

STAKE HOLDER CONSULTATION PROCESS OFFSHORE GRID NL

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QUALITY CONTROL

Prepared:	TenneT team	
Reviewed:	M. Müller	30.10.2015
Approved:	F. Wester	02.11.2015
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1. Background material

Literature used:

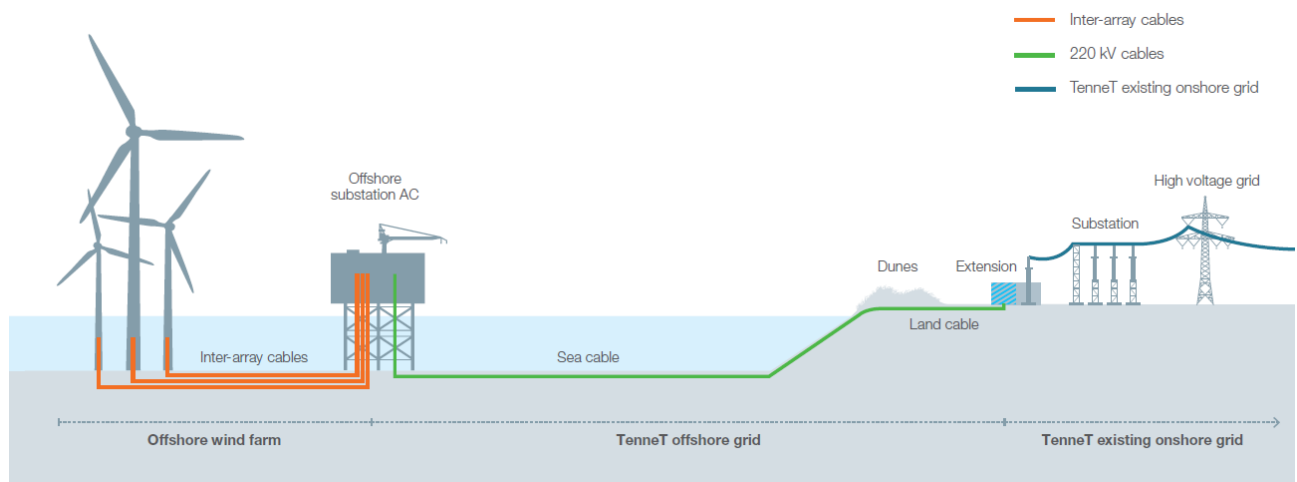
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2. Scope and considerations

The picture below shows a schematic cross section of the connection of an offshore wind farm to the onshore electricity grid. Wind turbines are connected through “inter-array” cables (in orange) to the offshore Connection Point (CP)¹ at the offshore substation, from which electricity is transported to shore. TenneT is responsible for the grid connection up to, and including, the offshore substation and will take care for the supply and installation.

The wind park, including the wind turbines and the array cables, up to the offshore CP at the switchgear installation on the offshore substation of TenneT, is to be supplied and installed by the wind park owner (WPO²).

TenneT intends to standardise the offshore transmission grid as much as possible for all five wind areas to be realised in the coming years in line with the Energy Agreement.



Schematic overview of the offshore electrical grid. Source: TenneT

¹ The connection point (CP) between the offshore power park module (PPM) and TenneT is specified [TenneT position paper ONL 15-061 T.3 Point of Common Coupling] at the cable termination of the inter-array cables and the switchgear installation on the platform.

² Wind park owner: owner of the Power Park Module (TenneT, position paper ONL 15-079 T.5 Operation of Bays)

This position paper describes the interface between the wind park owners including its contractors (one WPO per offshore platform up to a maximum of three³) and TenneT including its contractors, during the operational and maintenance phase. In this position paper the O&M interfaces will be listed and generally described where only on major interface items roles will be defined. The further detailing of the interfaces including detailed interface matrices will be made in later phases in mutual agreement between TenneT and the WPOs.

2.1 General interface management

For the different main O&M interfaces, functional roles are applicable for TenneT as well as the WPOs. For organizational interfaces the RASCI model will be used to define the roles and responsibilities between parties. In general one of the parties (mainly TenneT) will have the responsible (R) and accountable (A) role where the other party (WPO's) will have either a supportive (S), consulting (C) or informative (I) role.

Exchange of documents and formal communication between the parties shall be through a single document management system. As TenneT is the central party for all 10 connections, TenneT will have the responsible / accountable role, TenneT will select this system.

2.2 Operational Interfaces

2.2.1 Logistics/transport to platform

Logistics and transportation to the platform is a point of attention. Not only for combining transportation between the different parties, but also communication around the shipping activities, and for heli hoisting in emergency cases.

Therefore we will have a work permit process in place, including a work permit system decided by TenneT. In this process requests are placed and planned upfront. A thorough planning for work activities and planning of logistics is required to enable efficiency.

2.2.2 Access to platform

In position paper "ONL 15-131 T4 Access to platform", it is agreed that the WPO's can access the platform unaccompanied, and have access to their specific rooms.

For the unaccompanied access, the WPO staff (or WPO or contractors staff) will still have to fulfil the safety requirements of TenneT. As a minimum offshore requirements, HSE safety induction and a qualification of electrical educated person is required to pass high voltage cables on the cable deck. The WPO is responsible for the safety induction and the training of their (contractor) staff. The same is valid for the land station, although TenneT will physically separate the entries to the WPO rooms from the TenneT land

³ In case of test field for wind turbines.

station. The HSE checks will be performed by TenneT.

If access is required to other rooms (e.g. high voltage switchgear rooms), TenneT staff will accompany the WPO staff. The WPO needs to align and plan the staffing of TenneT.

