

STAKE HOLDER CONSULTATION PROCESS OFFSHORE GRID NL	
Type:	Feedback report
Work stream:	Technical
Topics:	T.8 SCADA
Status:	Closed for consultation
Filename:	ONL 15-135 T8_SCADA_FBRe_v4
Version:	4 – Public release
Pages:	11

QUALITY CONTROL		
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Release:	<b>Public</b>	

*Please note that the intention of this feedback report is to illustrate the overall discussion and results. The text should be placed in the greater context of transparency about TenneT 's consultation process. This text is not legally binding and could be modified during the stakeholder consultation process.*

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## 1. Moments of feedback

Feedback	Abbreviation
Expert meeting 27.11.2014	EM01
Expert meeting 29.01.2015	EM02
Expert meeting 15&16.04.2015	EM04
Expert meeting 02.07.2015	EM06
Consultation website April	WS02
Consultation website June	WS04
Consultation website July	WS05
Bi-lateral meetings	BL01

## 2. Feedback and action

Feedback	Feedback moment	Action
TenneT's concept is based on a "no need for access" on the platform offshore and therefore SCADA can be connected onshore by the provided data links. This was challenged by the concept where some suppliers install SCADA systems on the platform for operation of the OWF. The dependency of the export cable with telecom is also mitigated in this respect.	EM01	Notification
Given the discussion and questions, TenneT re-emphasized that the need of the OWF to know what is going on (measurements) is recognized and will be considered how to facilitate this. TenneT's point preferably onshore and otherwise a solution on the platform will be sought. But given the priority level no detailed information is available at this moment and will be part of the next steps.	EM02	Notification
Could you give an indication of the estimated cost reduction for installation of the SCADA system onshore?	EM04	This is up to WPO to determine. See " ONL 15-185-T8_SCADA communication interface and data links_PP_v2": a WPO room offshore and one onshore is available.

<p>With regards to HSE purposes we see it as a good thing to be able to control the WF offshore in case we lose contact with the onshore system. We do add a certain value to be able to stop the WF from offshore substation.</p>	EM04	<p>See " ONL 15-185-T8_SCADA communication interface and data links_PP_v2": a WPO room offshore is available.</p>
<p>During the commissioning phase it is also better to have a short line of communication – during commissioning our preference would be a system offshore where we and TenneT can work from. We will have to be able to sit together offshore during commission and will have to make this as easy as possible with quick communication and quick response.</p>	EM04	<p>Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"</p>
<p>As long as the system works it is a good idea. In practise there are always situations where things don't work and then the distance between onshore and offshore is far.</p>	EM04	Noted
<p>Is it possible to have the 'client' configured as a power control module? TenneT: no it is not.</p>	EM04	Notification
<p>We should also include a back-up system for communication as a consideration for redundancy – wireless communication system could be foreseen as mitigating measure.</p>	EM04	<p>Refer to notification below and to "ONL 15-217 O2_Stranded Asset Mitigation_PP_v1"</p>
<p>TenneT: the question is how much redundancy this wireless system would add to the already existing redundancy.</p>	EM04	Notification
<p>For us (OWF) it is common practise to have additional communication even though the SCADA system is offshore.</p>	EM04	Noted
<p>What about the onshore interface between OWF and TenneT? [TenneT] you can put the equipment onshore. We can make space available close to the system. If you say indicate you need space at the onshore subsystem and indicate how much space we will make sure it is available.</p>	EM04	<p>Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"</p>
<p>Yes, probability is we need an office as close to the onshore substation as possible.</p>	EM04	Noted
<p>TenneT: Confirmed that onshore space is needed with separate entrance for OWF. Question is how much? PCM's only or also other equipment and offices?</p>	EM04	<p>Incorporated in " ONL 15-185-T8_SCADA communication interface and data</p>

