

Wind Farms MOG 2

Technical workshop

12.12.2022 | Davy Verwilghen, Tom Trappeniers, Damien Rietjens



Agenda

Part 1 – Feedback from the Cabinet

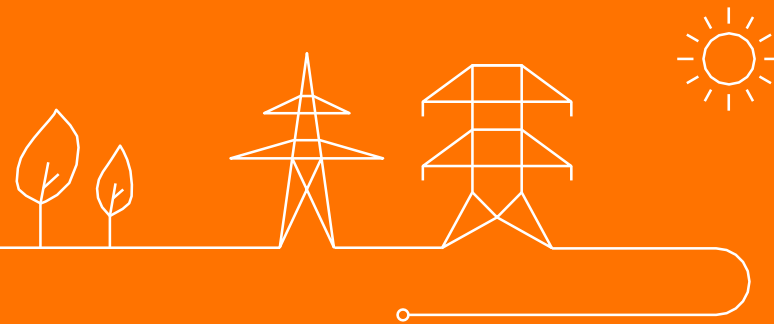
- Presentation inter-array voltage level for PEZ


Part 2 – Results stakeholder dialogue

- Process overview
- Princess Elisabeth Island Design
- Grid requirements
- High voltage interface
- Low voltage interface

Part I – Feedback from the Cabinet

Presentation inter-array voltage level for PEZ





**Expected voltage level
delivered by wind turbines in
the Princess Elisabeth Zone**
Feedback on the request for input

MOG2 Technical Workshop– December 12, 2022

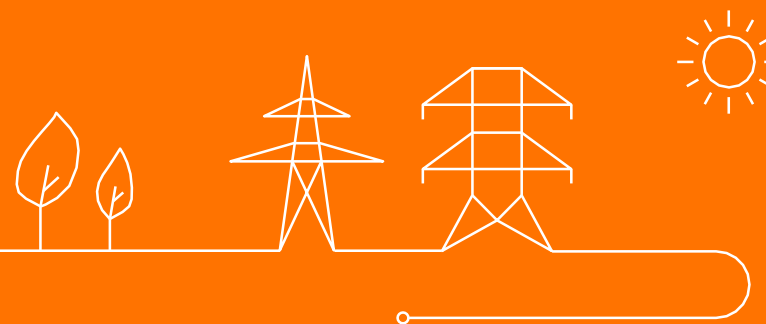
Letter to request input on expected voltage level of wind turbines for PEZ on Oct 3: 66kV or 132 kV?

- 12 responses received
- Advantages :
 - Less inter-array cable length
 - Less environmental impact
 - Lower number of connection points on MOG2
- Disadvantages :
 - Significant delay (up to 12 months)
 - Legal risks (contract breach) and risk for loss of interest from market
- Technology readiness :
 - not clear (only 2 positive responses on readiness)
 - 6 respondents requested to postpone the decision and keep both options open, which is not possible

