Best Paths

Transmission for sustainability

2ND GENERAL ASSEMBLY

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COMPLEMENTARITY ACROSS DEMOS

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BEST PATHS stands for "BEyond State-of-the-art Technologies for rePowering Ac corridors and multi-Terminal Hvdc Systems". It is co-funded by the European Commission under the Seventh Framework Programme for Research, Technological Development and Demonstration under the grant agreement no. 612748.

PROJECT COHESION AND DEMO COMPLEMENTARITIES

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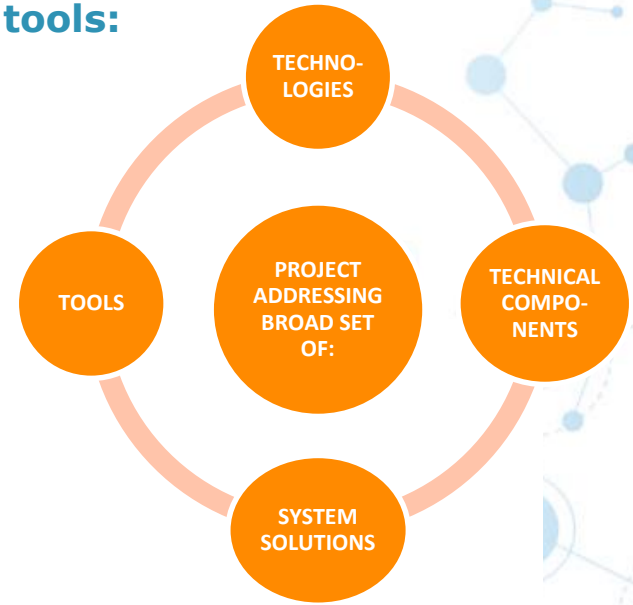
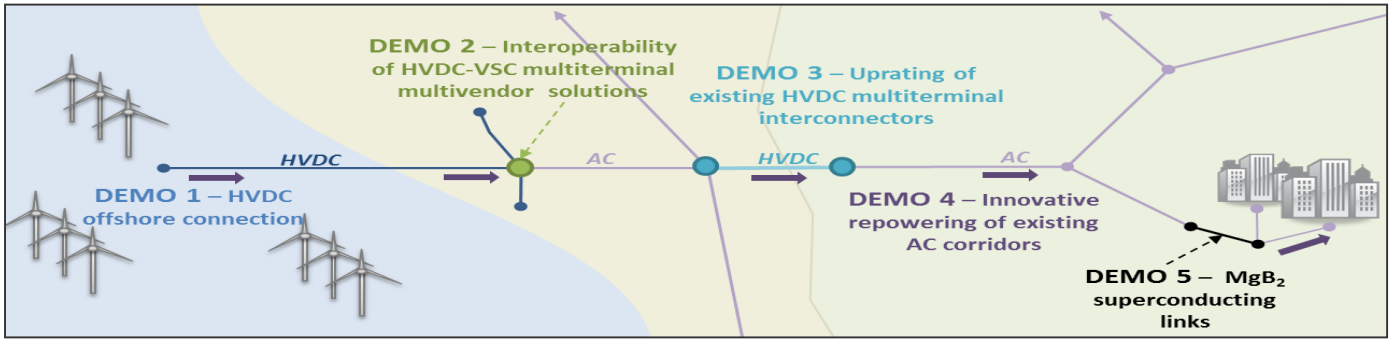
❖ **Best Paths is a vast cooperative project, with about 50 parties (including nominated third parties) addressing a broad set of technologies, technical components, system solutions and tools:**



❖ **The 5 Demos, quite independent from an organisational point of view, are actually deeply integrated with regard to scope, delivered outcomes and applicable results:**



