



High-voltage, low losses, small size

66 kV FITformer[®] WIND for wind applications

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SIEMENS
ENERGY

FITformer® WIND

– the optimal choice for wind applications

The challenge

While wind turbines were producing 0.5 MW of power at a height of 40 meters in 1990, today's wind turbines produce 10 MW and beyond. However, the voltage level output stayed at 33 kV for quite a long time.

An offshore wind farm in Denmark was one of the first to be equipped with 7 MW turbines and to be connected to a 66 kV grid voltage instead of 33 kV back in 2017. With the increased power capability (the SWT-7.0-154 provides 10% more output than its predecessor), the efficiency of wind power generation could also be increased. Therefore, the new generation of wind turbines has a voltage output of 66 kV, which allows reduced losses and higher efficiency in wind turbine operation. One of the key components in this process is a new generation of wind transformers which started first serial deliveries in 2017.

The solution

To operate on a new voltage level, a brand-new transformer type fitting all requirements had to be developed from scratch, designed and manufactured in a joint collaboration as a partner of the OEM. The new generation of wind transformer FITformer WIND is a fluid immersed 8.2 MVA transformer for a grid-voltage level of 66 kV. Unlike their predecessors, these transformers are not installed at the bottom of the turbines, but inside the nacelle. Space being very limited in a turbine, the new transformers are very compact and lightweight, while at the same time highly efficient, according to the Eco design directive, supported from a water cooling system used on the whole medium-voltage equipment inside the nacelle. Moreover, their design has been optimized to cope with the hostile conditions of offshore applications and to keep maintenance demand as low as possible.



Special technical aspects

1. Dimensions

Due to the limited space in a wind turbine's nacelle, the transformer's dimensions needed to be kept as small as possible. Although being a very large unit for a distribution transformer with 8.2 MVA, the new FITformer WIND for the 66 kV level keeps size and weight at a minimum below 20 tons.

2. Efficiency

Efficiency is a crucial factor when it comes to renewable power generation. The new voltage level of 66 kV instead of the former 33 kV standard already optimizes the operational efficiency of the application. Additionally, the new generation of FITformer WIND for the 7 MW wind turbines is designed according to the Eco design directive and meets the latest efficiency standards from the growing offshore wind market.

3. Robust and reliable

Offshore applications must withstand very severe ambient conditions. Wind and salty water impose the hardest strains on all installed equipment. High vibrations and overload requirements as well as harmonics are challenges that add to

the task of developing a high-tech transformer like the FITformer WIND for the 66 kV level. Being the supplier of choice for one of the most renowned wind energy companies for decades, Siemens Energy Transformers rose to this challenge with full commitment deemed to be a strong sustainable partner.

4. High temperature design

The new FITformer WIND for 66 kV wind applications is not only vibration and short-circuit tested. It is also manufactured in high temperature design, according to IEC 60076-14, and is cooled using water to fluid heat exchangers. It is insulated with high-temperature material and uses ester as an insulation fluid. This adds to the transformer's performance as esters can be run at higher temperatures than mineral oils. Moreover, it also increases operational safety and compatibility with environmental safety standards, as ester is naturally biodegradable.

5. Low maintenance

Maintenance on offshore equipment is a cost-intensive exercise. Low maintenance and reliable operation for decades are key criteria for offshore wind turbine operators. The new FITformer WIND fulfills all expectations because it requires little to no maintenance at all.

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