=> Conclusion : 66kV voltage level for the PEZ

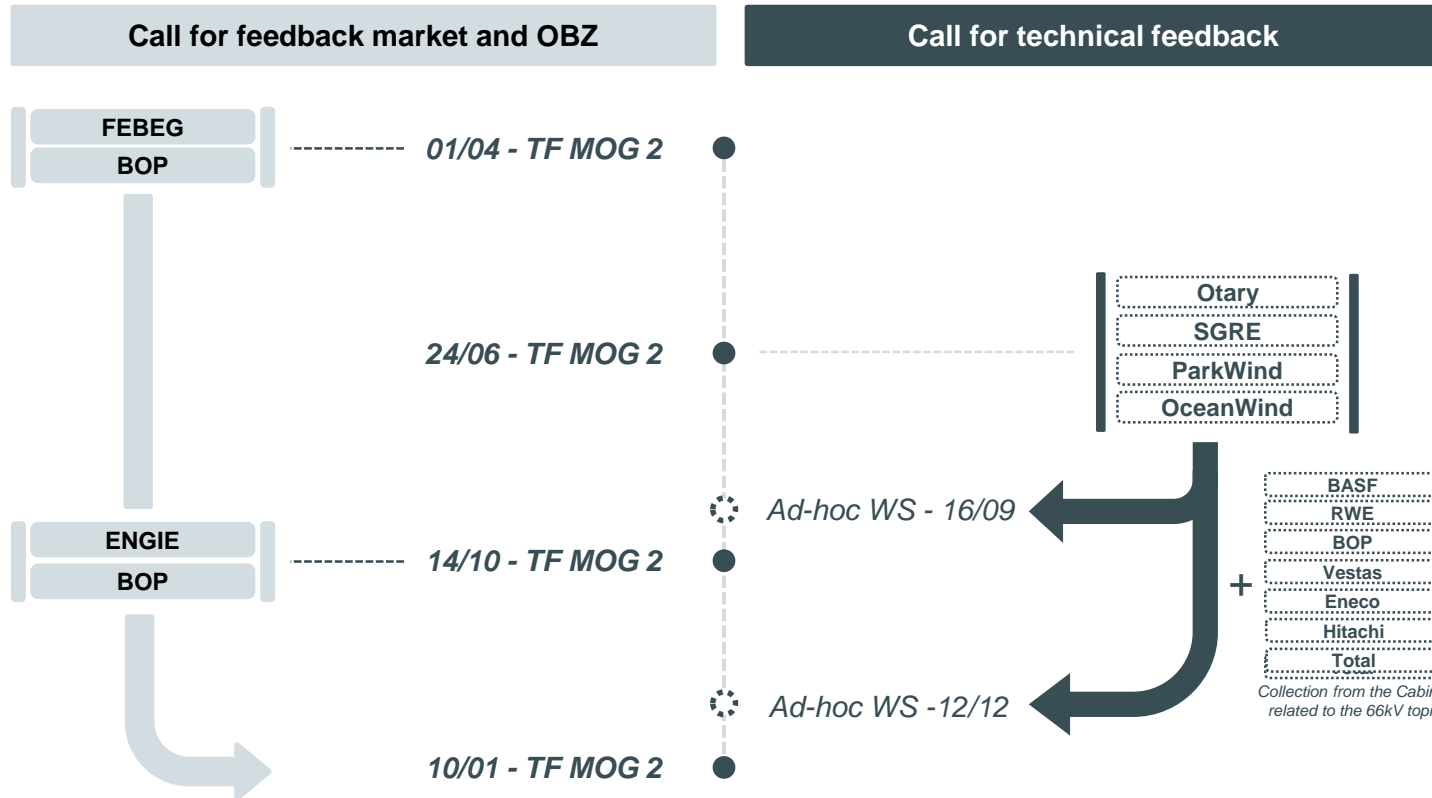
Part II – Results stakeholder dialogue

Answers to key technical questions from stakeholders feedback





Process overview on call for feedback in the framework of Task Force MOG2



This **workshop follows** the first ad-hoc technical workshop organized the 16th of September

Ad-hoc technical workshop was organized to **introduce design choices** made by Elia, and to **discuss with stakeholders** about the design elements

Written feedback was received from **9 parties**

The next TF planned for this **10th of January 2023** will cover the **other feedback** related to market and OBZ topics



The ad-hoc technical workshop today aim at giving **a response** on the **key open items** raised by the stakeholders



Overview of feedback received per topic

Reactions received mainly on grid requirement, high and low voltage interface for wind farms

Grid requirement

- ! Single Line Diagram MOG 2
- ! Installation of spare bays
- Looping of inter-array cables (answer)
- ! Circuit-breaker first wind turbine

High voltage interface

- ! Cable interface and property border
- ! Clarification short-circuit current

Low voltage interface

- Cable protection (answer)
- ! OWF interface

Cable routing

- ! Cable routing / Cable crossings *

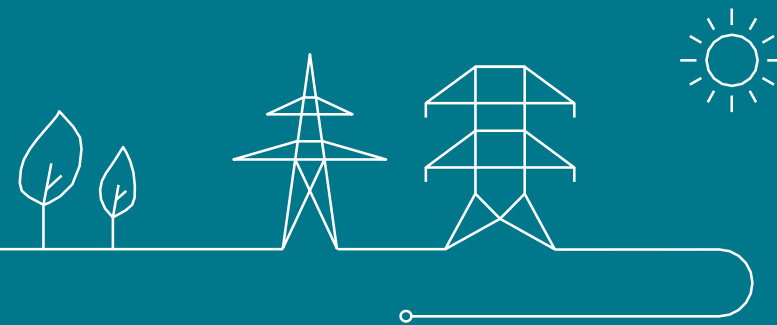


Stakeholders who provided feedback

	Otary	Parkwind			
Ocean Winds	Otary				
Ocean Winds	Otary	Parkwind	SRGE		
Ocean Winds	Otary	Parkwind	SRGE	Hitachi	Eneco
	Otary	Parkwind			
Ocean Winds	Otary	Parkwind	SRGE		
	Otary	Parkwind	SRGE		
	Otary	Parkwind			
Ocean Winds	Otary	Parkwind			Eneco