		links_PP_v2"
TenneT: could you all check the room we reserved offshore: 4 cabinets. We (OWF) would prefer 7 cabinets.	EM04	Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"
Could you keep more options open? Why already make this choice. If this limits our choice to two WTG suppliers you are limiting competition. TenneT: If we leave all possibilities open we have to add space and facilities everywhere. It is TenneT's position that the concept in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2" gives sufficient flexibility to the developers.	EM04	Notification
It doesn't have to do with WTG strategy but with our (OWF) development strategy. It is good to hear that some manufacturers are flexible in design but it would be good to leave all options open.	EM04	Noted
TenneT: How many fibres would you need? As many fibres as possible but minimum 48.	EM04	Noted
You should keep space at the platform available and as many fibres as possible – that will keep all options open.	EM04	Noted
The fibre requirements will be higher than just the amount of WTG, other systems apart from SCADA need to be transported to shore such as LIDAR data, visibility and wave measurements, meteo information.  Additionally we also need space for this equipment offshore. [TenneT] can you provide information on size of equipment and space needed?	EM04	Noted & question to stakeholders
Will TenneT install a base station for mobile communication on platform? TenneT: will be taken into account in the next position paper.	EM04	Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"
As stated in section 5, CTs and VTs need to be provided by TenneT for the PPM wind farm controller reference point measurements. However, it is unavoidable that the PPM need to install some grid measurement system and communication system at the platform to facilitate the wind farm control. This equipment will be turbine supplier specific and cannot be standardized and provided by TenneT.	WS02	Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"
IT security regulation requires the full control of sensitive devices for all programmable systems and networks including network switches in the	WS02	Incorporated in " ONL 15-185-

<p>OSP provided by TenneT. Physical access to the equipment is a basic requirement in this regard.</p>		<p>T8_SCADA communication interface and data links_PP_v2"</p>
<p>In current design, Generator's data (which are basically confidential) will flow through TenneT's equipment. A risk assessment for leakage or blockage of the Generator's data may be required.</p>	<p>WS02</p>	<p>Data will only flow through TenneT's fibre optical cables and patch panels. As there is no active equipment, data leakage is technically not possible. Patching of fibres for WPO in Export Cables will be fixed. Detailed patching design and procedures to be determined in a later phase.</p>
<p>Verbal communication for the OWF operator and also during the installation and commissioning requires some servers and antennas located in offshore.</p>	<p>WS02</p>	<p>Noted</p>
<p>Backup communication (LOS) especially for the early phases of the project (when the export cables are not ready) is required.</p>	<p>WS02</p>	<p>See "ONL 15-217 O2_Stranded Asset Mitigation_PP_v1": Backup communication is not foreseen. Export cable is planned to be ready before offshore commissioning of WPO.</p>
<p>Necessity of having VTMS and Sonar for the operation of the OWF has to be clarified.</p>	<p>WS02</p>	<p>A position paper on data acquisition systems will be available in September or October including services which can be</p>

		shared with the WPO's. VTMS is covered (AIS), but a sonar is not foreseen. WPO has the possibility to install its own data acquisition systems.
Conditions for use and the numbers of the fibre optics in the export cables, allocated to OWF operator, has to be clarified.	WS02	Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"
If TenneT will operate the whole platform (including the MV switchgears), an extra work/cost is needed to design the interface between TenneT's SCS and Generator's SCADA system. (However the cost will be very low but in the contrary with Cost Reduction). A risk assessment for adding an extra interface to the operation is required.	WS02	There will always be an interface between the SCADA of TenneT and the SCADA of the WPO's regardless of the definition of the Connection Point (CP). A separate risk assessment on this interface is not foreseen in this stage of the project.
It has to be clarified who is responsible for termination and splicing the array cables' optical fibers in the OSP. However Generator will need to access to the OSP for maintenance and troubleshooting of the connection points..	WS02	For installation interface management, see "ONL 15-xxx-T13_Installation interface management_PP_v1" . For access to platform, see "ONL 15-184-T4_Access to platform_PP_v2"
We would also ask to have transient and power quality recorders for on-line measurement of the wind farm performance in the reference point where TenneT will evaluate the compliance with codes.	WS02	Power quality measurements on CP are foreseen to be installed by TenneT

