

STAKEHOLDER CONSULTATION PROCESS OFFSHORE GRID NL

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QUALITY CONTROL

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(Please note that the below is not a literal transcription of the comments made, but rather represents the overall tone and context of the discussion)

0. Welcome

Rob van der Hage opens the meeting and welcomes all attendees.

1. Blue Print

Explanation on blue print document which summarises the result of the consultation process of each technical topic. Based on the feedback received in the Expert Meetings, in bi-lateral meeting and feedback received via the dedicated website, TenneT has come to a final position on the topic, which has been presented for decision making by the appropriate body.

Feedback from the meeting attendees

The blue print refers to Version V1.1 for topic T7. Is this document missing on the website?

TenneT: This document should be on the website. We will come back to you with a confirmation.

With regards to SCADA it was decided there would be room available for equipment on the topside. Is it correct there is no description of which amount of room is available. We would like to suggest to define which room is available on the topside.

TenneT: this will be available in a separate position paper. This will be discussed later this afternoon during topic T.18 - Shared data acquisition systems which will be discussed today and finalised during the next technical session.

2. T13 Installation interface management

[Discussion]

Summary of concerns based on feedback during the Expert Meeting

- There is a request for more clarity on the procurement, the associated cost and installation of the mentioned equipment. This shall be added in more detail to the interface matrix
- There is a request for more information on the available room on the platform for cable testing
- There is a request to add inspections of the j-tube

Feedback from the meeting attendees

How will TenneT work? Will there be working permit per activity or per day?

TenneT: this should be agreed upon after selection of WPO

In response to the table you present – could you inform us who will be responsible for design of e.g. cable

from hang off to switchgear/cable route plus for procurement, supply, installation and cost? Please clarify who procures and installs equipment for the activities in the table. Answer TenneT was that WPO is responsible

Is there a possibility to change these designs post-award?

TenneT: in principle it is. Part of the detailed design&engineering depends on infield cables and amount of wind turbines per string.

Until when is the bell mouth design open for changes?

TenneT: our preference is to finalise the design of the J-tube as soon as possible. This will be shared with WPO and WPO can check if this fits with cable protection system.

TenneT: Design of J-tube has been changed from 400 to 450mm this should be suitable for all future cables. This should also be reflected in the position paper.

TenneT: if we design the J-tube in such a way that is suitable for the biggest cable including bell mouth, length of j-tube, cable hang off and available space to pull in the cable will the WPO be able to design its protection system based on this? WPO: will have to check internally and come back on this.

Can we assume that all ducting and cabling, procurement is responsibility of TenneT?

TenneT: Procurement responsibilities will be mentioned in the next version of the position paper.

What is the number of fibres between hang off and SCADA? TenneT: 24 per cable is that sufficient. WPO: yes it is.

Cable testing would be the responsibility of the WPO. We will do this for 66 kV cables which needs quite some space. Has TenneT considered this in the design? TenneT: not in detail. On the roof there will be space to locate big testing equipment.

Does TenneT have any requirements with regards to WPO testing its cable(s)? TenneT: no this is your cable. WPO: so we can comply do a 24hr test as official testing.

Will TenneT define the (limited) space which is available for WPO so we know what is possible with regards to testing. TenneT: yes on the roof there will be space to locate big testing equipment..

Which winch will be used during cable installation? TenneT: we will define a location for the winch and will describe how the winch should be installed onto the platform and de-installed. Up to WPO how to do the cable pull in.

The position paper states the following: WPO winch will be installed by TenneT. Is this a typo and should this be corrected? TenneT: yes this should be corrected by TenneT since this is currently indeed multi-interpretable.

The position paper also states: Pull in wire is the responsibility of the owner -> shouldn't this be part of the J-tube?

TenneT: this needs clarification. TenneT is referring to the messenger wire which should be installed in the J-tube and the WPO can install this at the yard. This is clear for WPO but then TenneT should define which messenger wire is needed.

66kv switchgear-matrix

What is the location of the splice boxes? TenneT: we didn't define a location yet. Could be near the hang-off.

Has cabling for the WPO's LiDAR been taken into account in the design of the platform? TenneT: Please refer to the interface matrix 'WPO equipment located on TenneT platform'. This shows this has been taken into account into the design.