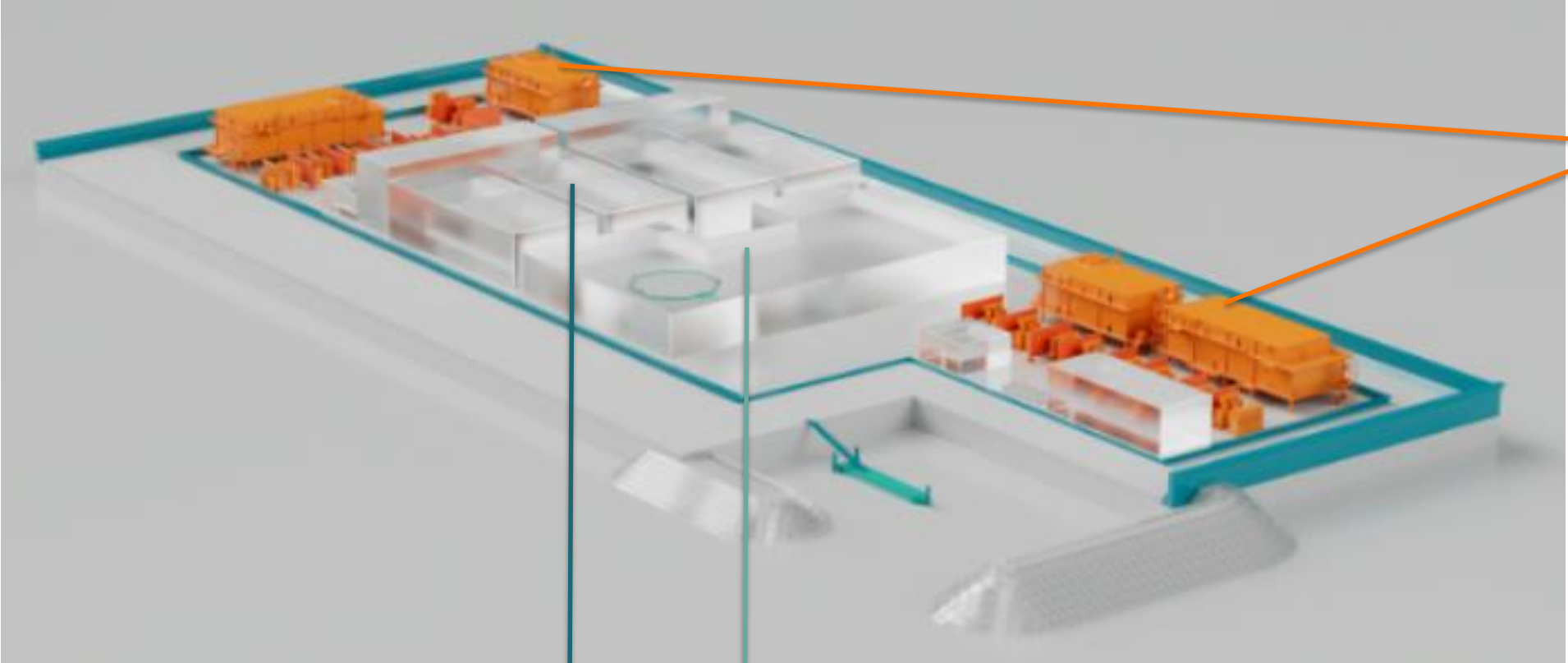
* Feasibility under investigation

Princess Elisabeth Island Design



Potential layout for Princess Elisabeth Island Design

AC substations will be classical module already installed in existing platform (MOG 1)



