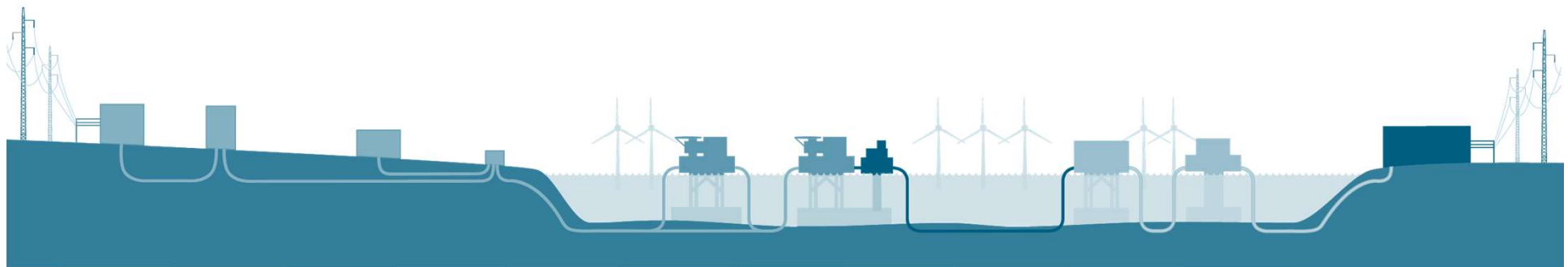


Kriegers Flak Combined Grid Solution

RGI Workshop to share best practices

22.01.2019

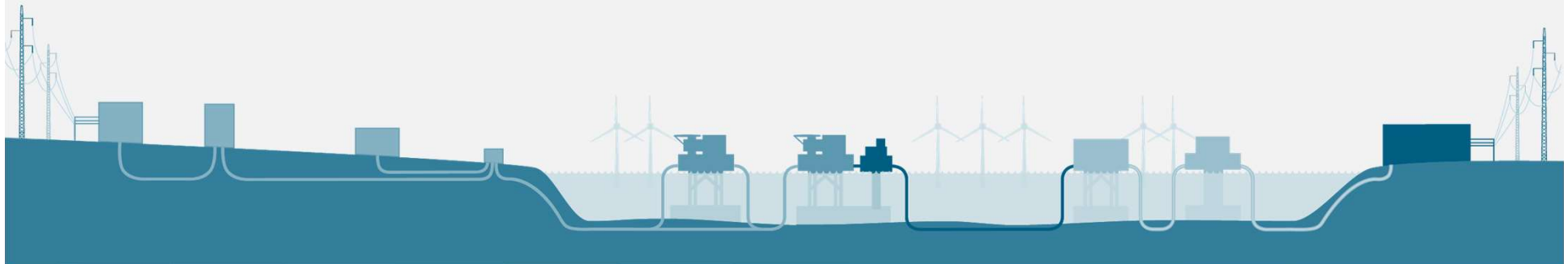
Madeleine Schmidt for 50Hertz



Content

1. The TSO 50Hertz
2. Project Overview
3. Technical Aspects
4. Permitting Procedure
5. Environmental Protection
6. Summary

