

TECHNOLOGY FROM THE MANUFACTURERS PERSPECTIVE

PROMOTiON Workshop: Best Practice on HVDC Projects, 5th October 2016, Edinburgh, Mitsubishi Electric Europe

Mitsubishi Electric Europe

History

- ↗ Mitsubishi Electric Corporation : established in 1921 from a shipbuilding company
- ↗ Mitsubishi Electric Europe: first European office opened in 1969 in London

Locations

- ↗ Head Quarter Europe: the Netherlands
- ↗ Power System Group: London UK

Products and Services:

- ↗ Building Systems
- ↗ Air conditioning Systems
- ↗ Transportation Systems
- ↗ Semiconductor Devices
- ↗ Energy Systems

Transmission & Distribution Systems



Transformers



Switchgears

Power Generation Systems



Static Var Systems



Instrumentation and Control

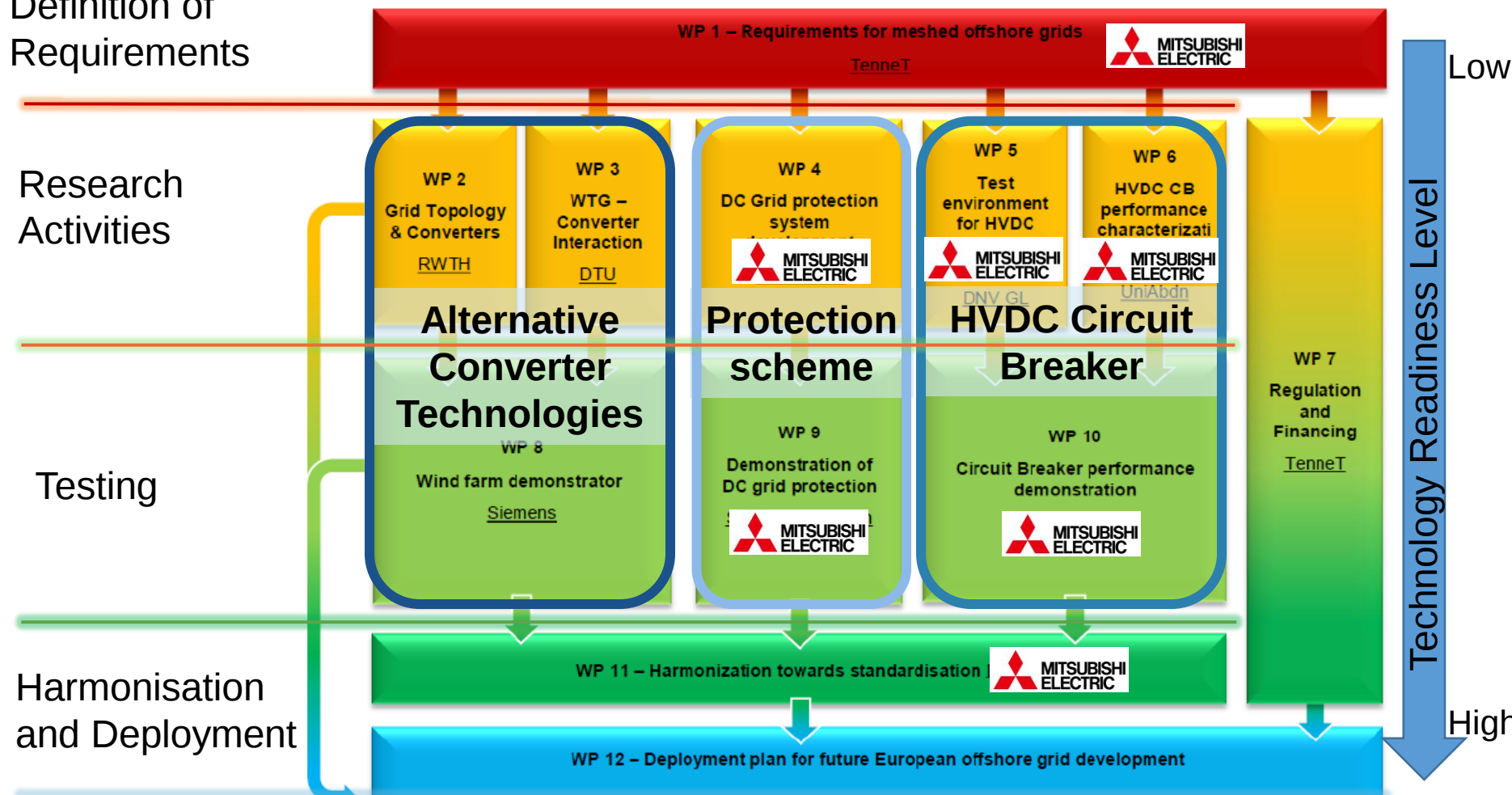
Mitsubishi Electric Europe in PROMOTiON

