

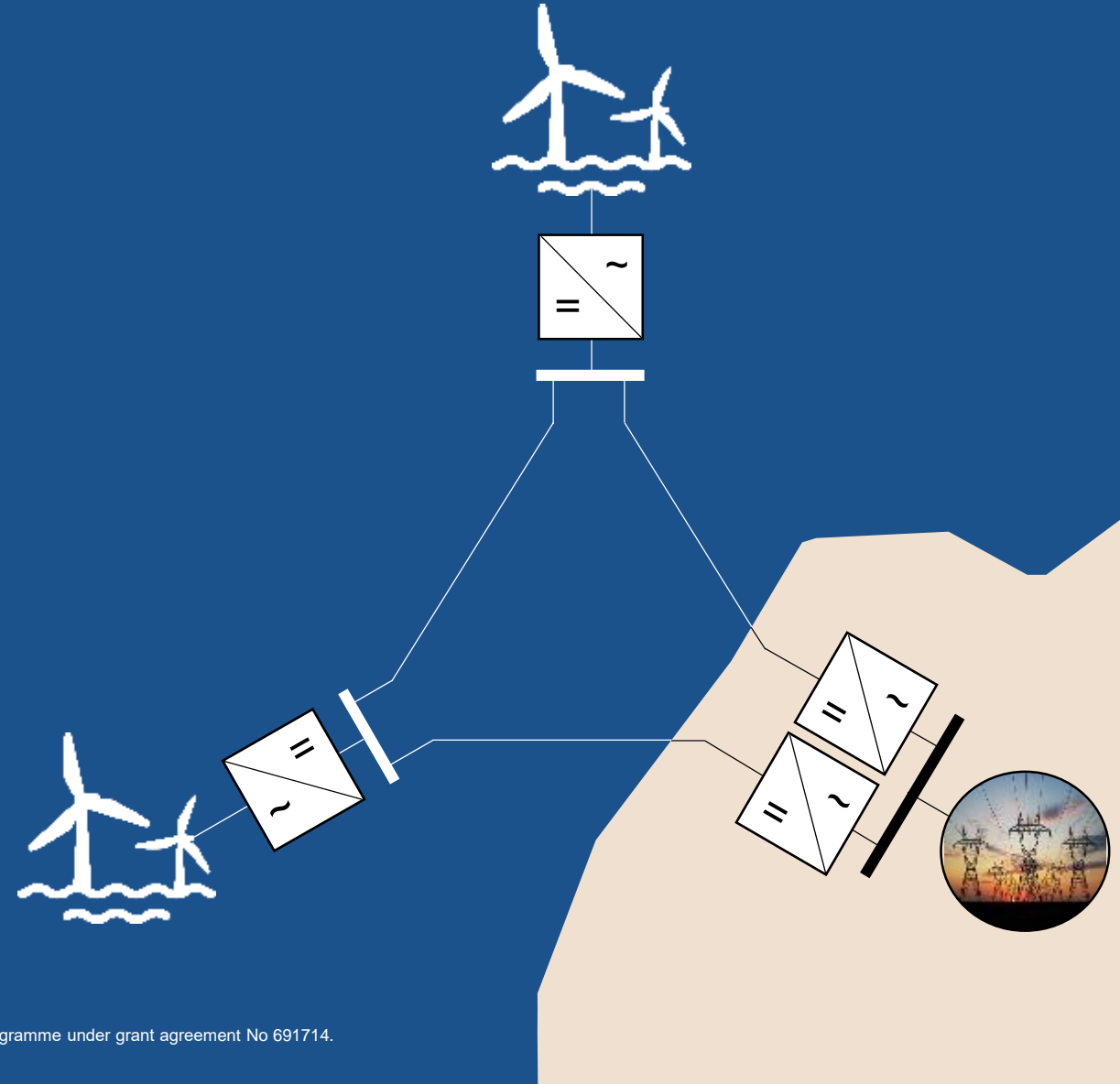
Progress on Meshed Offshore HVDC Transmission Networks

27th of November 2019 | Copenhagen | WindEurope Offshore Conference | Cornelis Plet (DNV GL)