1. The TSO 50Hertz

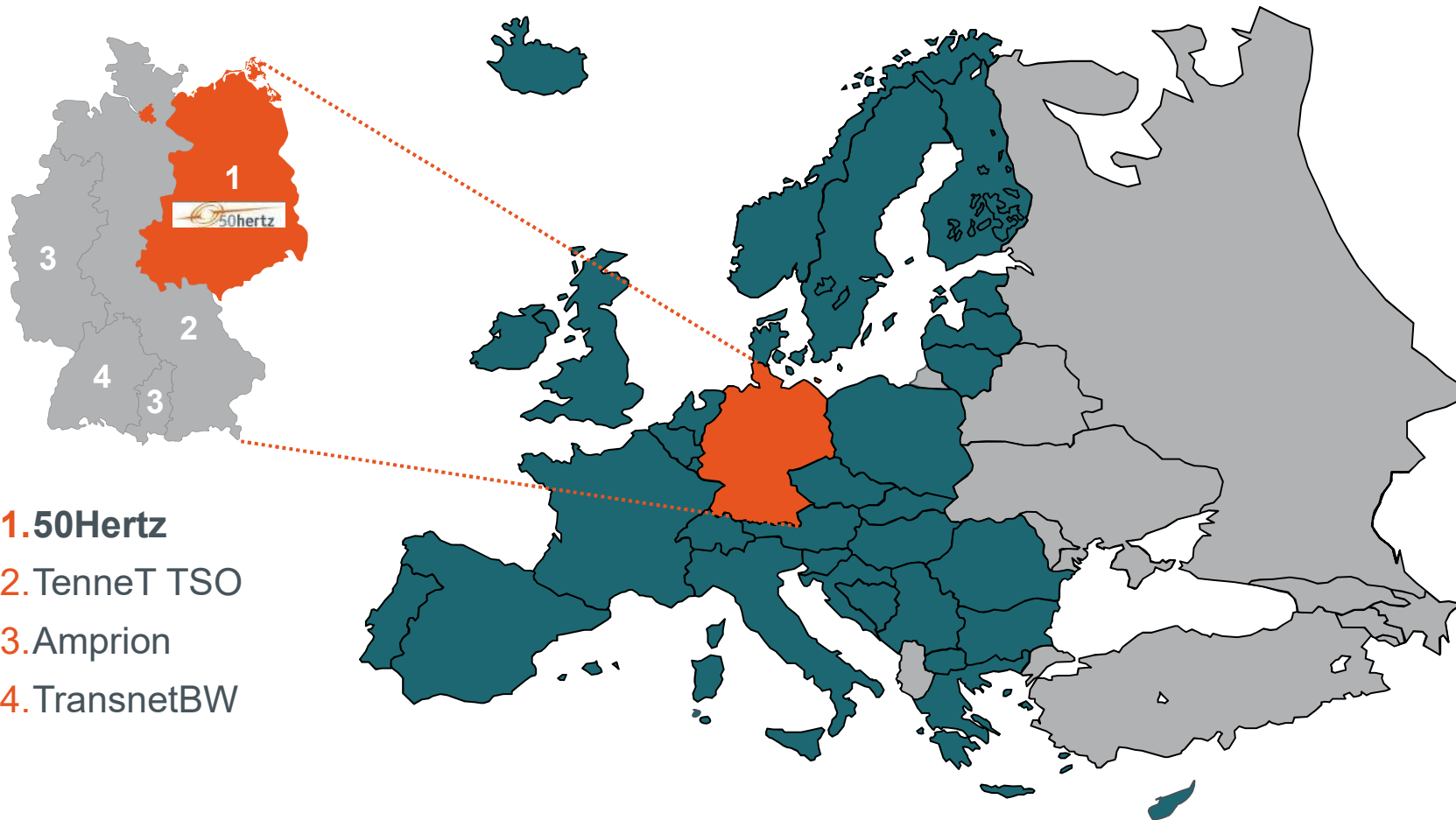


The Transmission System Operator 50Hertz

- Ensures the supply of electricity to over 18 million people in Germany
- Transmission System Operator for Berlin, Brandenburg, Hamburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt and Thuringia
- Responsible for the operation, maintenance and the development of the "Electricity Highways" (220 kV and 380 kV)