Definition of
Requirements

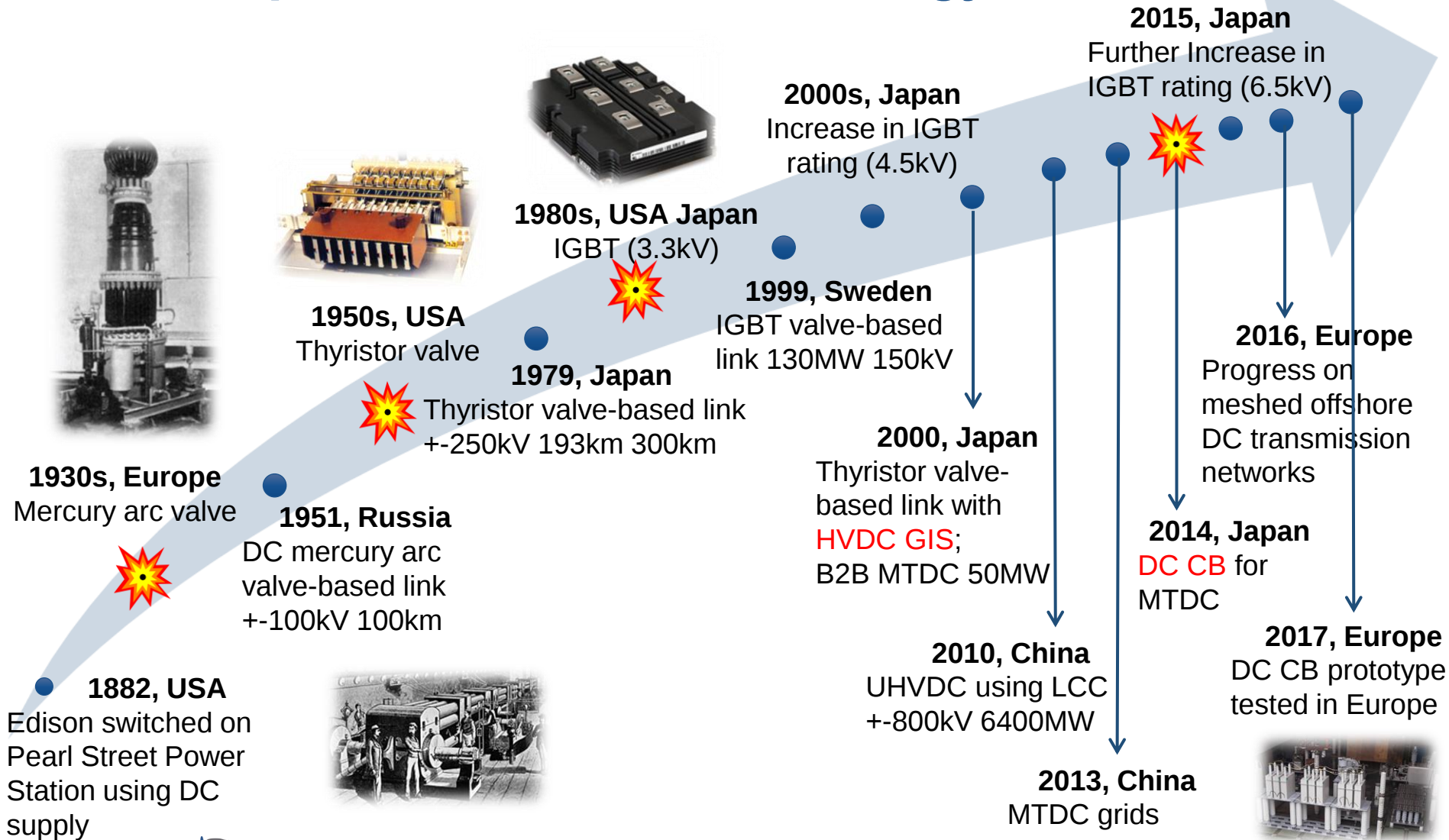
Research
Activities

Testing

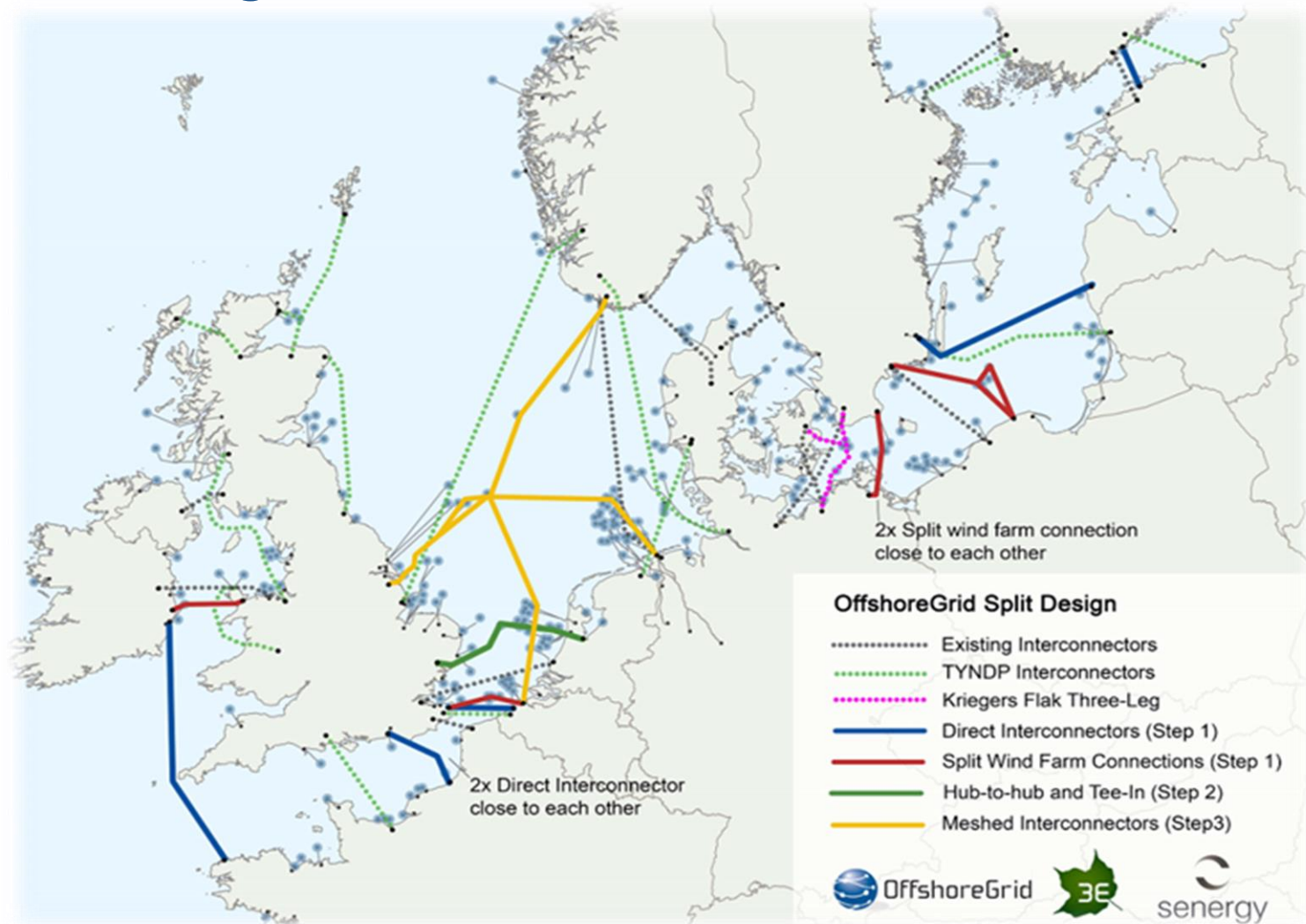
Harmonisation
and Deployment



Development of HVDC Technology



Technologies in Meshed Offshore DC Grids



Offshore Electricity Grid Infrastructure in Europe A Techno-Economic Assessment 3E (coordinator), dena, EWEA, ForWind, IEO, NTUA, Senergy, SINTEF