Progress on Meshed Offshore HVDC Transmission Networks

Enabling the North Sea power house

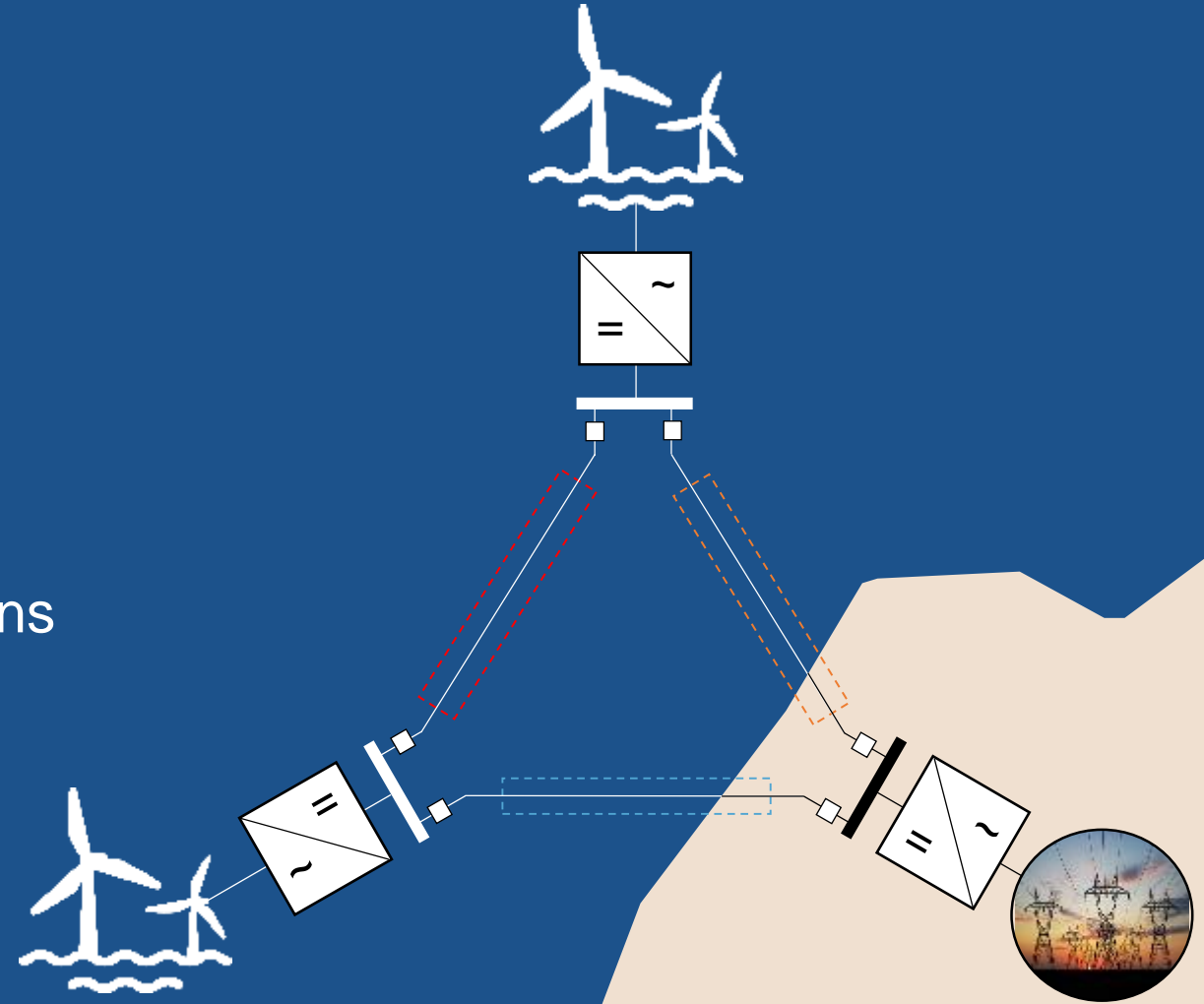
- Improve capacity utilisation by combining:
 - Offshore wind export
 - Interconnection
 - AC grids reinforcements



Progress on Meshed Offshore HVDC Transmission Networks

Enabling the North Sea power house

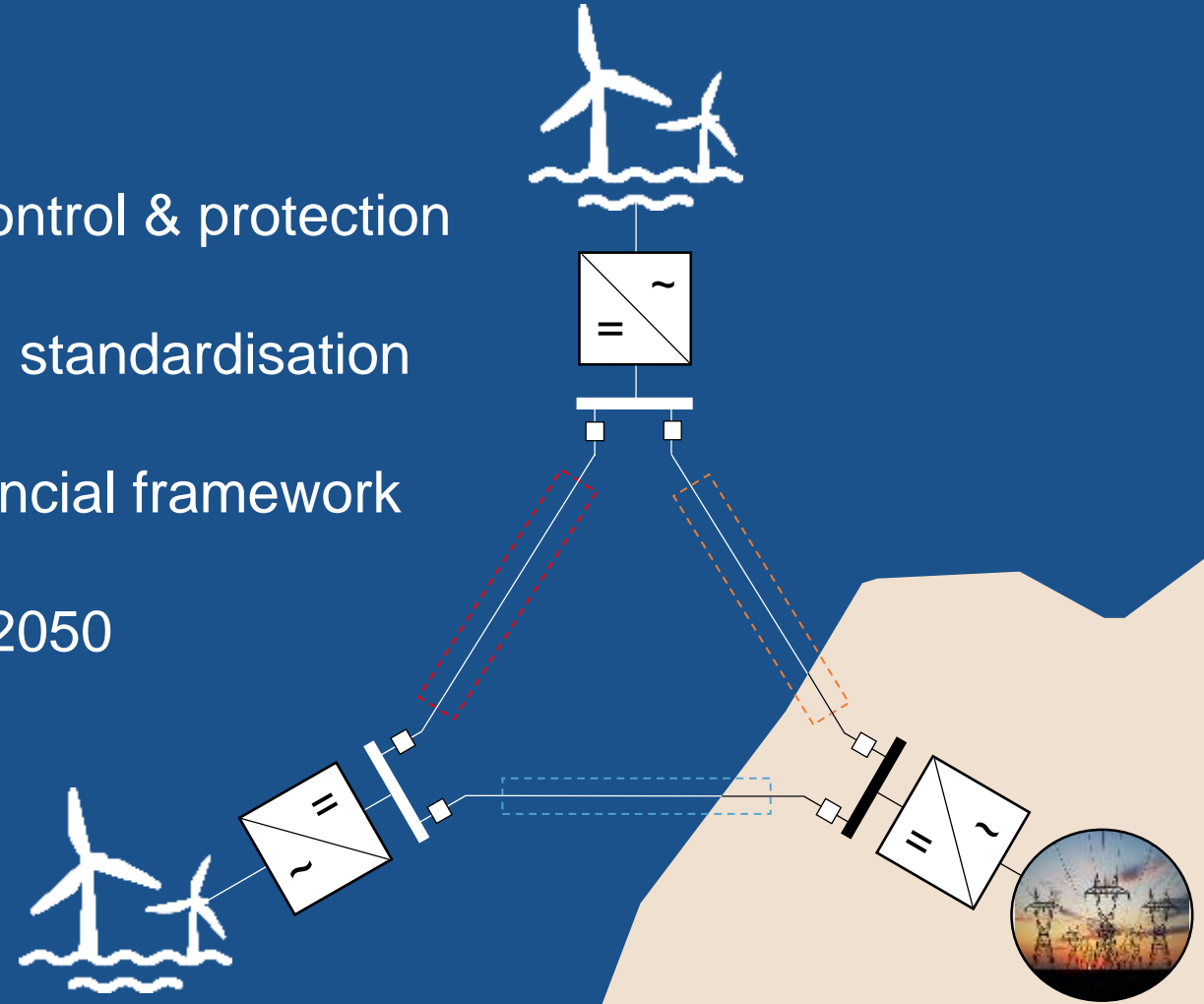
- Improve capacity utilisation by combining:
 - Offshore wind export
 - Interconnection
 - AC grids reinforcements
- Connect on the DC side
- Benefits compared to point-point connections
 - Better availability
 - Lower CAPEX
 - Lower OPEX