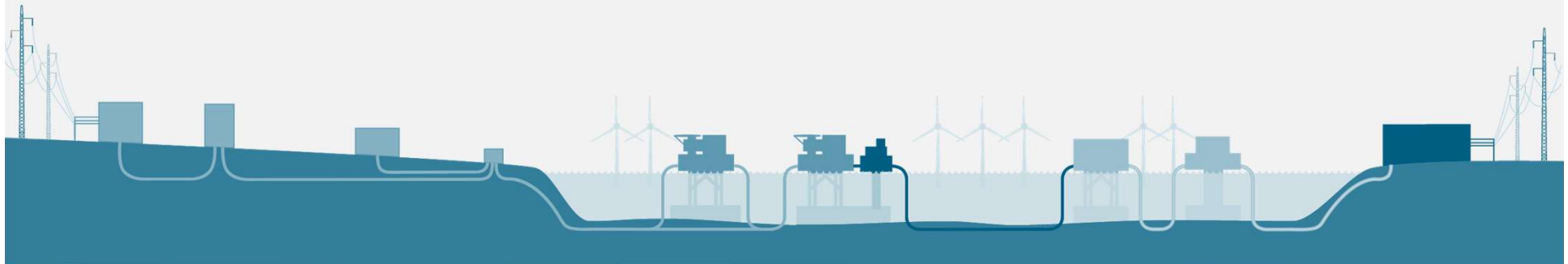


50Hertz as a part of the European Electricity System



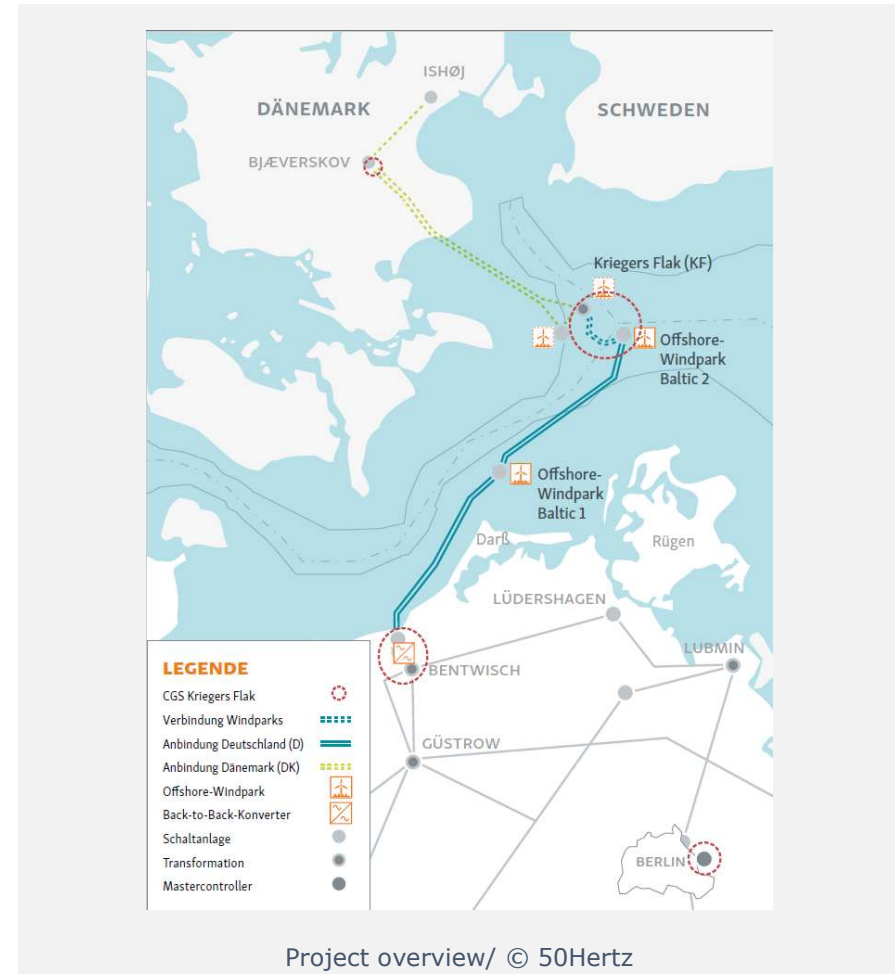
- 1. 50Hertz
- 2. Tennet TSO
- 3. Amprion
- 4. TransnetBW

2. Project Overview



Combined Grid Solution - A Brief Overview

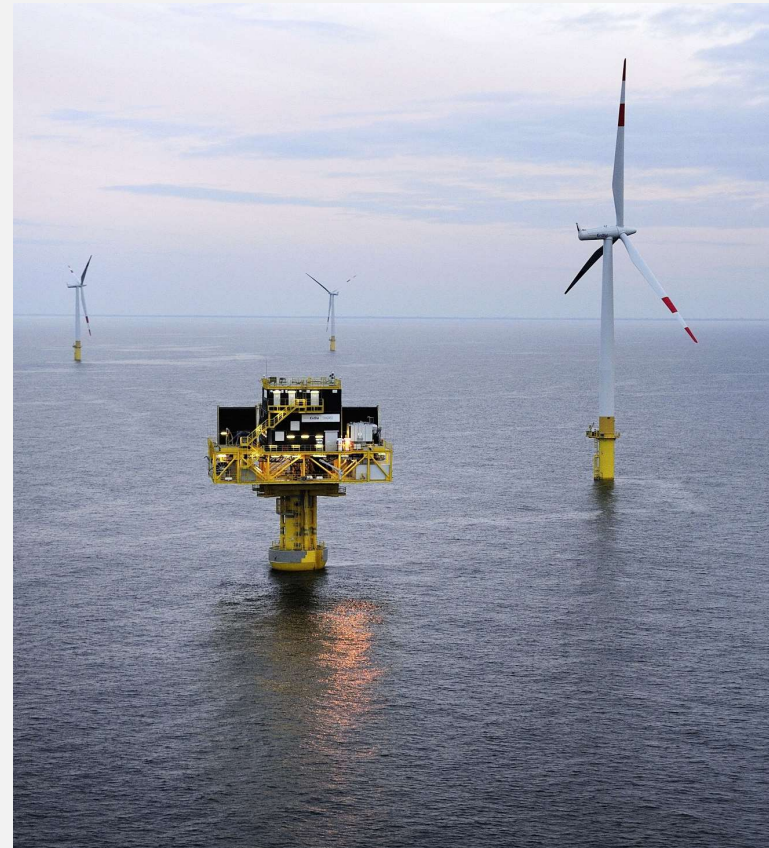
- CGS will link the German Mecklenburg-Western Pomerania and the Danish region of Sjælland
- Interconnection between the existing German offshore wind farms Baltic 1 & 2 and the Danish offshore wind farm (OWF) Kriegers Flak (under construction)
- Project partners: Energinet (Denmark) and 50Hertz (Germany)
- The project is co-financed by the European Energy Program for Recovery (EU)