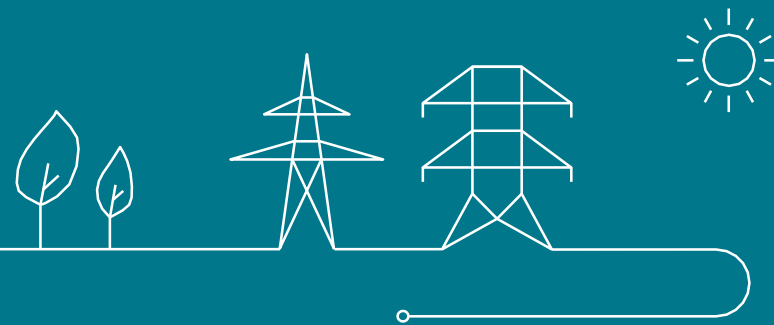
AC substations



DC substations

DC converter

Grid Requirements



Request for information on Single Line Diagram foreseen for MOG2



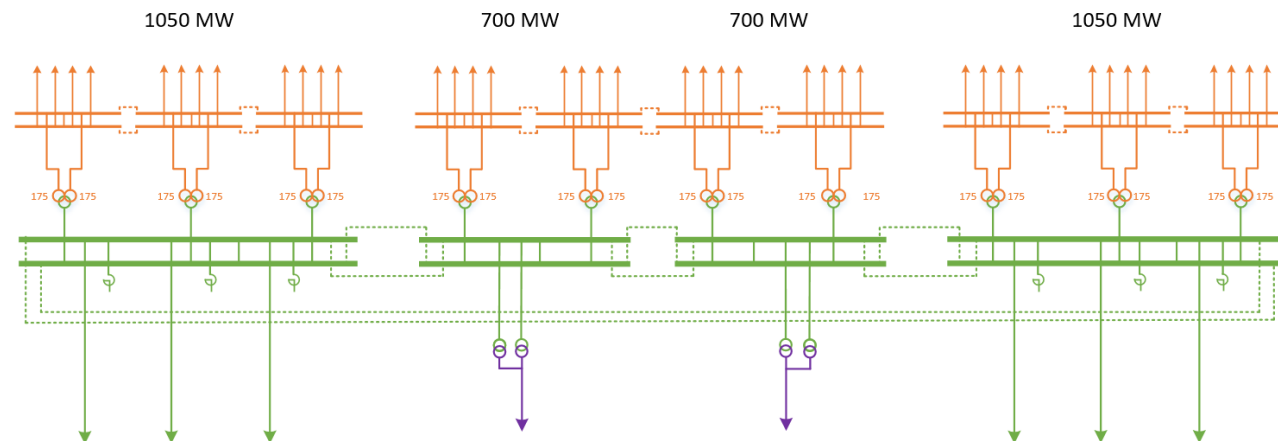
Otary

Parkwind

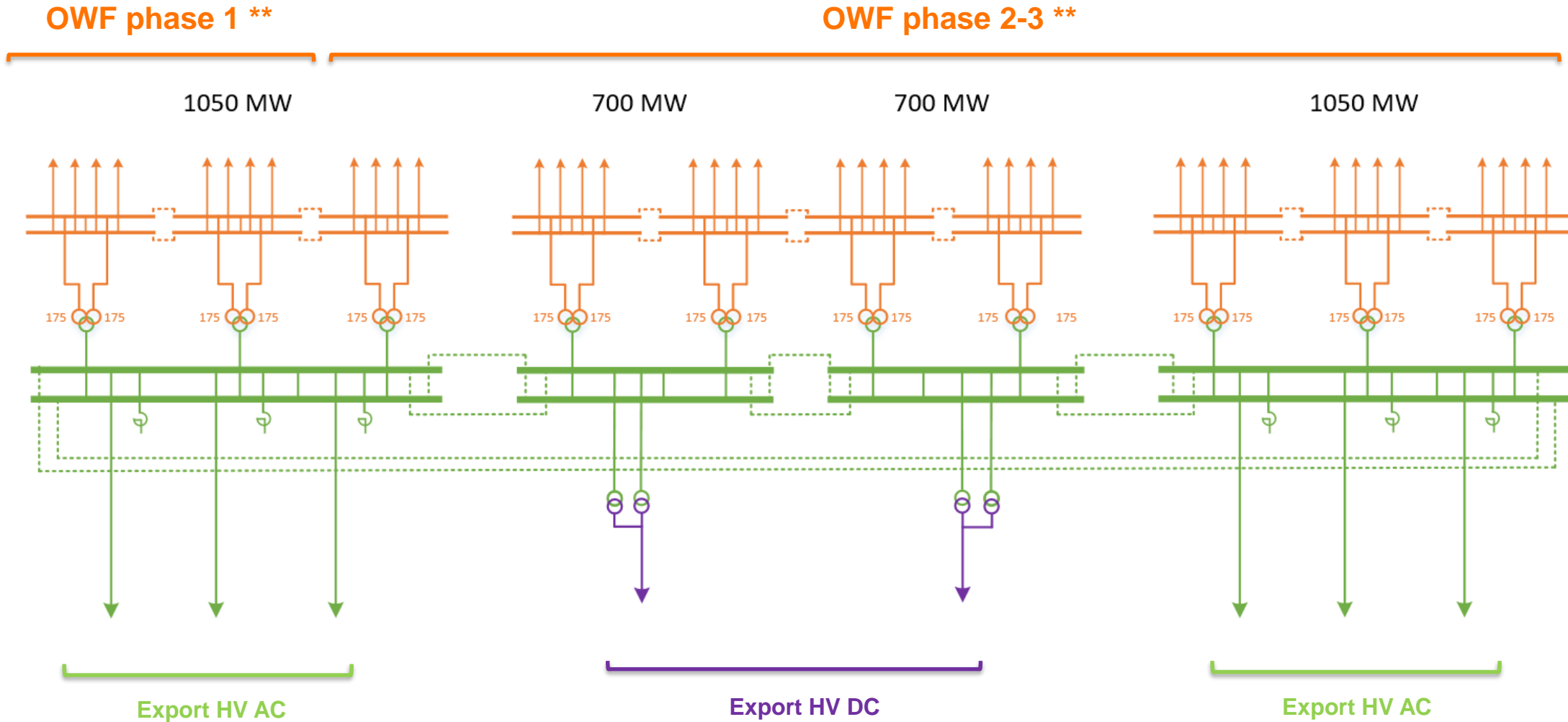
Answer Elia

- The SLD is based on the three concessions decided by the government
 - 1x 700MW (Northinder North)
 - 1x 1225 – 1400MW
 - 1x 1225 – 1400MW
- **1 GIS room 66kV with 4 cable bays** will connect **350MW of wind power**
- **Earthing and auxiliary transformer** will be connected on the **secondary side of the power transformer 400MVA**
