POSITION PAPER

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1. Background Material

LITERATURE USED:

- https://www.tennet.eu/nl/ons-hoogspanningsnet/offshore-projecten-nederland/programma-2023/technische-onderwerpen/

2. Scope and Considerations

For the roadmap offshore wind 2030 (routekaart windenergie op zee 2030) TenneT is tasked with the connection of several offshore wind farms up to 2030. The wind farm zones 'Hollandse kust West' and 'Ten Noorden van de Waddeneilanden' will be connected with TenneT's previously established and consulted standardized 700 MW grid connection concept. Due to its size and distance to shore, a new grid connection concept has been established for the wind farm zone IJmuiden Ver. The figure below shows a schematic cross-section of this new grid connection concept. Wind turbines are connected through 66 kV “inter-array” cables (in orange) to an offshore (HVDC) converter station. Using 2 GW high voltage (525 kV) export cables (in green) the electricity is transported to shore. TenneT will be responsible for the offshore grid, from the onshore substation up to and including, the offshore substation. TenneT intends to create a new standard HVDC grid connection concept for both connections to IJmuiden Ver and potential future far shore wind farms.

This paper describes how TenneT, as the offshore grid connection owner, proposes to deal with the offshore AC voltage and frequency.

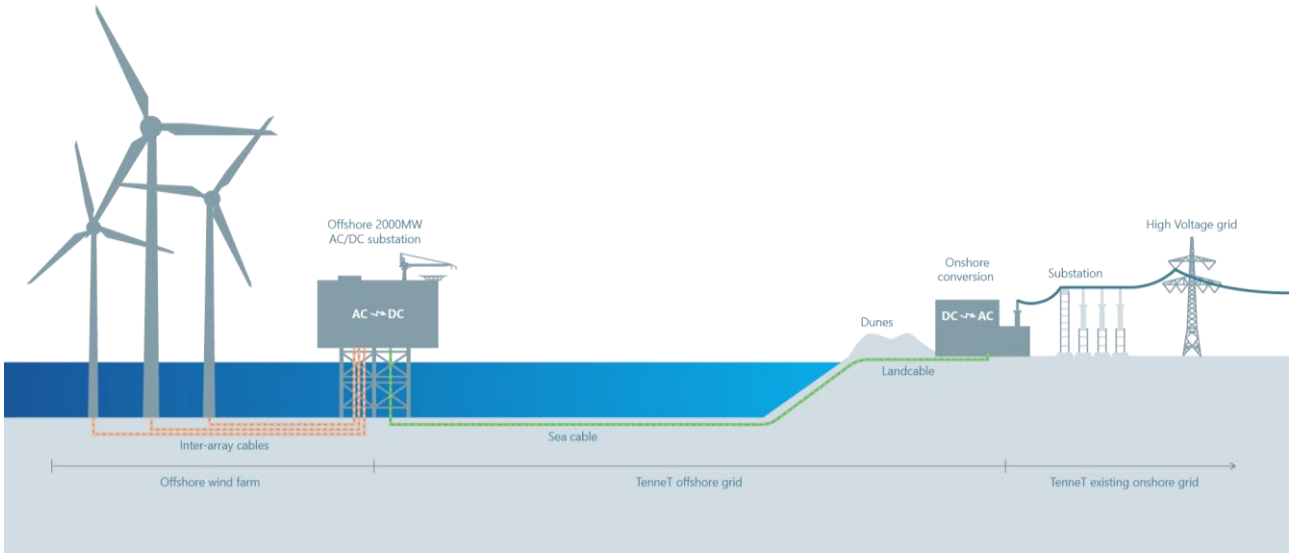

Figure 1 - HVDC grid connection concept

3. Voltage Level and Frequency

Following the successful introduction of 66kV as the nominal offshore AC voltage for the connection of offshore wind farms in the Netherlands, TenneT intends to continue with the application of the same voltage level also for IJmuiden Ver wind farm connections to the HVDC based platforms. This means that the offshore inter-array cables will be connected directly to the HVDC converter platforms, which will be realised by TenneT for the IJmuiden Ver wind area.

Similarly, the nominal frequency to be used for the operation of the offshore AC grid will also be based on 50 Hz, which is the so far standard for offshore wind farm connections. It should be noted that the offshore AC grid will not be directly connected to the 50 Hz grid of continental Europe. Hence the selection of the nominal frequency is not bound to 50 Hz. However, TenneT has no intention to change the frequency to another value than 50 Hz. Therefore there is no need to define additional frequency ranges and durations as indicated in the draft Dutch Netcode article 6.26 lid 3[1].

TenneT will be responsible for setting and controlling the operating voltage and frequency at the offshore AC grid utilizing the offshore HVDC converter.

TenneT does not see a benefit in studying a higher voltage level (say 110 kV) within the timeframe of IJmuiden Ver as the predicted rated power of IJmuiden Ver WTGs (less than 20 MW) does not justify to do so.

4. Position TenneT

TenneT intends to apply 66kV as nominal voltage for connecting directly to the offshore HVDC platforms and operating of all the offshore inter-array cable systems of the OWF's for IJmuiden Ver.

TenneT intends to apply 50 Hz as nominal frequency for the operation of the offshore AC grid.

[1] https://www.acm.nl/sites/default/files/documents/ontwerp-codebesluit-hvdc-2019-04-02.pdf