Objectives

The Combined Grid Solution...

- contributes to the single electricity market in Europe
- fosters the energy transition in Denmark and Germany by strengthening the integration of renewable energies in the electricity grid
- increases the security of supply by stabilising the electricity system
- contributes to the objective of the EU-council to provide 15 per cent of generating capacities as interconnector capacities



Offshore platform Baltic 1 / © 50Hertz

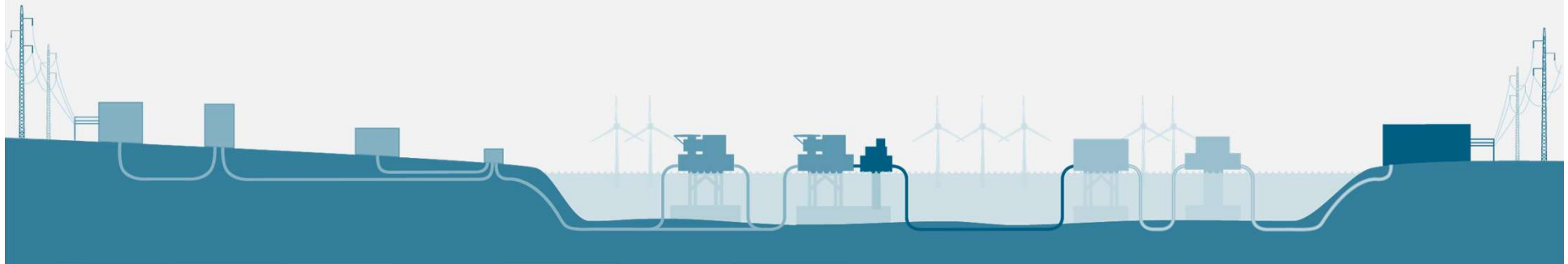
First of its kind

- The world's first connection of offshore wind parks and interconnector for two national grids within one system
- Higher utilization of the offshore infrastructure than normal.
- Strong wind = wind power transport
- Low or no wind = energy exchange between the countries
- Effective way to manage fluctuations in supply and demand of intermittent resources