		and data can be shared with WPO. Transient recorders are not foreseen.
<p>Alternatively would TenneT install such equipment and can the relevant PPM get access to on-line measurements from such? If not, we would need to install additional MV VTs in wind turbines and install more equipment which will add to the overall costs.</p> <p>Finally it has to be clarified that whether it's possible to have rooms in TenneT's onshore substation or not.</p>	WS02	Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"
<p>Should also be clarified in this topic is :</p> <ul style="list-style-type: none"> <li>• Number of optical fibers (FO) available for the developers in the export cable to shore. A minimum of 2 times of 48 FO in the export cable should be reserved for the developers.</li> <li>• Space available in the onshore substation for <ul style="list-style-type: none"> <li>- The connection of the FO</li> <li>- The installation of our equipment for exploitation (SCADA - metering - ...) of the wind park</li> </ul> </li> </ul> <p>Depending the supplier of the wind turbine, space between 20 to 50m<sup>2</sup> should be required.</p> <p>Since TenneT has to realize some facilities for their installation, and to optimize the investment, this should be provided by TenneT to the developer.</p>	WS02	Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"
<p>We need a room on the OSS, for switching, etc. We cannot make the statement yet whether 4 cabinets will be enough. This is difficult to assess without having made a design. Therefore we cannot agree to this.</p> <p>Do not save on fibers, and take care of full and immediate redundancy in case of faults in fibers or any other transmission equipment. Also consider a line of sight data connection for redundancy purposes.</p> <p>At least 24 dedicated fibers per intra array string. Also the possibility to switch and use those into the OSS.</p> <p>We need room for other equipment as well e.g..</p> <ul style="list-style-type: none"> <li>• Lidar</li> <li>• Wave measurement equipment</li> <li>• Visibility measurements</li> <li>• Power metering (extra)</li> <li>• DTS</li> </ul>	WS04	Noted

<ul style="list-style-type: none"> <li>• Camera's</li> <li>• Communication systems</li> <li>• Condition monitoring system (e.g. for foundations)</li> </ul>		
<p>So sufficient top space and other rooms and access to install and operate this equipment.</p>	WS04	Noted
<p>What is the equipment need of OWF on the offshore platform and how many space is required for this? This depends on preferences and can vary from nothing (excluding safety measures which are treated elsewhere) up to the following:</p> <ul style="list-style-type: none"> <li>• WTG SCADA server (not usual, normally positioned on land)</li> <li>• DTS system infield cables (not usual to implement, but provide the opportunity to implement)</li> <li>• Induced Current Corrosion Protection System (ICCP) SCADA server (could be located on land)</li> <li>• CCTV wind farm (not usual to place this on WTGs, but it is usual to put this on platform to be able to view the park from the inside)</li> <li>• UTMS transmitter (would be usable if there is no GSM coverage available from land, depends on preferences from users)</li> <li>• Meteo system (waves, wind, air pressure, humidity etc.): required sensors on the platform (e.g. antenna, radar, LIDAR, etc.) and possible control unit on platform.</li> <li>• Real-time monitoring system for forced migration of birds (radar) or bats (batcorders). This is one of the mitigation measures proposed based on the KEC (Kader Ecologie en Cumulatie)</li> <li>• Patch cabinet for glass fibres of infield cables.</li> <li>• Working space (Desk+chair)</li> </ul>	WS04	Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"
<p>To summerise, We (OWF) propose to provide a space of 16m2 minimum. This space can be used to the preference of the OWF for the above listed items. In the calculation of this space it is assumed that TenneT provides the utilities (NSA, UPS, HVAC, fire extinguishing equipment etc.).</p>	WS04	Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"
<p>Furthermore it could be considered to have an accommodation for people of a "Monitoring and Evaluation Programme": bird counters, porpoise spotters etc. This should be accounted for in the setup corresponding HSE issues.</p>	WS04	Noted.
<p>TenneT will provide for two separately accessible spaces for each wind farm owner. This will also be the case if one party wins both tenders. Are there any objections against this? OWF does not have any objections against two separate spaces in the</p>	WS04	Incorporated in " ONL 15-185-T8_SCADA communication