WPO suggests to add to the matrix: 'inspections' of the j-tube before pulling in the wire and the platform after pulling in the wire.

TenneT: correct and shall be added to the matrix.

TenneT has decided there will be no junction boxes. Is this choice fixed or will there be some flexibility after WPO has been selected? In case the topside is delayed would TenneT be responsible for WPO cables?

TenneT: in principle there is no junction box in the design. The cable deck is connected to the jacket, so cables can be stored there.

Could we leave this open and include junction boxes in the flexible design and decide once the WPO is selected? TenneT: will have to discuss this internally and will come back to this.

In the position paper it is stated that the construction yard may be located outside of Europe -> that's a wide definition - is this far east? TenneT: correct.

3. T2 Number of bays

[Notification]

Feedback from the meeting attendees

No additional comments.

4. T4 Access to platform

[Notification]

Feedback from the meeting attendees

Would TenneT be responsible for accessibility of the platform such as the condition of boat landing etc?

TenneT: correct.

Furthermore no comments.

5. T7 Reactive power compensation

[Notification]

Feedback from the meeting attendees

Is this approach also verified with the future grid code? TenneT: yes it is.

A suggestion to change the text into: "if the developer does not chose to compensate power it will be compensated by TenneT"

TenneT: this is not preferred since the wind turbine, without the extension, has basic capabilities and therefore TenneT and WPO first have to see what the standard model of the wind turbine can compensate after tender results.

Our calculations show different losses then the TenneT calculations.

TenneT: To our opinion our calculations are correct and in case the WPO has different results we can only compare when WPO shares its own calculations.

Could TenneT add the (communication) procedure between TenneT and WPO for setting the setpoint plus add this to position paper: T14 O&M interface management.

6. T14 O&M Interface management

[Discussion]

Summary of concerns based on feedback during the Expert Meeting

- Parties requested to include onshore interfaces with regards to land station.
- Parties request to provide revised soil assumptions (Dec. 2015) after new calculations have been executed by TenneT.
- Parties requested more detail on processes and communication between TenneT and WPO with regards to curtailment.

Feedback from the meeting attendees

TenneT: Are any interfacing points missing in this overview?

WPO: Corrective maintenance -> actions which should/can be made – the time you need for corrective maintenance is important for WPO. TenneT: this pp is more on how we can work together.

When will the detailing on requests and agreement be done? TenneT: After winners of first tender are selected. WPO: some elements influence the price of our bid: HSE inductions; training requirements; work permit system. In case TenneT's requests fit in our system there's no issue but if a new system needs to be set up then there will be additional costs.

A suggestion to also include onshore interfaces with regards to land station. TenneT: good will be included

On page 6 of PP 'overplanting capacity' is described with regards to operations of grid connection: will the principles be elaborated upon in the annexes or with WPO? TenneT: neither – the principles are clear. WPO: we have questions on how this will be done in practice? Will all 350 MW be shut down or shall we curtail till the right temperature? Procedure on how/which steps to curtail would be good to know.

It would be helpful to clarify the process on how/with which steps to curtail.

Would it be possible to receive the cables temperatures? This is important for WPO's forecasting and we should know how much room there is available.

After TenneT has selected a cable it should be possible to give a more accurate number for the ~95%. When will this be? Is this before the 31st of march? TenneT: no it will not be before march 31.

Would it then be possible to make a calculation for TenneT's shortlist?

TenneT: new calculations can be done after soil conditions are available. This is not before January. After that we can share the range of numbers for the shortlist.

Can you also share the assumptions? Soil data and wind data is already available. TenneT: revised soil assumptions (Dec2015) will be shared after recalculations have been executed.

Where did you assume the hotspot and could you share your information on this? TenneT: calculations have been done with several soil resistivity values. And cables types have been varied.

What happens if two parties overplant? Should procedures be needed how both WPO act (amongst each other). TenneT: during normal operation WPO's have no shared services from TenneT. Each WPO uses one cable. In case one export cable breaks both WPO share this export cable and should reduce 50%.

7. T18 Shared data acquisition systems

[Information]

Feedback from the meeting attendees

Could we change AIS and shipping radar in the table into a Yes?