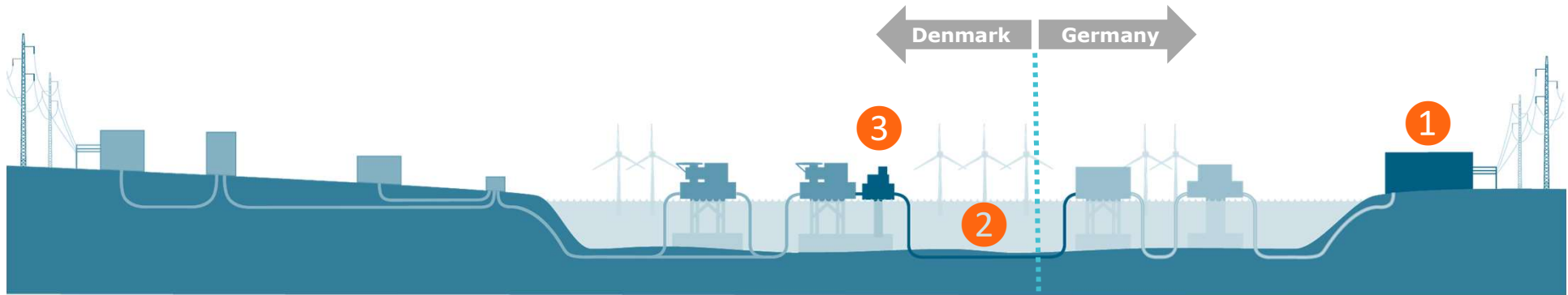


Offshore platform Baltic 2 / © 50Hertz

3. Technical Aspects



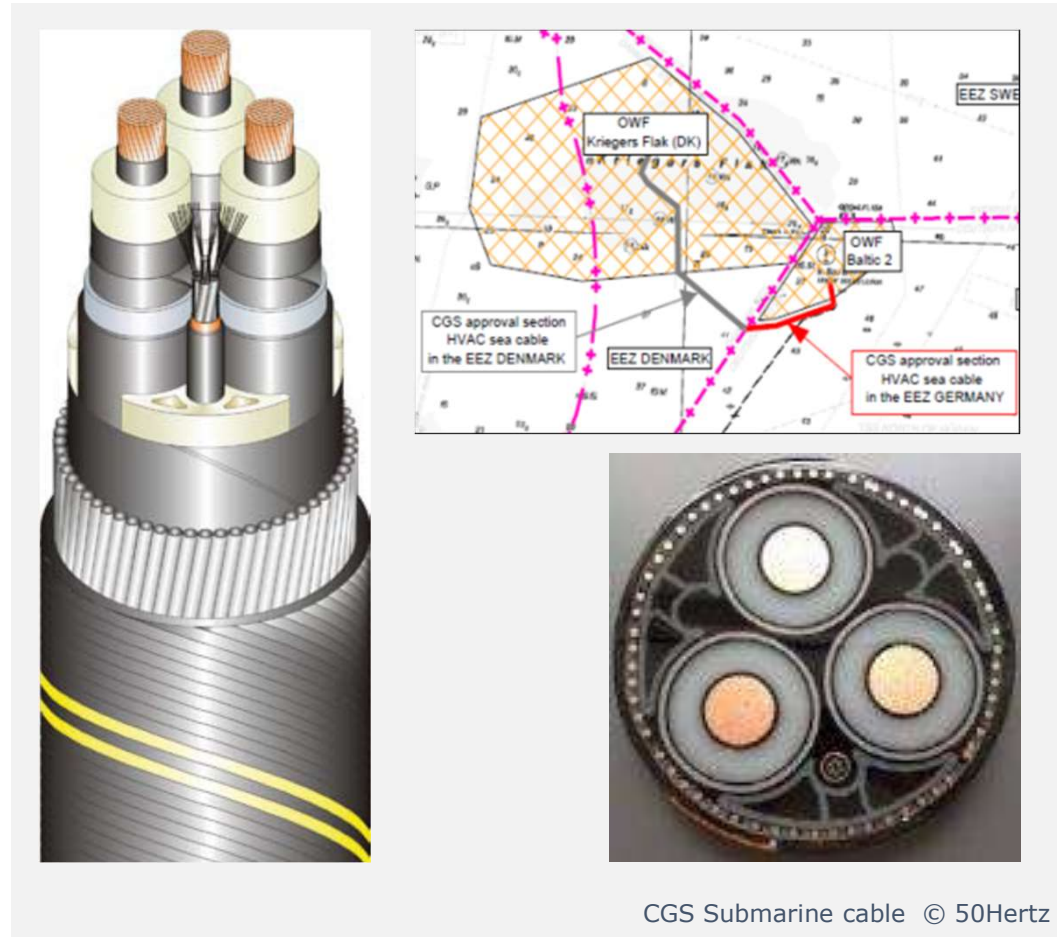
The CGS Subprojects



	Subproject	Scope
1	Back-to-Back Converter (GER)	EPC for a HVDC Back-to-Back (BtB), incl. extension works for Substation Bentwisch and Master Controller for Interconnector Operation - MIO
2	Sea Cables (GER/DK)	EPCI for two AC sea cables connecting OSS Ba2 with OSS KFE
3	OSS KFE, Ext. Bjaeverskov (DK)	EPCI for the HVAC Offshore Plattform „KFE“ as extension of Kriegers Flak OSS KFB, plus extension works for Substation in Bjaeverskov

Submarine cables

- Two AC Submarine Cables connecting German wind farm Baltic 2 and the new build Danish Kriegers Flak KFBE platform
- Type: 3x1x800 mm²-HVAC-XLPE (Cu)
- Voltage: 150 kV
- Power: 200 MW
- Length: 24,5 km each
- Plus 1 Fibre Optics