Progress on Meshed Offshore HVDC Transmission Networks

Enabling the North Sea power house

- Develop cost effective & reliable network control & protection
- Achieve technology interoperability through standardisation
- Recommendations for EU regulatory & financial framework
- Deployment plan for implementation up to 2050
- Full scale technology demonstrations



Statistics



33 partners



11 countries

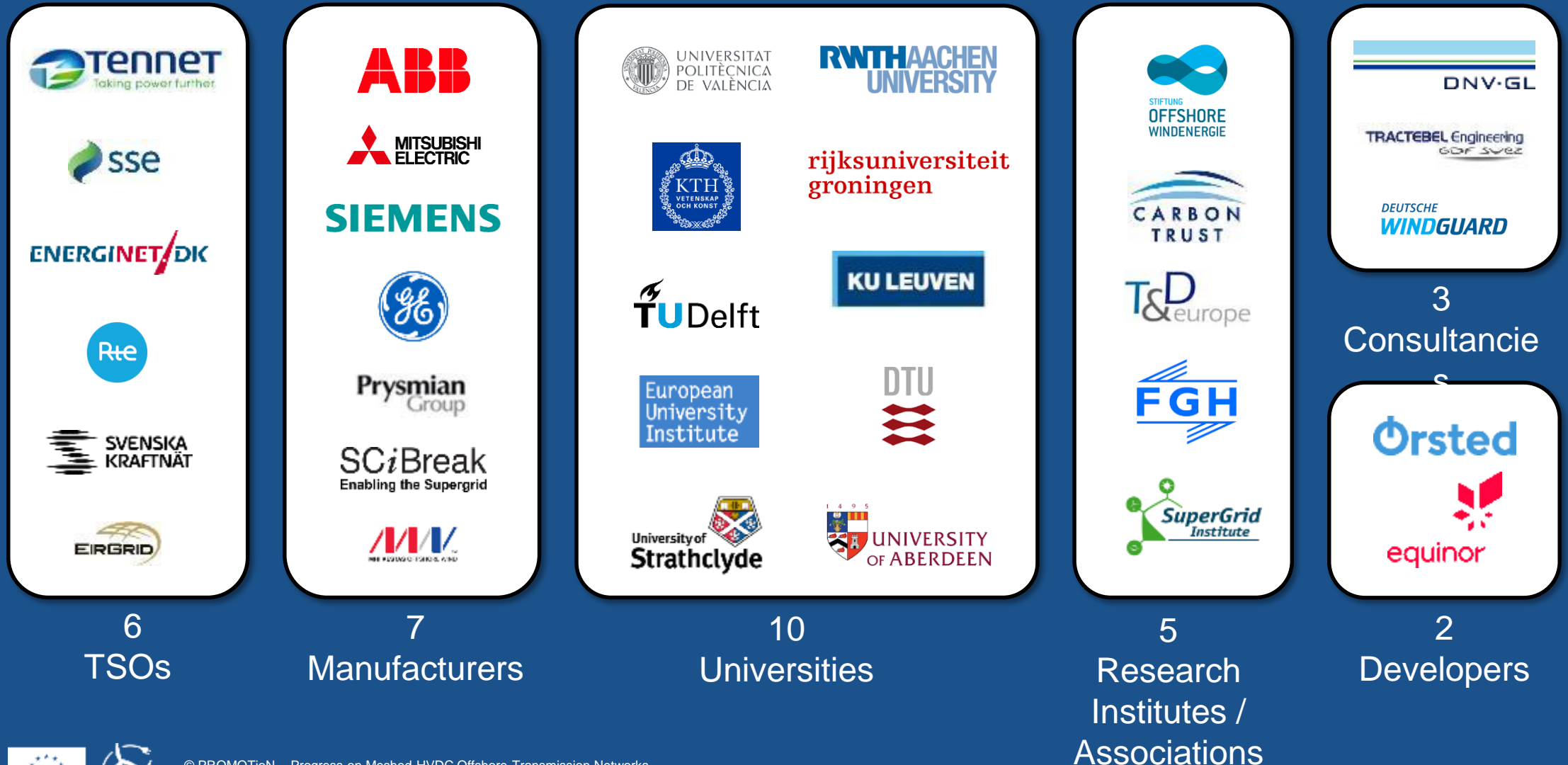


4,5 years



42 million EUR

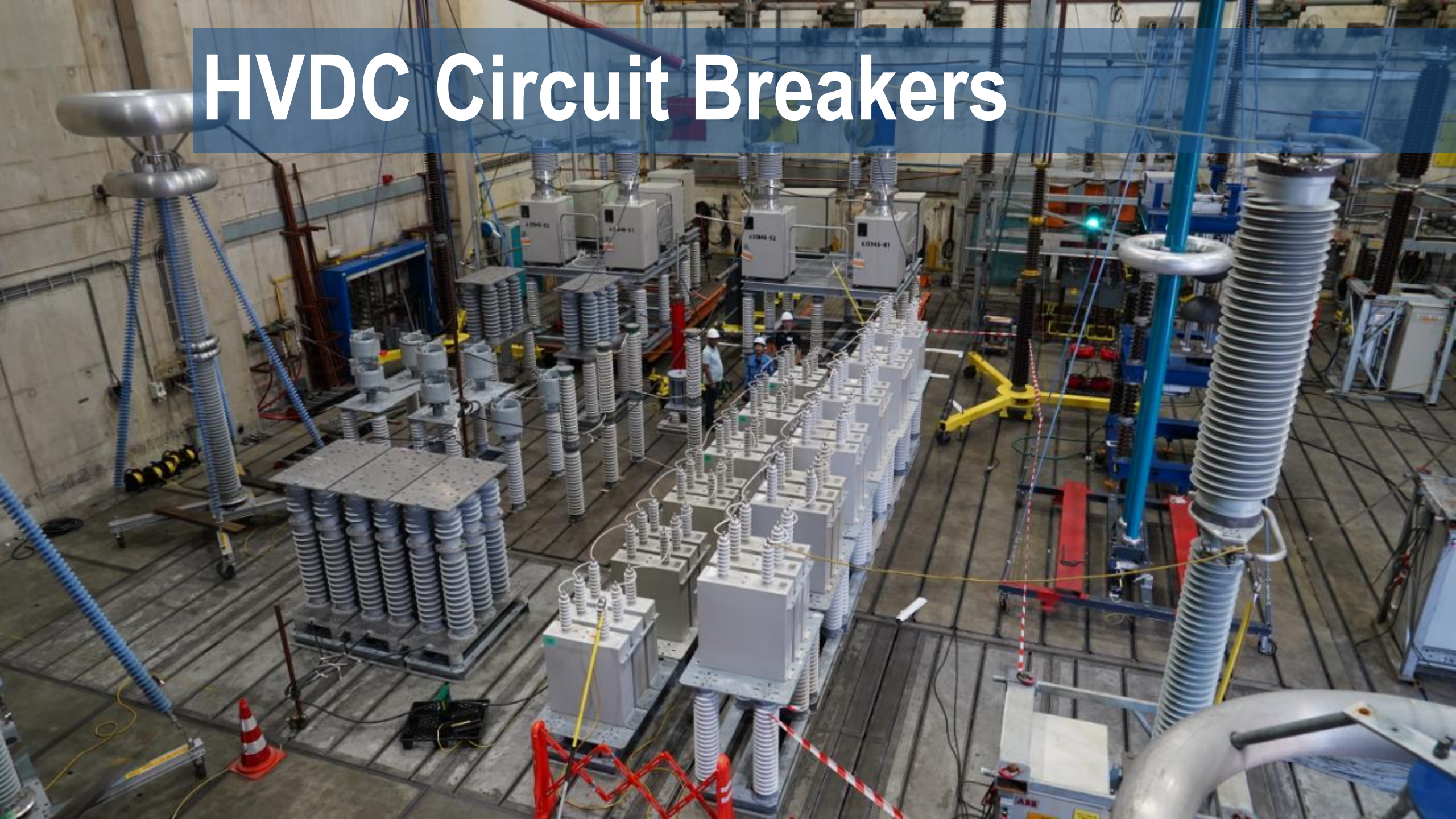
The Partners – Covering the Offshore Grid Value Chain