CCTV is included in the overview but in case these cameras can be controlled and steered it will be difficult to share between parties. TenneT: correct.

WPO would like to have the opportunity to also install own LiDAR. (export cable-)DTS and radar information would also be beneficial to have.

Is there still an option to install the WPO systems on the deck (incl cabling ducting and power)? TenneT: Yes for LiDAR and CCTV is possible but there's no unlimited space for several systems.

What is missing is data connection -> UMTS system. TenneT; we are researching the possibilities to install this. UMTS suppliers have been approached to do this. TenneT will provide fibre optics and opportunity to install.

The location of the park control equipment of WPO seems to be very close to 66kV switch gear but WPO is not allowed near the switch gear. Does TenneT have the same position? No clients close to 66kV switch room? TenneT: Park control equipment is within the allowable range.

8. Platform design

[Information]

Feedback from the meeting attendees

Does TenneT expect to install everything onshore? TenneT: Yes all that is possible onshore

What's the height of the cable deck? Is that fixed? TenneT: ~6.5m

Is that sufficient for winching? TenneT: yes this is designed as such that winching is still possible after installation of topside.

In Belgium maintenance on cable deck is high because the deck is not closed. Have you thought about this?

Was this design checked with suppliers? TenneT: as far as allowed this was checked with market.

Where is the diesel generator? TenneT: there is no permanent diesel generator but room to bring the diesel generator in order to power the platform.

Are the 220 kV separated? TenneT: this is described in the position paper. There is no connection between cables onshore

Is it possible to share these cable drawings with our experts? TenneT: no these drawings are to preliminary.

9. T15 Harmonics and transient study

[Discussion]

Summary of concerns based on feedback during the Expert Meeting

- There is a request for more clarity on specs on allowed emission levels per string, per park and how that might be divided per string per rated power

Feedback from the meeting attendees

Is it correct that the permitted levels of harmonic emission limits are not specified yet? TenneT: Correct; they are not.

Where will you measure the emission limits? TenneT: How to check/measure the compliance still needs to be discussed.

Will you execute this investigation based on measurements or harmonics simulations? TenneT: Both

So WPO has to execute harmonics studies for each 66 kV connection point? TenneT: details on how many strings and how to measure/report will have to be defined.

IEC standards are defined per wind turbine – what happens with 10 WTG and total distortions. TenneT: there should be guidelines for this and we are working on a documents to share.

Is it correct that we have to comply at the point of common coupling right? TenneT: Yes that's correct. WPO: Then why are we involved in the onshore situation? Could it be that we have to install equipment in hindsight? Onshore/offshore? In order to comply with compensation?

In case WPO cannot comply with emission limits it will be necessary to improve converters or install filters onshore.

WPO: But 66kV cannot be filtered by filter onshore. TenneT: Alternative is an active filter in the offshore substation.

We had some harmonics problems in the UK – will get back on the applied solution.

Will you specify the models you expect from the WTG? The details of the harmonics models and what happens if we cannot provide these models?

TenneT: We can't give the type of models upfront and have to come back on this and see in how much detail

we can define this upfront.

10. P1 Planning

[Notification]

Feedback from the meeting attendees

Liquidated damages have been a point of discussion during the legal session because of not meeting the jacket installation target. These could be put forward to TenneT's contractors instead of taking the milestone out. TenneT: TenneT and selected WPO will, in consultation, define what can be done with regards to planning/contractors/advancements in any other way. But for now TenneT doesn't accept any liabilities/penalties.

With who should we discuss this? EZ mentioned that this should be discussed during legal sessions. This is not done and now the jacket installation milestone will fall off the table.

Liabilities are now taken by the WPO – also if the grid is delivered in time but not according to the specifications.

The consequence of this planning is that WPO could have to delay the cable pulling till 31st of august. WPO has to mitigate the risk that TenneT does not meet the jacket installation milestone. Postponing installation always raises the price. Therefore the request to TenneT to commit to a date for jacket installation.

The risk should be at the party which is best capable to manage the risk and in this situation that is TenneT.

Could we forward penalties paid by TenneT's contractor to WPO. TenneT could need those penalties for their own costs, but please provide proposal.