CGS Submarine cable © 50Hertz

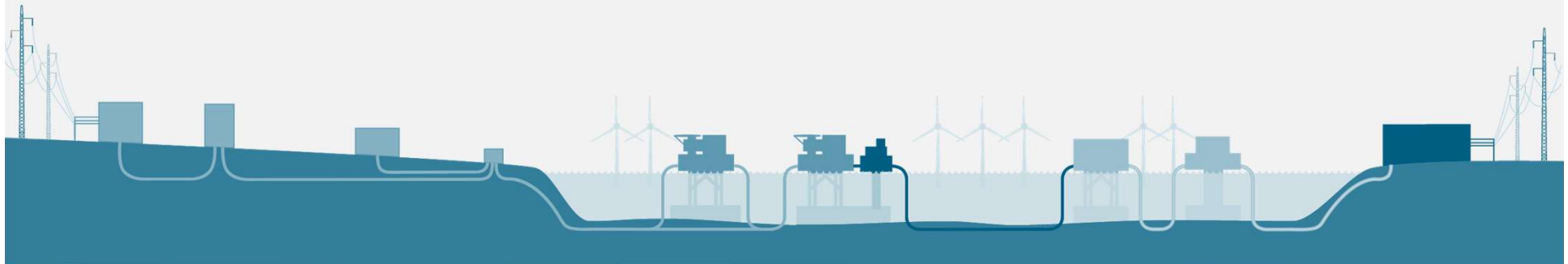
Offshore cable laying

- The two 150 kV submarine cables will be transferred to the turn table of an offshore cable laying vessel
- At offshore site the cables will be laid down to the prepared sea bed and pulled into both offshore platforms Baltic 2 and KFE
- The seabed will be prepared for cables laying by UXO survey and clearance and pre trenching
- After laydown to the sea bed the cables will be buried into final depths up to 1.5 m
- After final installation the sea bed will be re-established

