

# SIEMENS

*Ingenuity for life*

## Twice the voltage, lower losses and smaller size

First order for 66kV FITformer REN

[siemens.com/transformers](https://www.siemens.com/transformers)

### The challenge

While wind turbines were producing 0.5 MW of power at a height of 40 meters in 1990, today's turbines produce 7 MW and more. However, the voltage level output stayed at 33 kV for quite a long time.

A new offshore wind park in Denmark is one of the first to be equipped with 7 MW turbines and to be connected to a 66 kV grid voltage of instead of 33 kV. With the new capacity levels (the new SWT-7.0-154 provides 10% more output than its predecessor), the efficiency of wind power generation is also increasing. This is why 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 progress is a new generation of wind transformers delivered in 2017.

### The solution

To operate on a new voltage level, a brand new transformer type fitting all new requirements had to be developed, designed and manufactured. The new generation of wind transformer FITformer REN is a liquid-filled 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, and a high temperature design, according to IEC 60076-14. Moreover, their design has been optimized to cope with the hostile conditions of offshore applications and to keep maintenance demand as low as possible.



CAD-drawing of the new FITformer REN for wind applications at 7MW.

# Sweeping wind power generation

## 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 8.7 MW, the new FITformer REN for the 66 kV level keeps size and weight at a minimum and weighs less than 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 REN for the 7 MW wind turbines is designed according to the Eco design directive and meets the latest efficiency standards.

### 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 REN for the 66kV-level.

Being the supplier of choice for one of the most renowned wind energy companies for decades, Siemens Transformers happily rose to this challenge.

### 4. High temperature design

The new FITformer REN 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. It is insulated with an aramid based high-temperature material instead of paper and uses ester as insulation liquid. 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. Maintenance-free, reliable operation for decades is a key criteria for offshore wind turbine operators. The new FITformer REN fulfills all expectations because it requires little to no maintenance at all.

## Nissum Bredning Offshore Wind Park (Denmark)

The 28 MW wind park will consist of four turbines with a height of 207 m and a rotor diameter of 154 m. It can provide power annually to approximately 20.000 households.

Nissum Bredning Offshore Wind Park is one of the first wind parks to be connected to the grid with a 66 kV rating.

Siemens not only supplies its new 7-megawatt direct drive wind turbine, but also an innovative and cost efficient gravity jacket foundation solution. It also supplies its new 66kV voltage solution, including a new transformer for the 66 kV grid connection, cable and switchgear systems, along with further innovations regarding tower and controller settings.



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