

## Bright outlook for improved profitability

Direct drive wind turbine SWT-3.0-101

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Answers for energy.



How can you gain maximum performance with 50 percent fewer parts?





As wind power plants develop capacities similar to conventional power plants, power generation companies throughout the world are striving for greater efficiency and cost-effectiveness.

Siemens' solution: increase availability and profitability through innovative technology.



The SWT-3.0-101 wind turbine from Siemens offers innovation through a completely new generator. With half the parts of a conventional geared turbine, and much less than half the number of moving parts, the new wind turbine is easy to maintain and extremely reliable. The compact design allows for cost-effective transportation on standard vehicles within most markets.



"Fewer components, increased profitability! What once was only a dream is now ready for serial production. Comprehensive testing has shown that the new direct drive wind turbine is a reliable investment in the future of power generation."

Henrik Stiesdal, CTO, Siemens Wind Power

# Performance and profitability go hand in hand

In designing a wind turbine, a holistic view of the design and construction, materials, processes, manufacture, and installation is critical. With the SWT-3.0-101, Siemens started with the ambitious aim of reducing the number of components by half, while increasing performance. Thanks to innovative engineering, that vision is now a reality.

The gearless SWT-3.0-101 carefully balances all these factors in a compact system that has the potential to significantly lower maintenance costs and service time.

#### **Reduced complexity**

Regardless of how reliable Siemens' wind turbine gearboxes have been in the past, the gearbox is always the most complex component of a wind turbine. Eliminating the gearbox reduces complexity and increases reliability.

Siemens has opted for a permanent magnet generator for improved efficiency. Unlike an electrically excited machine with a gearbox, a permanent magnet excited machine does not expend any energy on the excitation itself.

The SWT-3.0-101 also has an outer rotor, where the rotor spins on the outside of the stator. This design feature allows the rotor to operate within narrower tolerances, which aids in keeping the dimensions of the nacelle compact.



#### Simplified design

Despite the compact design, Siemens has actually given service technicians more space in which to operate. The drastic reduction of parts has created a relatively spacious environment within the nacelle, where key components are readily accessible. The "plug and play" nature of components allows most components to be interchanged without impacting other components.

The top-mounted, passive cooling system improves energy efficiency. The SWT-3.0-101 has a dual cooling system that provides an even cooling of the generator. The coolant life expectancy is also increased, aiding both reliability and performance.

Of the five key components in a wind turbine – the blade, rotor hub, nacelle, tower, and controller – all but the nacelle are adopted from the existing Siemens' portfolio. By utilizing proven components, Siemens has endeavored to eliminate many of the variables traditionally associated with the introduction of such an innovative product.

#### Ease of transportation and erection

The nacelle has a length of 6.8 meters and a diameter of 4.2 meters. Weighing 73 tons, the SWT-3.0-101 machine is "light" enough to be carried on trucks commonly available in most major markets.

The dimensions of the new wind turbine allow for greater flexibility in road transportation. Key bridge and tunnel clearance specifications have been carefully considered when engineering the machine, and as a result, the 3.0 MW wind turbine can navigate many of the most demanding transport routes.

One clear advantage of the new nacelle's size is that the nacelle is transported in one piece to minimize expensive and risky on-site assembly of critical components.



The compact system design, with a reduced number of rotating wear parts, is an ideal basis for profitable deployment onshore, offshore, and in coastal areas.

### A new definition of competence: fully developed technology, advanced design

#### Grid performance with NetConverter®

Grid stability requirements grow as more wind power is fed into the grid, and Siemens sets the standard in the field of grid compliance.

Power conversion is implemented by the Siemens' Net-Converter<sup>®</sup> system. This system is characterized by full conversion of the power generated, efficiently decoupling generator and turbine dynamics from the grid.

The NetConverter<sup>®</sup> system can offer maximum flexibility in the turbine response to voltage and frequency control, fault ride-through, and output adjustment. As a result, Siemens wind turbines can be configured to comply with a variety of relevant grid codes in major markets and can be readily connected to the grid.

#### Siemens IntegralBlade®

The rotors of the SWT-3.0-101 are manufactured using patented IntegralBlade<sup>®</sup> technology. The blades are made in one piece from fiberglass-reinforced epoxy resin in a single production step. As a result, there are no glue joints, that may become weak points potentially exposing the structure to cracking, water ingress and lightning.

#### Efficient lightning protection

The SWT-3.0-101 has efficient lightning protection. Its overall basic construction is based on the international standard IEC 61400-24 Lightning Protection Level I.



Key features at a glance	Technical data	
<ul> <li>New drive train design with permanent magnet generator is a technological leap forward</li> <li>Simple design with less moving parts reduces complexity and need for maintenance</li> <li>The compact and lightweight design is a major advantage for transportation and installation</li> </ul>	IEC Class	IA
	Rotor diameter	101 m
	Blade length	49 m
	Swept area	8,000 m <sup>2</sup>
	Hub height	80 m
	Power regulation	pitch regulated
	Annual output at 8.5 m/s	12,400 MWh
	Blade weight	10.3 t
	Nacelle weight	73 t
	79.5 m tower weight	162 t

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