to include the following cable termination in the 66 kV switchgear (only GIS part) which is designed according to IEC 62271-209: Pfisterer HV-CONNEX, Size 4.

The Connected Party shall align the accessories and (type) testing of its 66 kV cables on these specifications. Aspects on which the Connected Party will be consulted during the design phase of the 66 kV switchgear protection system are:

- Type of protection relay(s) for the 66 kV feeder bays;
- Protection relay settings for the 66 kV feeder bays;

Testing and commissioning

For testing and commissioning of the 66 kV cables is referred to Annex 5.

3.2.3 Telecommunication and fibre optic infrastructure

In the table below, high level interfaces for the telecommunication and fibre optic infrastructure (for use of the Connected Party) are listed with for each interface the role of the two main stakeholders.

High level interfaces on the telecommunication and fibre optic infrastructure (for use of the Connected Party)

<u>Interface</u>	<u>TenneT</u>	<u>C P</u>
<u>Design & installation: Fibre optic infrastructure of the grid connection system</u>	<u>R/A</u>	<u>C</u>
<u>Design & installation: routing and termination of inter-array FO cable in splice box</u>	<u>C</u>	<u>R/A</u>
<u>Design & installation: Interface to other equipment of TenneT</u>	<u>R/A</u>	<u>!</u>

Fibre optic infrastructure design and installation

In the design phase, TenneT will define requirements, location of patch panels and fibre optic cabling within the Platform.

The Connected Party shall provide all necessary design input including number and specification of fibre

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optic cables from 66 kV cables of the Connected Party. Special attention shall be given to the location of the first splice boxes where fibre optic cables from 66 KV cables of the Connected Party will be terminated and connected to fibre optic platform cables.

During the design phase, agreements shall be made on interface management of the installation phase (checks by the Connected Party) and testing phase.

3.2.4 Connected Party's equipment located on TenneT infrastructure (offshore and onshore)

The Connected Party can freely design the equipment to be installed in the designated rooms as long as general requirements and boundary conditions applicable to these rooms are followed (weight / size limits, climate conditions, power supply etc).

In the case equipment of the Connected Party is to be placed outside of the designated room (including connection from this equipment to the designated room), the Connected Party shall inform TenneT on these requirements in the early design stage and agreements on this equipment shall be made between TenneT and the Connected Party.

With regards to installation of equipment in the designated rooms, agreements shall be made on starting date and (ultimate) date of completion of the Connected Party's installation works.

Designated room for the Connected Party in onshore station

In the table below, high level interfaces for the equipment of the Connected Party in the designated room in the onshore substation are listed with for each interface the role of the two main stakeholders.

High level interfaces on the Connected Party's equipment in the designated room on the onshore substation

<u>Interface</u>	<u>TenneT</u>	<u>Connected Party</u>
<u>Design: TenneT auxiliary services for the designated room</u>	<u>R/A</u>	<u>C / I</u>
<u>Design: Connected Party's equipment inside designated room</u>	<u>I</u>	<u>R / A</u>
<u>Construction: TenneT auxiliary services for the designated room</u>	<u>R/A</u>	<u>I</u>
<u>Construction: installation of Connected Party's equipment in the designated room</u>	<u>S</u>	<u>R / A</u>

Designated room for the Connected Party at the Platform

In the table below, high level interfaces for the equipment of the Connected Party in the designated room on the Platform are listed with for each interface the role of the two main stakeholders.

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[Connected Party]

XXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXX XXX	XXXXXXXXXXXXXXXXXX *	XXXXXXXXXXXXXXXXXXXX TenneT TSO B.V. DATE N
XXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX

3.3 Switching procedures

High level interfaces on the Connected Party's equipment in the designated room on the platform

<u>Interface</u>	<u>TenneT</u>	<u>CP</u>
<u>Design: TenneT auxiliary services for the designated room</u>	<u>R/A</u>	<u>C / I</u>
<u>Design: Connected Party's equipment inside designated room</u>	<u>R / A</u>	<u>R / A</u>
<u>Construction: TenneT auxiliary services for the designated room</u>	<u>S</u>	<u>C / I</u>
<u>Construction: installation of Connected Party's equipment in the designated room</u>		<u>R / A</u>
<u>Construction: installation of Connected Party's equipment on other locations</u>	<u>S</u>	<u>R / A</u>

All permanent equipment of the Connected Party for the designated room on the Platform must be installed when the Platform is in the construction yard, i.e. before load out. Configuration / programming works, interface tests and inspections by the Connected Party shall be done in the construction yard as far as possible. The construction yard may be located outside of Europe. If installation works need to be planned after offshore installation of the topside, the Connected Party shall inform TenneT as soon as possible.