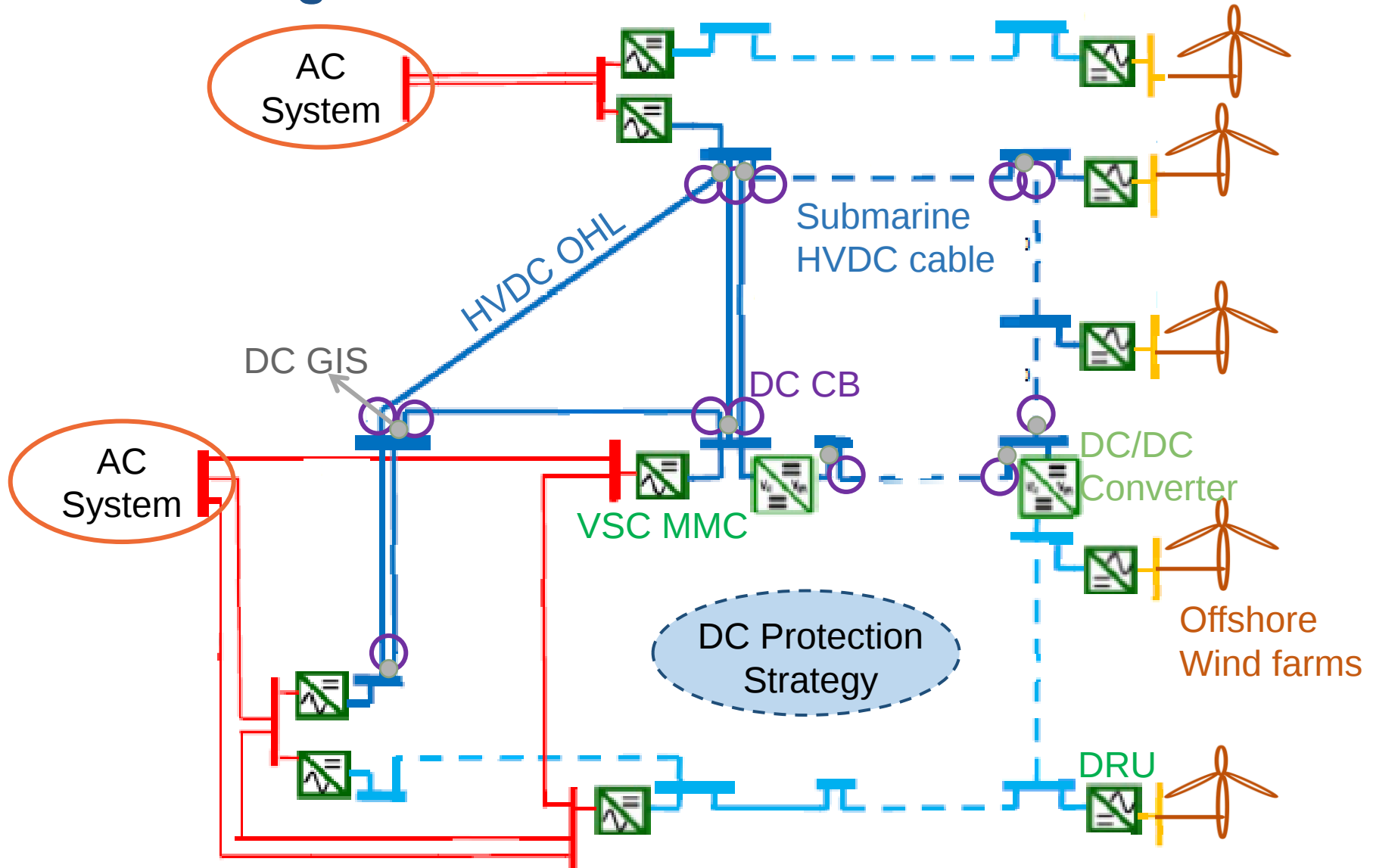
© PROMOTiON – Progress on Meshed HVDC Offshore Transmission Networks

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691714.