- Other technical requirements are in further investigation and will be proactive communicated during the TF MOG2

Overall Single Line Diagram (version 12/12/2022) *



Overall Single Line Diagram (version 12/12/2022) *



* Operating modes will be discussed in the TF MOG2 on 10/01/2023

** 350MW per 66kV building block / spare bays not shown on the SLD

Stakeholders asks if spare bays will be foreseen to obtain flexibility



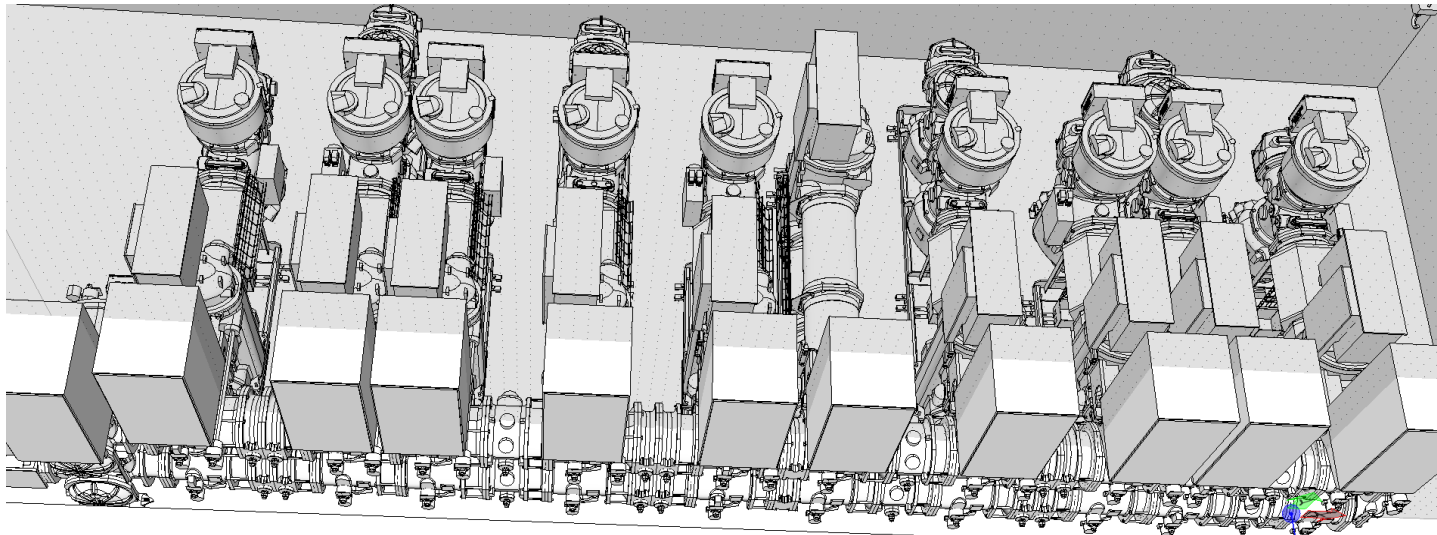
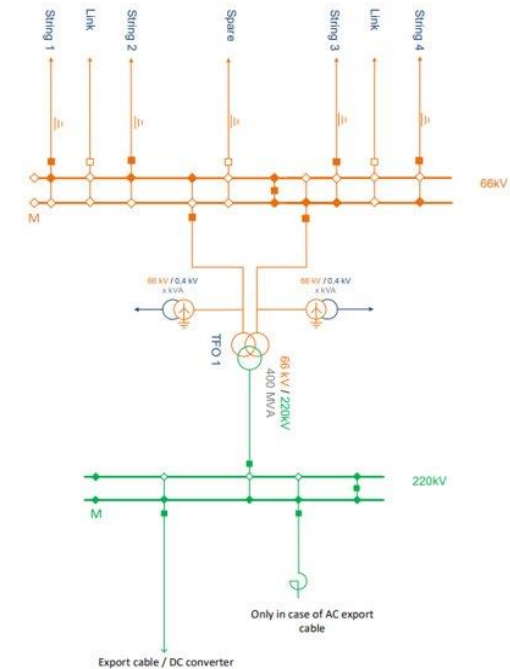
Answer Elia