<p>case of one developer. OWF proposes that TenneT makes a key plan to ensure that wind farm owners only have access to the areas they should have access to. Emergency escape routes should be taken into account. Depending on the size of the spaces it is legally required to provide two emergency escape routes. In practice, this is always preferable and TenneT should provide this where possible.</p>		<p>interface and data links_PP_v2"</p>
<p>How many glass fibres does OWF Need? The amount is fully dependent on where the servers for the various systems will be located. In the case everything will be located on land :</p> <ul style="list-style-type: none"> <li>• WTG SCADA: 4 glass fibres per string = 4*6 strings = 24 glass fibres (preferences is not to implement active components like multiplexers on the platform if this is not required)</li> <li>• ICCP SCADA: 4 glass fibers per string = 24 glass fibres</li> <li>• DTS system infield cables: 4 glass fibres</li> <li>• CCTV: 2 glass fibres</li> <li>• UMTS: 4 glass fibres</li> <li>• Mateo: 2 glass fibres</li> </ul> <p>In total a number of 60 glass fibres should be available per park.</p>	<p>WS04</p>	<p>Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"</p>
<p>Which requirements does OWF have with respect to Onshore spaces that can be used e.g. for SCADA equipment of the OWF. OWF proposes to provide in a minimum space of 75m2 to have sufficient flexibility in using the space. This area is larger than the platform because every OWF needs to setup their own utilities (UPS, HVAC, fire extinguishing systems etc.).</p>	<p>WS04</p>	<p>Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"</p>
<p>If the building will be located on TenneT terrain it will be subject to the TenneT safety regulations. However, possibly this building will be outside of TenneT terrain. In that case, also a sound security (cameras, fences, alarm system, etc.) is required.</p>	<p>WS04</p>	<p>Notification</p>
<p>Under TenneT's proposal relating to the OWF having no equipment on the OSP it is presumed that TenneT is proposing they own all required control and monitoring equipment on the OWF array circuits ? Including, but not limited to :</p> <ul style="list-style-type: none"> <li>• CTs &amp; VTs;</li> <li>• All equipment to take required measurements to facilitate control &amp; monitoring of array circuits to (i) allow normal operational control of the OWF (ii) to facilitate compliance with RfG / Grid Code. It should be noted that this may include equipment that the WTG supplier needs to specify;</li> </ul>	<p>BL01</p>	<p>See the latest version of the position paper: " ONL 15-185-T8_SCADA communication interface and data links_PP_v2". OWF / WPO will have a dedicated room on the offshore</p>

<ul style="list-style-type: none"> <li>• All equipment to allow communication of these measurements to wherever the OWF control systems are located;</li> <li>• All equipment necessary to allow OWF communication systems to communicate with land based equipment / control centres via the OSP;</li> <li>• What about back-up communications to OWF if subsea cable fibre circuits are unavailable, what do we normally have on OSP to facilitate back-up communications ?</li> </ul>		platform.
<p>Important question, also in regard of possible turbine choice, is whether a glas-to-glas coupling (patching) on the fibre communication would be possible, in relation to the choice of where the SCADA system is positioned. According to us (OWF) some turbine manufacturers are very hesitant to allow a third party (TenneT) to provide a fibre connection platform.</p>	BL01	Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"
<p>Please clarify: Do the TenneT's deliverables for WPO (i.e. rooms in OSS and ONS, patch panels, FO in export cable, and etc.) have any costs for WPO? How? We need to use TETRA and VHF for verbal communication. Does TenneT provide such systems or not?</p>	WS05	Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"
<p>What will be the "back-up (voice) emergency communication system"? We may prefer to have our own systems (TETRA and VHF) and in this case can we have antennas on top of platform for these systems as well?</p>	WS05	There will be space available on top of the platform for WPO to install their equipment.
<p>Is there any view from MEZ to look at a common SCADA system for data commonly used by windfarm operators for the Offshore NL windfarms? <a href="http://www.thecrownestate.co.uk/news-and-media/news/2015/pioneering-sparta-system-for-offshore-wind-farms-goes-live/?utm_source=News+alerts&amp;utm_campaign=d1613461f8-RSS_EMAIL_CAMPAIGN&amp;utm_medium=email&amp;utm_term=0_b0f0a5ecf9-d1613461f8-339623113">http://www.thecrownestate.co.uk/news-and-media/news/2015/pioneering-sparta-system-for-offshore-wind-farms-goes-live/?utm_source=News+alerts&amp;utm_campaign=d1613461f8-RSS_EMAIL_CAMPAIGN&amp;utm_medium=email&amp;utm_term=0_b0f0a5ecf9-d1613461f8-339623113</a></p>	WS05	To the information of TenneT, there are no plans for such a system at this moment.
<p>PCM equipment should be a separate control system for the windfarm, and not be a part of the SCADA system. It should be located in the telecommunication room on the platform.</p>	WS05	Noted
<p>Is there enough room in the telecommunication room (20 m2) to place all the SCADA, communication, metering and control equipment?</p>	WS05	Incorporated in " ONL 15-185-T8_SCADA communication interface and data links_PP_v2"

<p>Please clarify the possibilities to install a 4G network to support communication within the OWF.</p> <p>In which topic is space on the platform e.g. for LiDAR, SODAR, wind and wave measurement arranged? Prepare discussion for next meeting if measurements can be shared (in order to avoid 2 or 3 redundant installations).</p> <p>Furthermore no comments.</p>	<p>EM06</p>	<p>Incorporated in "ONL 15-185-T8_SCADA communication interface and data links_PP_v2". There will be a separate position paper on possible shared data acquisition systems in the expert meeting of October.</p>