03.05.16

5

Technologies in Meshed Offshore DC Grids

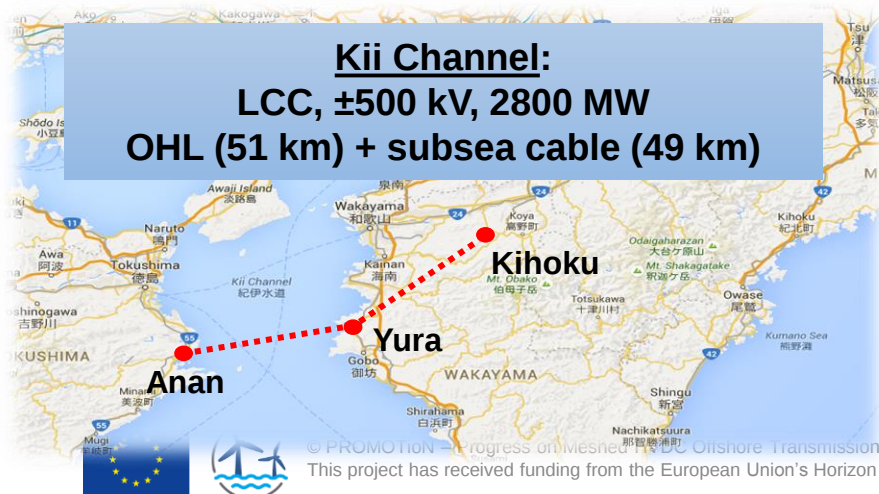
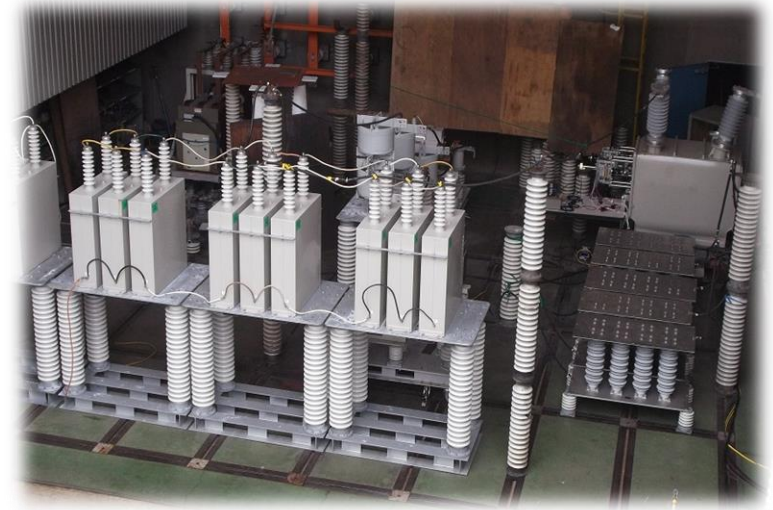


