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# Direct Drive Technology for Wind Turbine Applications

Siemens Wind Power have developed direct-drive (DD) wind turbine technology over the past decade to meet the future demand for cost effective and reliable onshore and offshore wind power. The increasing power requirements from the industry resulting in higher torque requirements in the drive train, has made it necessary to reduce the complexity and improve reliability of wind turbines by going to DD generator technology.

Following an evolution of the DD turbine design throughout the concept phase, an optimised solution was finalised with the generator integrated into the nacelle structure, providing a light weight power dense drive train. The first 3MW prototype was then erected in December 2009, which was quickly followed by several pre-series turbines before the serial production was finally undertaken in 2012, after an extensive test campaign. In parallel a 6MW DD turbine platforms was also developed with the first prototype being erected in the summer of 2012. To date, <900 3MW turbines have been installed on 5 continents.

A key formula in the success of the DD turbine is the design for manufacturing, utilising the volume production techniques to manufacture large generators, which have previously been made in one-off/small batch production. This has enabled the Siemens Wind Power direct drive wind turbine to compete commercially with established geared turbine topologies.

In the future, Siemens Wind Power will continue to develop DD technology wind turbines to meet the continuous pressure to reduce the Levelised Cost of Energy (LCoE), allowing wind power to become an invaluable energy resource for the future.



Siemens WP 6 MW DD turbine installation



Siemens WP 3 MW DD Turbine