Meshed HVDC grid technology is real

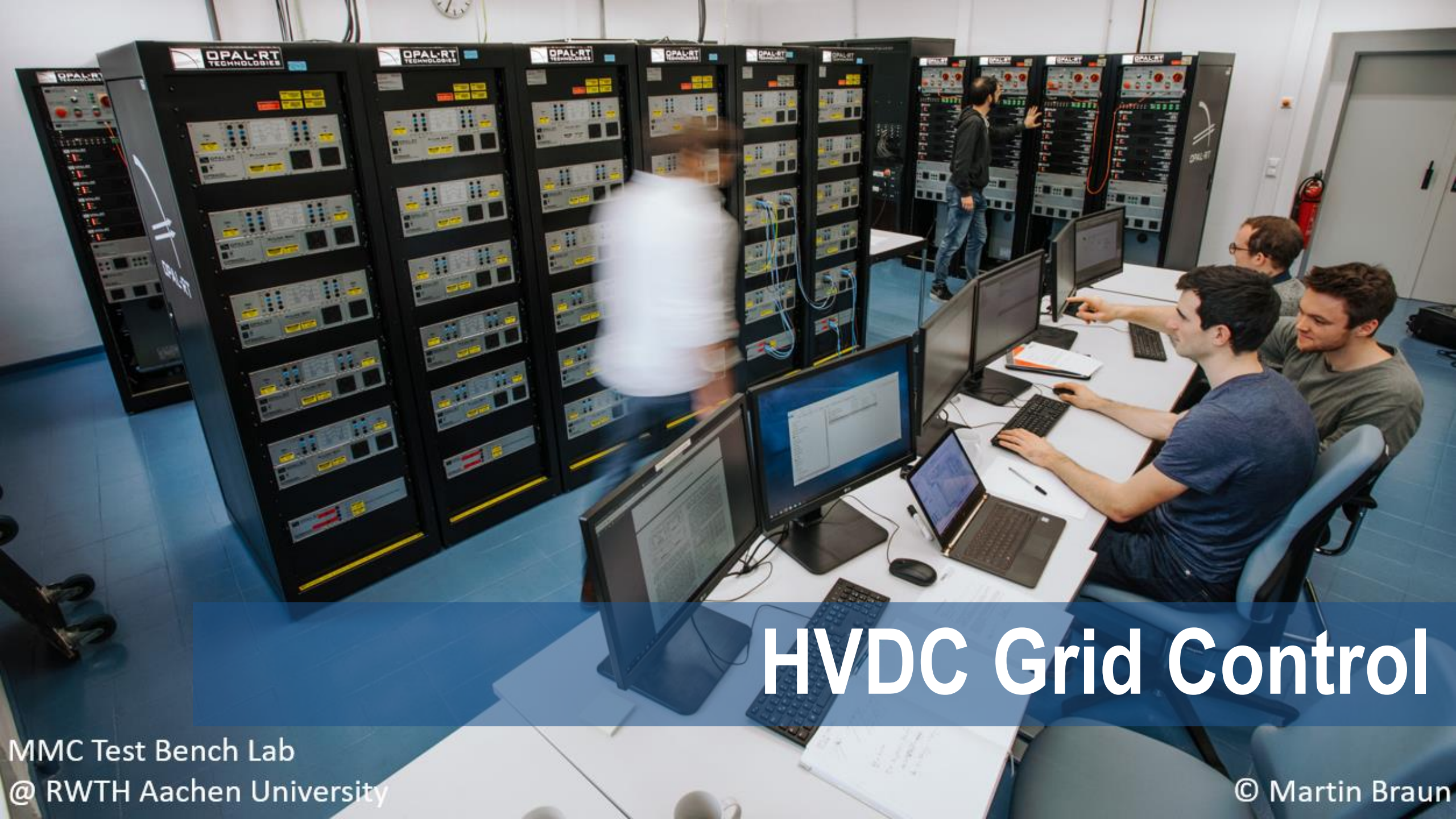


HVDC Circuit Breakers



HVDC Gas Insulated Systems





HVDC Grid Control

MMC Test Bench Lab
@ RWTH Aachen University

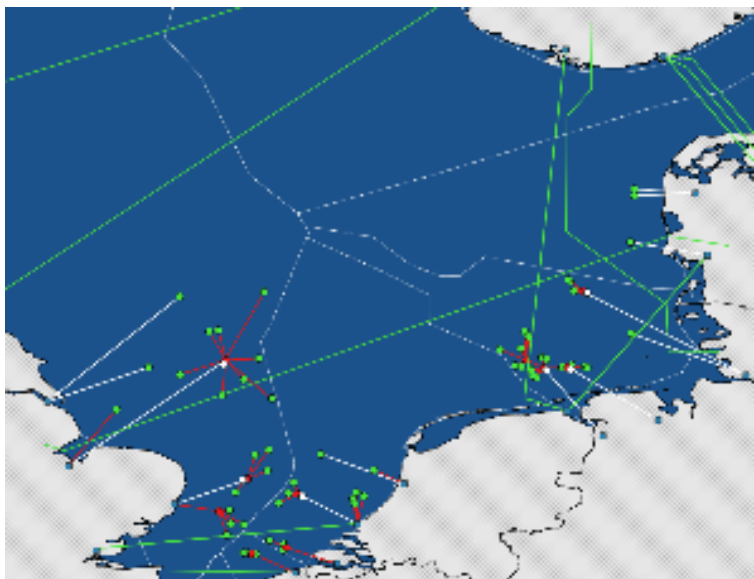
© Martin Braun



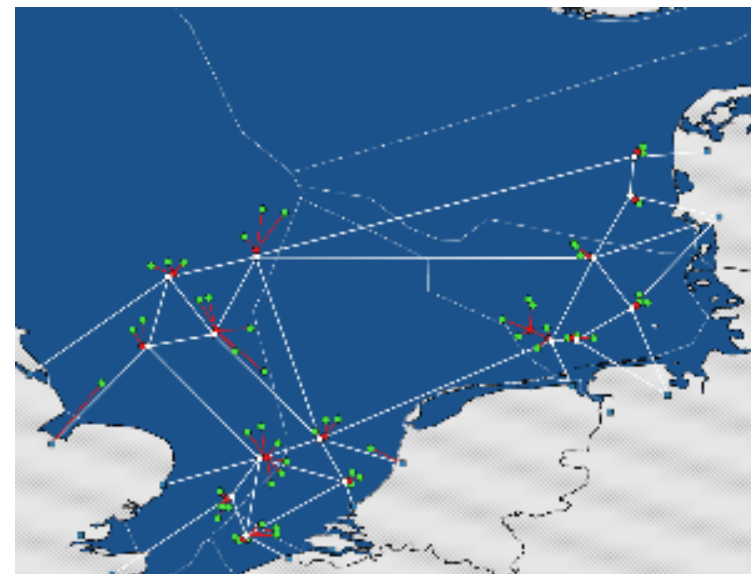
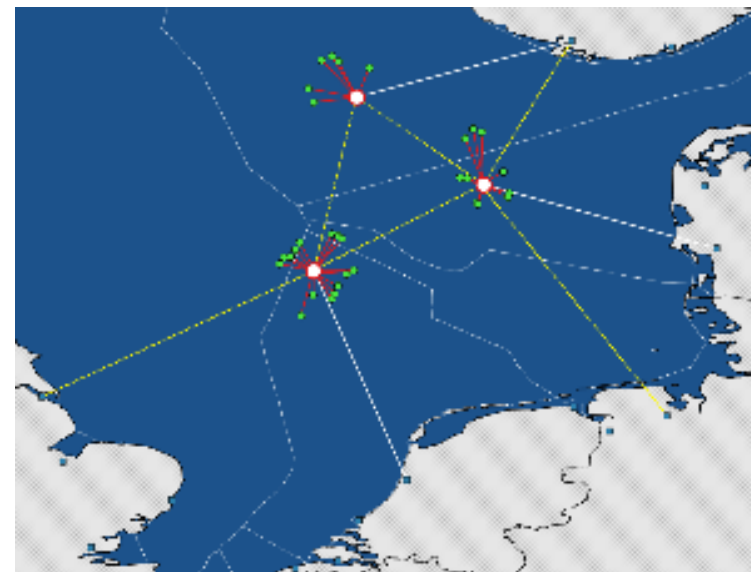
HVDC Grid Protection

Multi-terminal HVDC grids will develop incrementally





?