Fault interrupting Technologies

DC Gas Switchgear

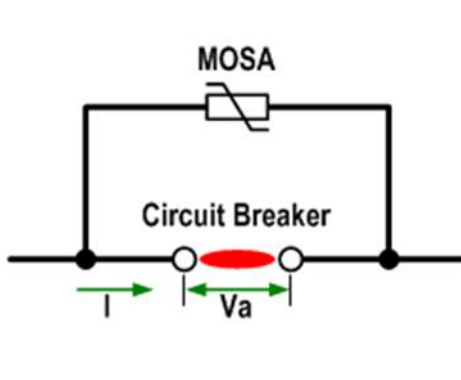


DC Circuit Breaker

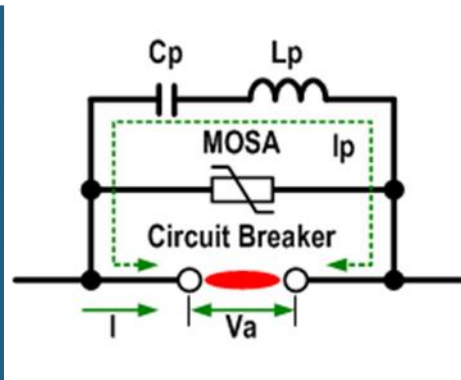


DC Circuit Breaker Technologies

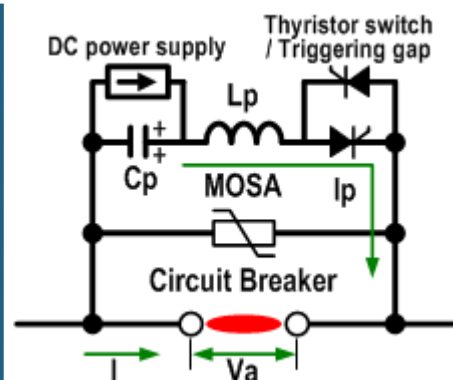
Resistive Current Limiting



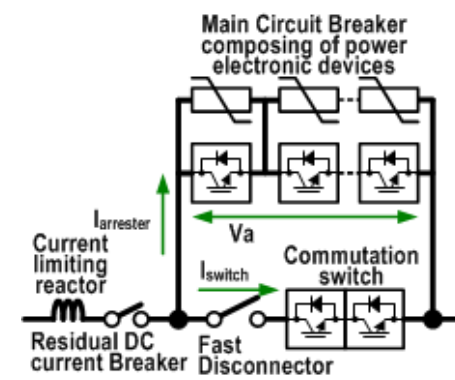
Passive Resonant Scheme



Active Resonant Scheme



Hybrid using IGBTs



Applications

LV-DC Circuit Breaker
DC Disconnecting Switch
DC Earthing Switch

DC Circuit Breaker for LCC
2 terminal MRTB

DC Circuit Breaker for
VSC HVDC grids

DC Circuit Breaker for
VSC HVDC grids

Ratings

750/1500V-50kA in railway
Few ms for interruption

10kV-5000A for MRTB
550kV-2200A for LLC
20-40 ms for interruption

72kV-25kA for VSC
Less than 8 ms for
interruption

80kV-9kA for VSC
Less than 5 ms for
interruption

HVDC Projects: Discussion

Q1: Technology Development



HVDC Projects: Discussion

Q2: Project Risks and Challenges



HVDC Projects: Discussion

Q3: Interoperability



Thanks for your attention



APPENDIX

DISCLAIMER & PARTNERS

COPYRIGHT

PROMOTioN – Progress on Meshed HVDC Offshore Transmission Networks

MAIL info@promotion-offshore.net WEB www.promotion-offshore.net

The opinions in this presentation are those of the author and do not commit in any way the European Commission

PROJECT COORDINATOR

DNV GL, Kema Nederland BV
Utrechtseweg 310, 6812 AR Arnhem, The Netherlands
Fon +31 26 3 56 9111
Web www.dnvgl.com/energy

CONTACT

Claudia Spallarossa PhD, MSc
Mitsubishi Electric Europe B.V., Power System Group
2 Cherry Orchard Road, Croydon, CR0 6BA, UK.
Tel: (+44) (0)20 8256 1524
Mobile: (+44)(0)75 2576 6732
Email: claudia.spallarossa@crd.meuk.mee.com

PARTNERS

Kema Nederland BV, ABB AB, KU Leuven, KTH Royal Institute of Technology, EirGrid plc, SuperGrid Institute, Deutsche WindGuard GmbH, Mitsubishi Electric Europe B.V., Affärsverket Svenska kraftnät, Alstom Grid UK Ltd (Trading as GE Grid Solutions), University of Aberdeen, Réseau de Transport d'Électricité, Technische Universiteit Delft, Statoil ASA, TenneT TSO B.V., German OFFSHORE WIND ENERGY Foundation, Siemens AG, Danmarks Tekniske Universitet, Rheinisch-Westfälische Technische Hochschule Aachen, Universitat Politècnica de València, Forschungsgemeinschaft für Elektrische Anlagen und Stromwirtschaft e.V., Dong Energy Wind Power A/S, The Carbon Trust, Tractebel Engineering S.A., European University Institute, Iberdrola Renovables Energía, S.A., European Association of the Electricity Transmission & Distribution Equipment and Services Industry, University of Strathclyde, ADWEN Offshore, S.L., Prysmian, Rijksuniversiteit Groningen, MHI Vestas Offshore Wind AS, Energinet.dk, Scottish Hydro Electric Transmission plc



<http://www.thecrownestate.co.uk/energy-minerals-and-infrastructure/offshore-wind-energy/offshore-wind-electricity-map/>