SOME SIMILAR ASPECTS, BUT DIFFERENT PERSPECTIVE

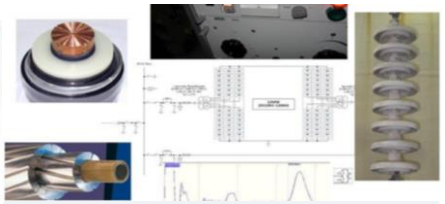
- **The separate Demos must be seen as portions of an overall effort to improve existing lines and develop new lines**
- **Individual Demos are highly complementary for the future users: TSOs, Utilities, planning bodies, Regulators**
- **In some cases they address similar technical aspects but from different utilisation perspectives; in such cases overlapping is being avoided by a careful and constant coordination at both technical level (Technical Committee) and managerial level (Steering Committee)**

DEMO 1
HVDC links in offshore wind farms and offshore interconnections

The aim of this demonstration is to reduce the risks of HVDC links connecting offshore wind farms and to foster new suppliers and sub-suppliers of HVDC technology.

DEMO 2
HVDC-VSC Multivendor Interoperability

The goal of the demonstration is to outline the conditions to ensure maximum interoperability for HVDC-VSC converters connected to a DC system.

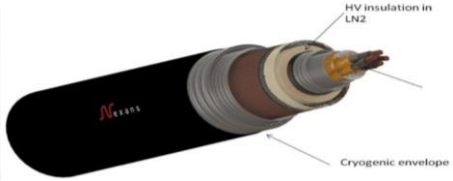


DEMO 3
Upgrading multi-terminal HVDC links using innovative components

The demonstration aims to design, develop and test new technological solutions allowing to upgrade multi-terminal HVDC links.

DEMO 4
Innovative Repowering of AC Corridors

Demo 4 objectives are addressed in three parallel sub-projects.



DEMO 5
Superconductor cables power up for DC grids

Prototype scale validation of the technical feasibility of integrating DC superconducting cable links within an AC meshed network.

COMPLEMENTARITY MATRIX

- It gives an overview of contact points / overlapping and complementarities across demos related to topics
- In particular, interactions among multiple VSC converters systems are further monitored through constant interaction at Technical Committee level

Issues	Demo1	Demo2	Demo3	Demo4	Demo5
Multiple VSC system	Addressing interactions between wind turbine and converter stations	Addressing interoperability between different manufacturers	Addressing operation of multi-terminal systems		
VSC simulator & prototype (MMC half / full bridge)	50 kW for offshore grid portion	For 3-terminals converters (by 3 manufacturers) in several grid configurations	12 MW for existing 3-terminal system to be upgraded		
VSC, control strategies, protection	Normal operations, faults	Normal operation, transient, several faults	Normal operation, few faults		
VSC studies, transients harmonics, resonance	Normal operations, faults	Normal operation, transient, several faults	Normal operation, few faults		
HTLS conductors for OHL			For DC lines	For AC lines	
Insulator systems OHL			DC polymers insulators	AC insulated cross-arms (also polymers)	
Cable systems, insulation			Land & marine HVDC with extruded insulation		Superconductive HVDC cables

Legend to colours:

High complementarity: cross-fertilisation is an added value	**Same asset/technology, different scope: comparison is beneficial**	**Same kind of studies, different scenarios and operational frameworks: benchmarking is beneficial**

COMPLEMENTARITY IMPACT

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- **Besides complementarity on topics, another dimension of complementariry is on expected impacts and addressed barriers:**
- **Also KPI definition and assessment shows integration and coordination**

IMPACT	D1	D2	D3	D4	D5
Improvement in technical KNOWLEDGE (risk reduction)	X	X	X	X	X
Beyond state of the art PERFORMANCES in specific technologies			X		X
Increase in COMPETITIVENESS (leads to cost reduction)	X	X			
System PLANNING	X	X	X		X
System OPERATION				X	
Grid MAINTENANCE				X	
RES integration	X	X	X	X	X

BARRIERS	D1	D2	D3	D4	D5
TECHNICAL (complexity of the solution and/or lack of background)	X	X	X	X	X
Representativeness/Interpretation of the results (from DEMO to real facility)	X			X	X
Suitable FACILITIES to host demonstrator	X	X			
REGULATORY/LICENSING			X		