Meshed offshore transmission grids key to a sustainable energy future

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Credit: AI-generated image (disclaimer)

Coordinated development of electricity infrastructure connecting offshore wind farms to land will bring financial and environmental benefits.

Offshore wind plays an increasingly important role in Europe's

renewable power generation. According to a report by WindEurope, formerly the European Wind Energy Association, offshore represented 20 % of the annual EU wind power installations, with 3 154 MW of new capacity connected to the grid in 2017. This was twice as much as in 2016. To realise the full potential of these resources, the EU-funded PROMOTION project is investigating the benefits of linking offshore wind farms with onshore grids in different countries.

Quoted in a press release, WindEurope CEO Giles Dickson said an efficient North Sea grid would unlock the unconstrained exchange of energy between countries. It would also bring energy from places with higher wind resources. His comments were made at a mid-term project conference organised by PROMOTION. He added that a meshed offshore grid should not be the goal in itself; rather, it should be treated as a means of deploying competitive wind generation across the North Sea.

The PROMOTION (PROMOTioN – Progress on Meshed HVDC Offshore Transmission Networks) project was set up to develop and demonstrate key technologies used for wind power transmission, such as high-voltage direct current (HVDC). This transmission link consists primarily of a converter station, a power transmission line and another converter station on the other end. The electricity can be transported in both directions. The lines can go across land as overhead or underground lines or can be installed in water as submarine cables. An installation that combines cable and overhead line or submarine and underground line is also possible.

Obstacles to meshed offshore grid development

Several EU projects – including PROMOTION and Best Paths – demonstrate how HVDC technology is rapidly evolving. HVDC interconnectors offer significant flexibility for transmission system

operators (TSOs). Yet, as indicated on CORDIS, "the deployment of meshed HVDC offshore grids is currently hindered by the high cost of converter technology, lack of experience with protection systems and fault clearance components and immature international regulations and financial instruments."

The WindEurope press release noted that TSOs are building point-to-point (country to country) interconnectors to reap the benefits of wholesale price differences between markets. "This allows wind farms to plug in to their interconnector, potentially reducing the income for TSOs and thus decreasing the incentive to adapt the existing infrastructure." However, as pointed out by Dickson, the TSO is in charge of deploying the grid in some countries. As the TSO is regulated, it has the potential "to develop an optimal solution for both the wind promoters and grid promoters. This is because the possibility of achieving 'hybrid projects' is much higher." Hybrid projects are those feeding electricity to two different markets, such as Kriegers Flak, part of a 400 MW interconnector between Denmark and Germany.

PROMOTION partners include major HVDC manufacturers, TSOs linked to the North Sea, several wind turbine suppliers, offshore wind developers, leading academics and consulting companies. The European vision for a North Sea offshore meshed grid dates back to 2010. Combining new HVDC technologies within current systems is seen as instrumental in bringing large-scale renewables into the grid, thus providing significant benefits to the European electricity market.

More information: CORDIS project web page:cordis.europa.eu/project/rcn/199016_en.html

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