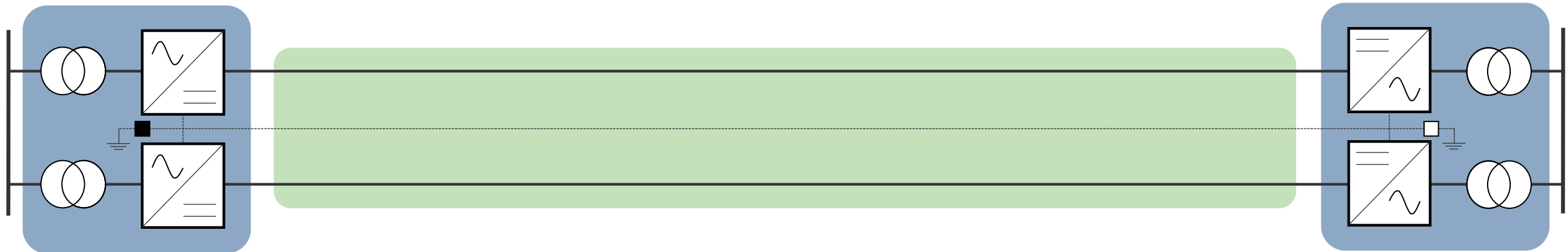


Who integrates the HVDC system?