Commissioning

The Connected Party shall be responsible and accountable for all testing and commissioning activities related to the Connected Party's equipment on TenneT's infrastructure.

TenneT will support the Connected Party during testing and commissioning with regards to the services provided by TenneT (66 kV GIS switching actions, auxiliary services to designated rooms, shared data acquisition systems, optical fibres).

3.2.5 Coordination during offshore works

TenneT will be responsible (R) and accountable (A) for the Platform and therefore for planning, coordination and safety rules, where the Connected Party will be supportive (S). To manage planning, coordination and safety properly, TenneT will provide work permits for offshore works within the safety zone (500 m) of the Platform and for all works on the Platform.

The Connected Party will support TenneT with this coordination by correct and on-time application for work permits and by participating in all planning, interface and progress meetings to be scheduled for this purpose.

TenneT will define the method for (emergency) communication within the project site (platform safety zone and the Platform itself).

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Further agreements between TenneT and the Connected Party on marine coordination and coordination of works on the Platform shall be made in a later phase.

3.2.6 Document management

Exchange of documents and formal communication between the Parties shall be through a single document management system, to be selected by TenneT.

3.3 Operations & Maintenance (O&M) interface

The major O&M interface categories are described below. Further details of these interfaces will be worked out in cooperation with the parties connected to the Platform (during the construction phase).

Identified operational interfaces

- Logistics/transport to the Platform
- Logistics/transport from the Platform
- Work permitting process
- Installation responsibility / Work responsibility / designated persons
- Access to the Platform for the SCADA controls system
- Communications regarding activities around the Platform
- Switching activities by TenneT on behalf of the Connected Party
- Operations of grid connection
- Power interruptions due to failures on the Platform or in the 66kV Connection

Identified maintenance interfaces:

- Maintenance of the 220 kV equipment
- Maintenance 66 kV inter-array cables Connected Party and 66 kV equipment TenneT (including protection control)
- Maintenance equipment Connected Party on the Platform
- Maintenance combined equipment on the Platform
- Metering activities (calibrations)

3.4 Switching procedures

Supplemental to relevant (international) standards and guidelines, a specific switching procedure may be in place that the Parties must follow to assure safety, continuity, etc. If this situation occurs, it is detailed in the table below.

Switching procedure (brief description)

Annex

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[Connected Party]



DATE

TenneT TSO B.V.
~~October~~
8 November 4, 2015
~~25~~39 of

4.4

	4.1
	4.2
	4.3
	4.4

Part of the procedures will be the fault location for isolating the Connected Party ~~strings is~~ 66 kV cables is the Connected Party's responsibility. TenneT will execute the incorporated switching activity upon notification by the Connected Party.

Arrangements for tag out and lock out will be made in mutual agreement to place locks at the bays in relation

to isolation and earthing of the ~~string~~ 66 kV cables in order to assure that safe working can be executed in accordance with the relevant (international) standards and guidelines.

4. Resolution of failures

For the purposes of this Annex ~~7~~, a failure is defined as an unscheduled interruption or restriction of electricity transmission, including but not confined to a voltage management disruption (such as voltage dips and transients).

4.1 Duty to provide information on failures

As soon as a failure occurs, the Parties shall inform each other as comprehensively and as quickly as possible to allow them to act effectively. The information provided must in any event include the volume of switched-off capacity and the estimated resolution time of the failure.

Subsequently, the Parties shall on request provide each other with information from which the (probable) cause of the problem can be determined, and shall state the actions taken to resolve the failure as well as the measures that will be taken to prevent a recurrence.