Otary

Ocean Winds

- In the inter-array cable design, Elia provides 4 connections of 90MW each (350MW per transformer)
- **Elia designs 10 spare bays** for max. 3,5GW Offshore Wind
 - 5 bays for OWF optimisation or OWF curative interventions.
 - 5 bays for future connections or TSO curative interventions.

350MW building block



Several stakeholders respond about the looping of inter-array cables (i.e. connecting two strings at the end)



Otary

Ocean Winds

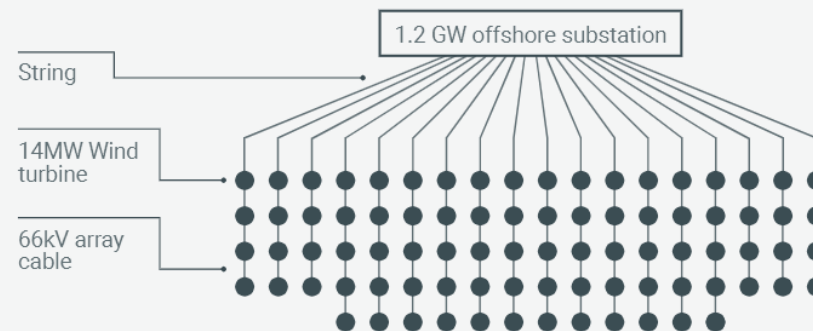
Parkwind

SGRE

Answer Elia

- The looping of strings has a strong link with the business case of the Wind Farms
- Elia concludes to keep this option available
- **The fixed requirement from Elia is that the loop cannot connect on the busbar 66kV**
- **Looping of inter-array cables stays available for auxiliary services**

66kV array system with 14MW turbines



Ref. Carbon Trust

Several stakeholders respond about the Elia proposal to install a circuit breaker on the first wind turbine



Answer Elia

- Elia has received 6 constructive responses with a **clear pushback on installing a circuit breaker and/or voltage transformers on the first wind turbine**
- **Elia** has investigated the option of the circuit breaker and **detects clear opportunities to achieve operational independence** between the OWF and Elia during the operational phase
- The feedback remains that an extra circuit breaker is an interesting idea, nonetheless will bring extra complexity and costs to the Wind Farms. **The circuit breaker will not be included on the first wind turbine and in the further design**
- Correspondingly, **Elia will require all switch** (disconnecter and earthing) **positions.**
- Elia will provide the switching procedures during detailed design