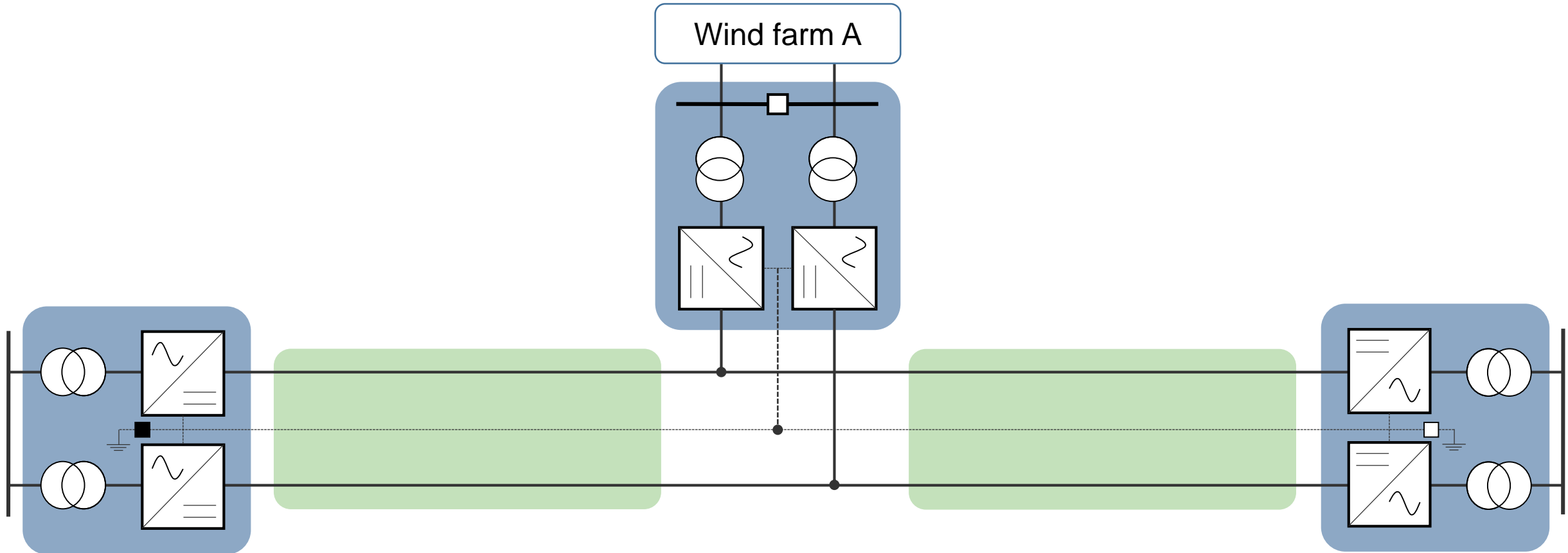
Manufacturer A

Manufacturer B



Manufacturer A

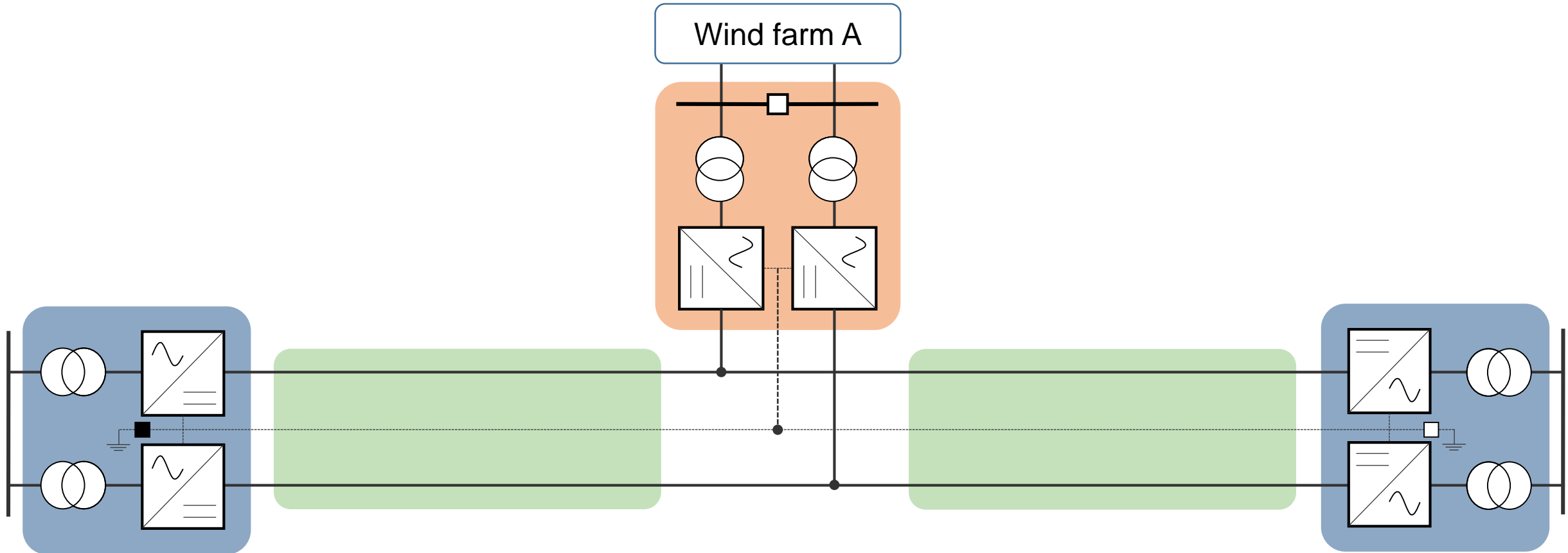
Manufacturer B



Manufacturer A

Manufacturer B

Manufacturer C



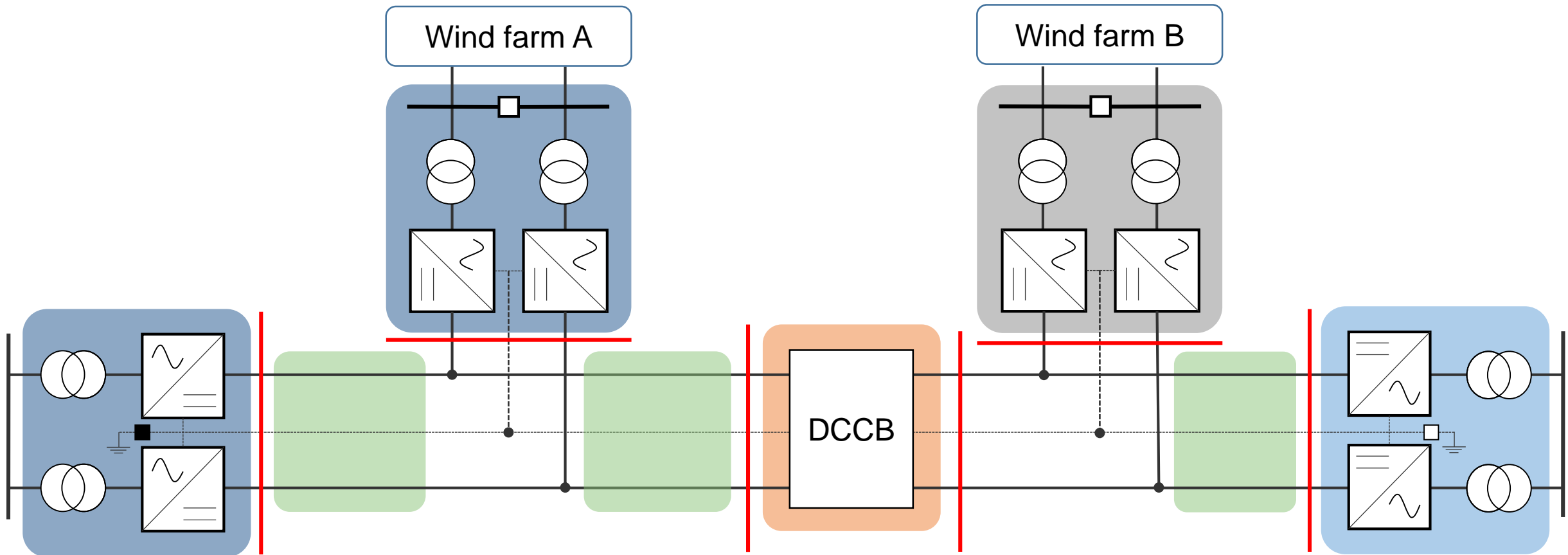
Manufacturer A

Manufacturer B

Manufacturer C

Manufacturer D

Manufacturer E



Need for Standardised Interfaces



Harmonize HVDC system characteristics



Google

Google
Maps

Wikipedia