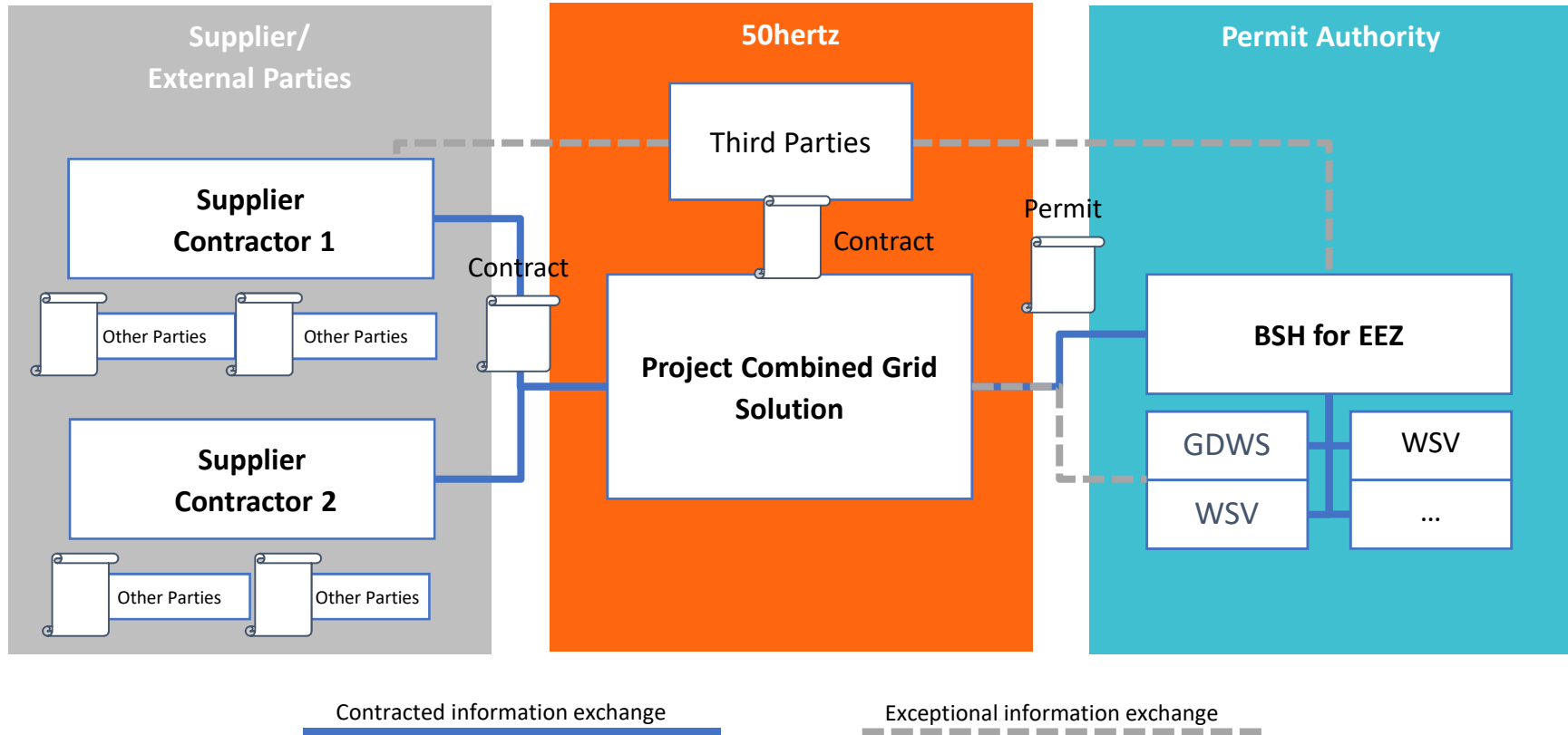


Cable laying vessel © Caley Ocean / Cable Turn Table © VBMS

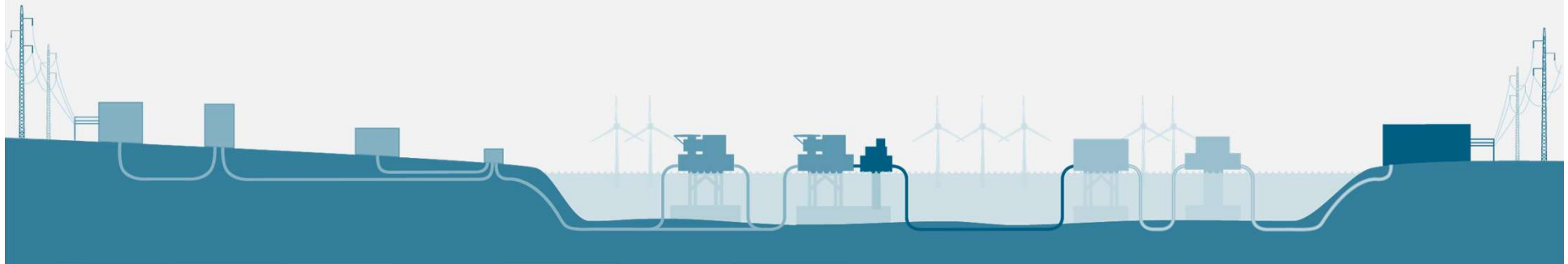
4. Permitting Procedure



50hertz is the project's face to authorities



5. Environmental protection



Environmental protection

- Environment protection is of utmost importance for 50Hertz and Energinet while planning and constructing.
- 50Hertz is committed to minimising the impact on the environment, animals, plants and water through active environment protection.
- 50Hertz works in close coordination with environment protection agencies of both countries and implement adequate compensatory measures when required.
- 50Hertz enters into active dialogue not only with the approving authorities, but also with NGO and citizens involved.



© 50Hertz

Protecting the offshore environment

- German coastal zones are an important biotope for many species. The high significance of coastal zones is reflected by the fact that wide coastal surfaces have already been turned into nature reserves.
- In the future, more research will be done on the effects of offshore wind parks and of installing and maintaining cables
- Currently protection is generally through compliance with 2K criteria and/or through implementation of compensation measures



1 Submarine Cable © 50Hertz/ 2 Cable © VBMS

The 3 kinds of compensation measures

- There are 3 different ways to do compensation measures:
 - Replacement compensation
 - Substitution compensation
 - Monetary compensation
- Authorities can request different compensation measures in Offshore Projects:
- BSH – EEZ (CGS, CWA1):
 - Obligation to create artificial reefs
 - Preparation of a concept for execution of the compensation measures
- EM M-V - Coastal waters Mecklenburg Western Pomerania (CWA1) :
 - Decommissioning of the Görmitz dam,
 - In the event that further compensation is required, that creation of reefs in the area „Großer Stubber“ is possible
- Consequently 50Hertz is concerned with the creation of reefs