2.2.3 Work permitting process

In the work permitting process, the offshore work activities will be planned and prepared. The TenneT work permitting system will be applicable. In the accompanying documents (format by TenneT), the content of the work activity, the method statement and a risk assessment are described. Also an approval / review procedure of the work permit should be described.

2.2.4 Installation responsibility / Work responsibility / designated person

Regarding the different activities of all parties, related to the inter-array grid and the platform, both parties will have to assign a nominated person (installation responsible). For the working activities different roles, should be assigned. Processes (e.g. registration), protocols (e.g. switching activities, work permits) and standards to apply to should be worked out in more detail. As a starting point the TenneT customers processes, protocols and standards (which are already in place) can be applied.

The above does count for TenneT and the WPO's, but also for the other parties on the platform or the land station.

2.2.5 Access to the SCADA control systems

TenneT will provide access to the controls room for the WPO SCADA systems, network patch panels etc. This access will not be accompanied but organized by TenneT. Therefore a work permit procedure will be used, describing the required access (including key protocol) in which rooms at the platform and for what work activity (work at the fibre optic networks for instance). TenneT requires offshore staff to be qualified and sufficiently educated to pass the cable deck of the platform.

2.2.6 Communications regarding activities around platform

As the platform is a central haven in the wind area, it can be used as the platform for communications with e.g. marifone or 4G. Central coordination can be very welcome.

2.2.7 Switching activities by TenneT for WPO

As is agreed on in position paper T5, the switching activities of the 66kV switchgear will be executed by TenneT for the WPO's. Regarding the switching activities, appointments will be made between TenneT and the customers, including the protocols. Again, the standard protocol for customer connections can be applied as a starting point. Additional points can be response time of TenneT staff. The switching plans for overlapping activities should be aligned.

Therefore a working procedure will be made and brought into place. This procedure will minimal consists of work request by the WPO for remote switching in the bay of the 66kV switchgear. The work execution will be

done by a work responsible of TenneT and the WPO. If for instance isolation of a 66kV bay is required a tag out lock out procedure will be executed and locks will be placed at the bay. After that the work responsibility for that bay and cable string will be transferred to the work responsible of the WPO's. This will be formalized by a document.

In case of an emergency actions however when something is noticed by the WPO, the WPO can switch off immediately informing TenneT asap. Regarding the switching activities, appointments will be made between TenneT and the customers, including the protocols. Again, the currently applied protocol for customer connections can be applied as a starting point.

2.2.8 Operations of grid connection

In case of abnormal situations in the grid connection, TenneT needs to act together with the PPM/WPOs. In case of overloading of the export cable, curtailing of the wind production should take place, as overloading is not guaranteed, T11 Overplanting. General agreement is that both wind parks have a guaranteed production capacity of 350MW.

In practice this means that TenneT will provide insight in the cable temperature and gives warning signals when temperature is increasing as a sign for curtailing. When the maximum temperature is reached, the WPO's are obliged to curtail down to 350MW. If the WPO does not fulfil to curtail, TenneT will have the right to interfere. Exact appointments need to be agreed on how to curtail, regarding the moment of action and the amount for each connected party.

2.2.9 Power interruptions due to failures on the platform or in the 66kV grid

In case of a failure in the 66kV switchgear or protection equipment, a string of the PPM could be interrupted. This could imply reaction of TenneT for repair activities on the platform, or to assist the PPM with their activities on the platform. For these situations, different points need to be agreed on, as switching protocols, response times and communication.

2.3 Maintenance interface

2.3.1 Maintenance on 220kV equipment

The maintenance activities on the grid connections to shore will be planned during low wind times. To maintain one of the connection systems (onshore or offshore) from one platform, the connected PPM's will be transporting via the second export cable. This would result in no power generation losses. The connected PPM's will be notified of these activities, including the up-front planning of these activities.

2.3.2 Maintenance 66kV inter-array + 66kV equipment TenneT (including protection control)

At 66kV level, maintenance activities of TenneT and WPO can be combined, so the outage time for

maintenance is as short as possible. Therefore it would be good to inform each other of the planning of activities as much as possible. E.g. when a PPM is planning to disconnect an inter-array string, TenneT could adapt their planning for maintenance on the 66kV switchgear or protection. Or the other way around. This cooperation would result in a higher availability of the grid.

For this information exchange and the adaption time, appointments should be set-up in the way of working and communication. Also in this way, logistics to the platform and wind areas could be combined.

2.3.3 Maintenance combined equipment on the platform

For the combined equipment on the platform, TenneT will be responsible to maintain or replace this equipment. The PPM's should be informed of all the activities which can be planned up front. Scheduling of activities should not be a surprise. Way of notification in line with 2.3.2.

2.3.4 Metering activities (calibrations)

As described in position paper T6 Metering, TenneT and the PPM's have agreed on the possibility of TenneT organising the contracting of a party for the offshore activities regarding accountable metering.

2.4 Responsibilities and roles in different processes

For the different points above, more detailed working out of processes, protocols and standards are necessary, based on the currently applied agreements. For this, TenneT has the opinion that this should be worked out in close cooperation with the connected parties. Therefore TenneT will do this in close cooperation with the connected parties for Borssele Alpha, which will be known medium 2016. The Borssele Alpha connection should be operational in 2019. The adopted processes, protocols and standards should give clarity on the roles at the interfaces for customer connections will be applicable for the other four platforms.

3. Position TenneT

Above considerations lead TenneT to the following position:

In this position paper, the major O&M interface categories have been identified and briefly described. Further details of these interfaces will be worked out in cooperation with the connected parties of the Borssele Alpha platform (during the construction phase) and will be applicable for the other four platforms.

4. Topic consultation

The expert meeting of October 21, 2015 has given TenneT the opportunity to get feedback from developers on their position regarding "O&M interface management". The main goal of this meeting was to assess whether TenneT's views as documented within this position paper are shared by the industry.