News

Popul

**This accessory may
not be supported.**

Dismiss



Harmonisation
&
standardisation

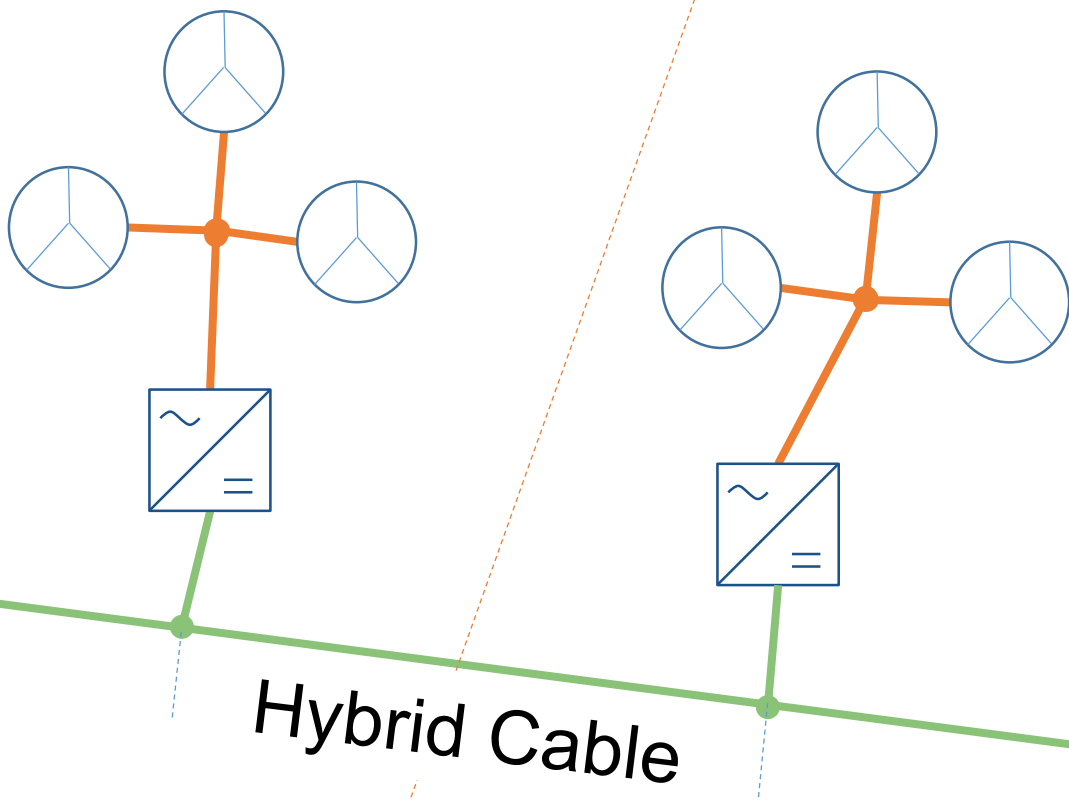


Regulate hybrid assets



Country A

EEZ (A) EEZ (B)



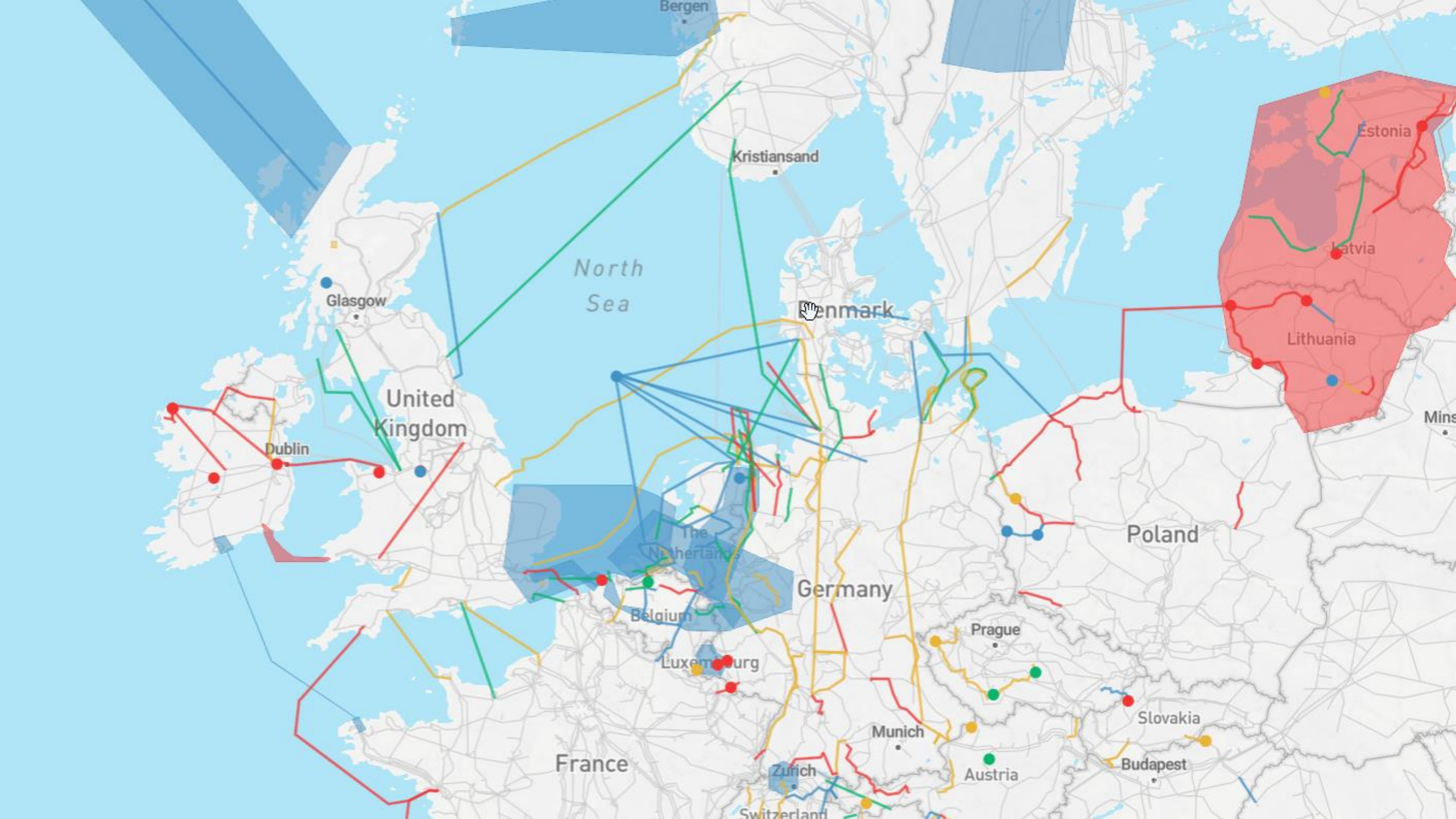
Hybrid Cable

Country B



Coordinate internationally





Conclusions

Ingredients for HVDC multi-terminal grids are ready...
...but HVDC system integration remains key challenge:

- Requires change in responsibilities
- Need for further harmonisation & standardisation



Conclusions

Pragmatic international political collaboration & cooperation cannot wait!

North Sea Treaty





PROMOTioN

PROGRESS ON MESHED HVDC
OFFSHORE TRANSMISSION
NETWORKS

www.promotion-offshore.net/newsletter



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APPENDIX

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