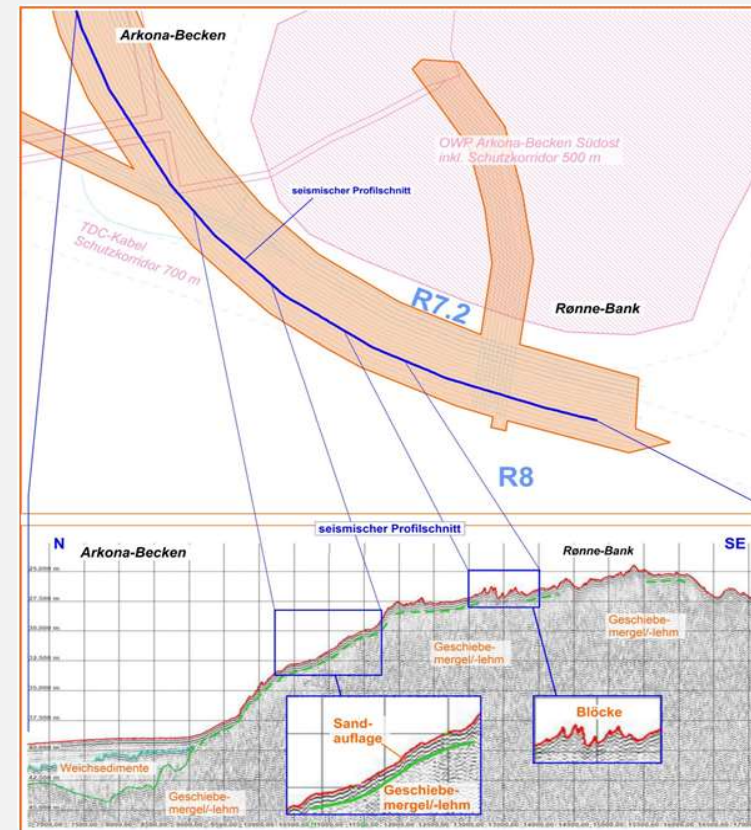


Compensatory measure decommissioning of the Görmitz dam / © 50Hertz

Creation of an artificial reef

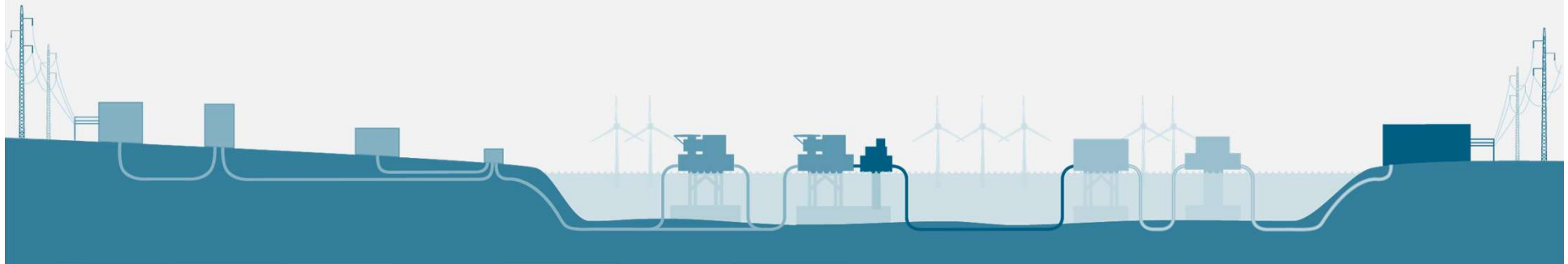
Planning of a compensation measure – creation of an artificial reef

- Planning the reef concept
- Assessment of existing geophysical data
- Researching historical geophysical and geotechnical data
- Analysis of the data and calculation of the potential compensation areas
- Finalising the reef concept and submission to the authorities
- Concept is subject to ongoing revision in line with as-built of the project



Compensatory measure / © 50Hertz

6. Summary



Identifying difficulties, finding solutions

- Defining agreed target areas for future compensation measurements
- Definition of distances from planned reefs to infrastructure and other uses
- Unclear allocation of costs for surveys especially in the case of subsequently unsuitable areas
- Clear definition in advance of suitable biotope areas
- Consistent requirements for target biotopes: creation/ reconstruction of natural/artificial reefs
- BSH and EM have differing scoring systems in the EEZ and coastal waters respectively
- Limitation of costs for the compensation measurements needed

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