Offshore wind energy in Europe: Experiences and challenges

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Contrary to new wind turbine installations in Europe, which has stabilized at around 11 GW annually, the offshore market for wind energy increased in 2013 in size with 50 %, reaching 1,7 GW installed in 2013 bringing the total installed capacity to 6,8 GW. The development of offshore wind energy primarily takes place on Northern Europe, with China and Japan as the exceptions. In the process the turbine technology has developed rapidly, both in terms of size, the largest wind turbine offered to the market being the 8 MW Vestas V164, and in reliability, which is the reason for the development of new drive train options such as the direct drive. As wind farms move to deeper waters and further from shore, the key challenge for offshore wind becomes even more evident, namely the need for substantial reductions in the cost-of-energy. This requires a broad effort, not only on cheaper and more reliable turbine technology but in particular new solutions for support structures, grid connection and installations as well as new strategies for operation and maintenance.

The presentation will summarize the European experience on offshore wind energy on technology and implementation, key elements in ongoing R&D to support the further development as well as trends in standards and certification. With the aim to enable and facilitate further cost reductions, research focuses on improving the predictability of the performance and reduce uncertainty on performance and external conditions, removing barriers for upscaling and introduction of more reliable technologies and developing methods for optimization of the full plant, and enhancing the provision of ancillary services from the wind farms and new transmission technologies for offshore wind to become better integrated into the European power system. A key element in improving reliability is testing of all scales from materials to full systems, and the approach and needed facilities will be outlined.