TenneT's contract is of a different size then WPO's contract. WPO would like to be convinced that TenneT is sufficiently incentivised in order to push TenneT and its contractors sufficiently to be in time. Can WPO be partly compensated for this risk?

TenneT: we understand your point and worry – please further explain your suggestion online.

Is the hesitance of risk taking because it is on the P&L of TenneT? Does it make a difference if WPO includes this in the LD?

What can WPO execute while TenneT is installing topside? Which space is available for WPO on platform. Also during testing and commissioning. This would be the period before 31st of august.

So cable pull in cannot take place between 31st of march and 31st august? TenneT: TenneT has the intention

to investigate possible windows with the winners of the tenders but cannot guarantee a window at this point in time.

How much time does WPO need for cable pull in?

Topside installation only takes 1 day and cable pulling only takes 2days/cable and you have two cables. It makes a major difference for the bid when WPO needs to assume they cannot be on the platform till Aug. 31st.

TenneT: would it help that you are allowed to execute works during these 6 months knowing that you could be interrupted for a couple of days? WPO: yes that risk is manageable. Also keep in mind that a vessel (cable pull in) is a different cost then a crew going from the platform to e.g. a wtg. Those are two different risks.

Can you guarantee a timeslot within a certain period or not even a timeslot? TenneT cannot guarantee but has the intention to investigate possibilities

Design session between WPO crew and TenneT needs to be pencilled in. TenneT: yes that's taken into account.

Please also include milestone for design freeze.

Latest moment for WPO to have equipment installed should be defined.

What does WPO still need to do at platform during TenneT's commissioning and testing of grid connection?

SCADA system needs to work before the first WTG is installed. TenneT: SCADA is installed onshore. Correct but patching and connection should be tested before WTG is installed.

11. Investment plan

[Information]

Feedback from the meeting attendees

Which topics will be in the investment plan? Could you provide a bullet list of topics in order to communicate that 'yes; the plan might change after handing in the bid but is limited to certain topics'. TenneT: we will have to come back on this question.

Is it the GEN where consultation will take place? TenneT: this will be a wider consultation via internet.

12. T12 Redundancy

[Notification]

Feedback from the meeting attendees

Is it correct that that each wind farm is connected to two transformers? TenneT: No one wind farm is connected to one transformer.

Please update the position paper with the right single line diagram

DONG-> in case one transformer is out - this might cause stability problems – if two WF are connected via same busbar. Dong will make comment via email.

13. O2 Stranded asset mitigation

[Notification]

Feedback from the meeting attendees

No further comments

14. T17 Compliance testing

[Information]

Feedback from the meeting attendees

Does TenneT expect to have requirements for site testing? TenneT: yes

What will be the content of information exchange online? TenneT: real data, design information

15. Recap main elements legal session

[Information]

Feedback from the meeting attendees

Planning is such that we will receive a new version of the model agreement in October. Will TenneT also provide the annexes at that point? TenneT: yes, the intention is to do so but please respect the workload and timeline. TenneT does fully realise there should be sufficient time to evaluate.

Would you foresee another meeting after Oct 15&16. In case TenneT already foresees this then good to schedule as soon as possible. For now, TenneT intends to reach closure on Oct 16.

16. Closure

17. List of attendees

Company	Name
DELTA	Jan Maas
TenneT	Daniel Markus
TenneT	Bart van Hulst
TenneT	Thomas Donders
Vattenfall	Mike Wiseman
Vattenfall	Martin Ars
RWE/Innogy	Jörn Runge
RWE/Essent	Joost Pellens
Engie	Eric Dekinderen
Engie	Bob Meijer (morning)
DONG	Ole Holmstrøm
TenneT	Rob van der Hage
Eneco	Jos Jacobs
TenneT	Marien Ruppert
TenneT	Frank Wester
Ecofys/TenneT	Anna Ritzen
Vattenfall	Martin Ars
NWEA	Guido Hommel (>14hr)
TenneT	Ralph Harrewijn
DNV GL on behalf of E.ON	Paul Kozan
TenneT	Thomas Donders
TenneT	Daniel Vree
TenneT	Bart van Hulst
Ecofys	Michiel Müller
Ecofys	Anna Ritzen
TenneT	Saskia Jaarsma