Otary

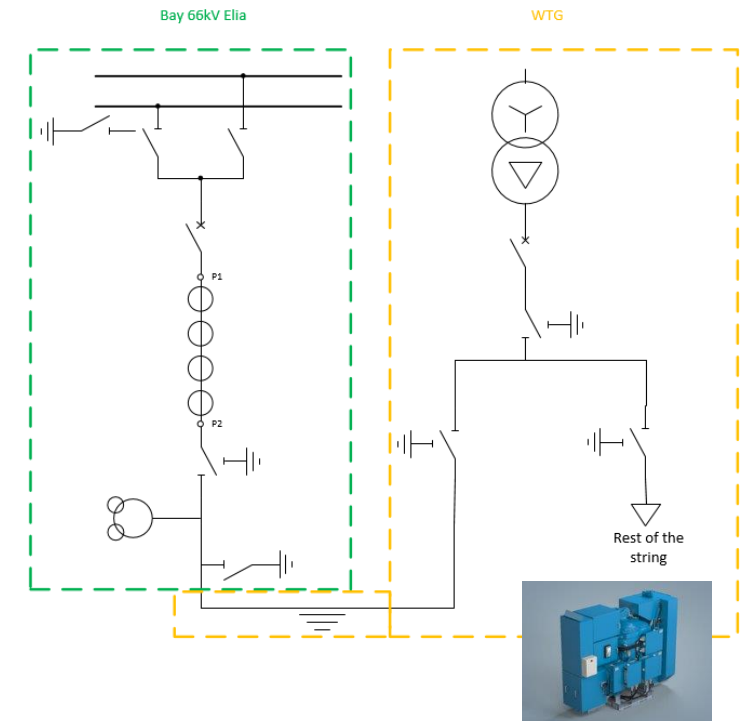
Ocean Winds

Parkwind

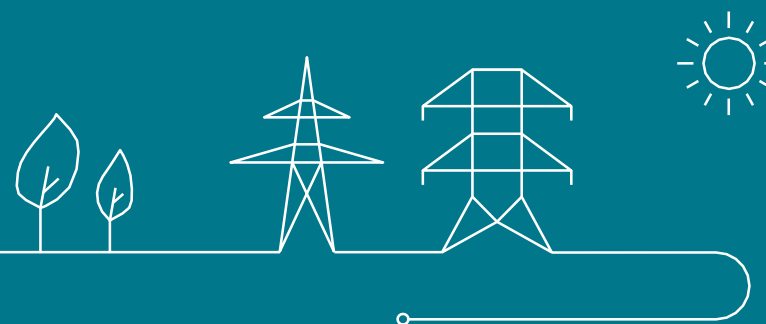
SGRE

Hitachi

Eneco



High Voltage Interface



Adaptation of the short-circuit currents



- Otary
- Ocean Winds
- Parkwind
- SGRE

Answer Elia

- The standard ratings and specific situation for the Wind Farm connection has been further investigated by Elia in relation to the short circuit currents

- **For the 3-phase short circuit Elia concludes that**
 - The short circuit current is **31,5kA** on the connection point
 - the duration (trip time) can be **lowered** from 3s to **1s**

- **For the 1-phase short circuit Elia concludes that**
 - The short circuit current can be **lowered** from 8kA to **4kA**
 - The duration (trip time) can be **lowered** from 3s to **1,2s**

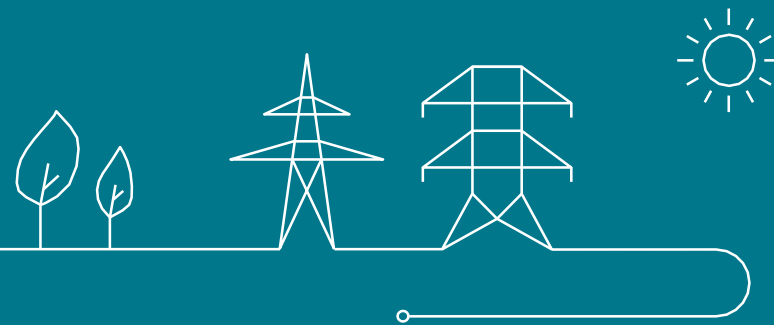
150	170	750	125 ou 100 (*)	50 ou 40 (*)	≥ 1 s	50 ou 40 (*)	0.6 s	40
110	123	550	100	40	≥ 1 s	40	0.6 s	Cable: 40 Ligne: 40 ou 31,5 (*)
70	82.5	380	100 ou 80 ou 50 (*)	40 ou 31.5 ou 20 (*)	≥ 1 s	40 ou 31.5 ou 20 (*)	0.6 s	Cable: 25 Ligne: 25 ou 20(*)