4.2 Major incidents and protection and restoration plan

TenneT shall coordinate the response to a major incident affecting the security of supply. For this purpose, TenneT may execute a switch-off. ~~{Name-of-The~~ Connected Party} must then take care that the requested amount of power is shut down in accordance with instruction of TenneT. This instruction will be provided from TenneT's National Control Centre by telephone to the contact listed in 2.1. At its request, TenneT will confirm the instruction in writing provided by telephone to ~~{name-of-the~~ Connected Party}.

~~{Name-of-The~~ Connected Party} may request TenneT to switch off all or part of the Connection if it is affected by a major incident. This must be done to control the incident or to prevent damage to the

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managed Installation, the Connection, or the ~~grid~~[Transmission System](#). TenneT shall respond to such request unless it cannot reasonably be expected to do so.

4.3 Crisis centre

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4.3 Crisis centre

In the event of a major incident, ~~[Name of the~~ Connected Party] may opt to have a crisis centre handle communications. ~~[Name of The~~ Connected Party] shall indicate when the crisis centre is to take over handling communications. The details of ~~[Name of the~~ Connected Party]'s crisis centre are stated below.

~~[Name of Connected Party]~~'s crisis team

[Name of Connected Party] has designated a crisis team to handle major incidents. The contact details of this team are as follows.

Organisation:

Location:

Person responsible:

Telephone:

Fax:

E-mail:

5. Exchange of information

The Parties shall provide each other with the information that by reasonable standards may be relevant to the operation of ~~TenneT's grid~~ the Offshore Transmission System (including the Connection and the Platform) and the onshore transmission system and the operation of the Installation of ~~[Name of the~~ Connected Party].

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[Connected Party]

Annex 7 Insurance

General note

The topic of Insurance will be discussed during the legal consultation on 16 October 2015.

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[Connected]

Annex 87 Tariff sheet

General note

Following the annual regulatory tariff decision by the Dutch regulator ACM, TenneT will send the Connected Party a so-called 'tariff letter' which includes:

- Tariff sheet ('Tarievenblad');
- Explanatory notes to the fees and tariffs of TenneT, and
- Explanatory notes on the tariff decision.

For consultation purposes only, please find below an example of a tariff sheet (in Dutch only).



TARIFVENBLAD 2014

Gegevens aansluiting

Naam aansluiting Offshore Platform X

Adres aansluiting

Factuurgegevens klant

Facturatiernaam

DWF G.V.

T.a.v.

T.a.v. Crediteurenadministratie

Factuuradres

Postbus

Postcode Woonplaats

Debiteurennummer

TE.....

Uw betalingskenmerk

Tariefcategorie EHS (220 kV - 380 kV)

Bedrijfstijd Groter dan 600 uur

EAN-code

Volumecorrectiefactor

0 %

Tarieven*
Transportdienst
kW-gecorr. 220-380 kV (> 600u)
kW-max mind 220-380 kV (> 600u)
Vastrecht transportdienst 220-380 kV
Meeldienst
Meeluur
Meeldienst

* Dit tarievenblad geeft tevens indicatie van de tarieven voor aansluitingen op het Extra Hoogspanningsnet. Dit wil niet zeggen dat de hier genoemde aansluit-, transport- en meeldiensten ook zullen gelden voor aansluitingen op een transmissiesysteem op o.a. hiervoor zijn voorafgaand geen tariefstructuren voorzien.
 *) De hoeveelheden voor kW-max wordt op basis van meetwaarden vastgesteld.
 **) Het maandelijks is (v.m. afdeling-overbrengen) indicatief weergegeven.

Wij verzoeken u dit tarievenblad zorgvuldig te bewaren bij uw aansluit- en transportovereenkomst en de bijhorende toelichting door te lezen.

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[Connected Party]

Summary report:	
Litéra® Change-Pro TDC 7.5.0.125 Document comparison done on 4-11-2015 16:54:51	
Style name: De Brauw Default Style	
Intelligent Table Comparison: Active	
Original filename: Annexes to CTA_Offshore OUD.pdf	
Modified filename: Annexes to CTA_Offshore NIEUW.pdf	
Changes:	
<u>Add</u>	672
Delete	344
Move From	1
<u>Move To</u>	1
<u>Table Insert</u>	35
Table Delete	17
<u>Table moves to</u>	0
Table moves from	0
Embedded Graphics (Visio, ChemDraw, Images etc.)	4
Embedded Excel	0
Format changes	0
Total Changes:	1074