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36	40.5 (42)	200 ou ≥ 170 (*)	100 ou 80(*)	40 ou 31.5 (*)	≥ 1.2 s	40 ou 31.5 (*)	3φ: 1.2 s 1φ: 1.2 s	3φ: 31,5 1φ: 4
30	36	170	100 ou 80 (*)	40 ou 31.5 (*)	≥ 1.2 s	40 ou 31.5 (*)		
26	30	145	80 ou 63 (*)	31.5 ou 25 (*)	≥ 2 s (1)	31.5 ou 25 (*)		
15	17.5	95	63	25	≥ 2 s (1)	25	3φ: 2 s 1φ: 3,3 s	3φ: 25 1φ: 4
11-12	17.5	95	63	25	≥ 2 s (1)	25		
10	12	75	63	25	≥ 2 s (1)	25		
6	7.2	60	63	25	≥ 2 s (1)	25		

(*): suivant la décision du gestionnaire du réseau

Low Voltage Interface



Stakeholders respond on the cable protection



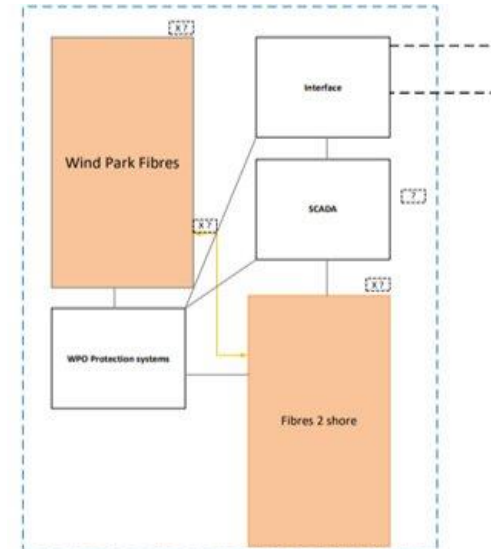
Otary

Parkwind

SGRE

Answer Elia

- The **protection and interface cubicles** will be installed on the **island substation**
- The interface Elia – OWF lays in the cubicles provided by Elia in the dedicated wind farm room on the substation
- **Elia will protect the 66kV inter-array cables** with **two distance protections**
- Elia **investigates the need of an overload protection** of the 66kV inter-array cable
- Joint scope Elia – OWF will be necessary during detailed design and construction



Offshore wind farm interface



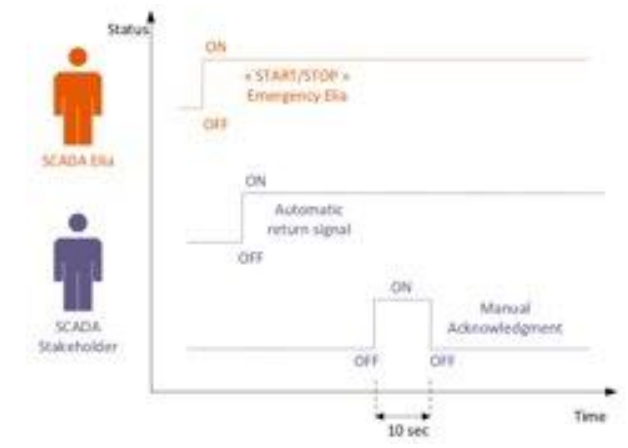
Otary

Parkwind

Answer Elia

- The **Elia 66kV bay controller** includes a **built-in measurement convertor**
 - For time critical purposes Elia concludes that a dedicated **OWF measuring convertor should be installed in the Elia protection cubicle.**
 - For all other purposes Elia concludes **protocol IEC104 via RTU/DCS Elia towards the OWF interface cubicle is applicable**
- For safety reasons Elia cannot allow a direct connection** to a dedicated current transformer and voltage transformer
- Elia will provide hard wired** the real time counting impulses for **metering purpose**
- The exchange list of all I/O will be part of the detailed design

Device	Sineax DM5S	SIEMENS 7KG85	GE I5MT
Response time	85...165ms	200ms	100ms
Interface	Modbus/RTU (via RS485) 4 analogue outputs +/-20mA	Modbus/RTU Modbus/TCP IEC61850 IEC60870-5-103	Modbus/RTU Modbus/TCP 4 analogue outputs +/-20mA



Thank you.

