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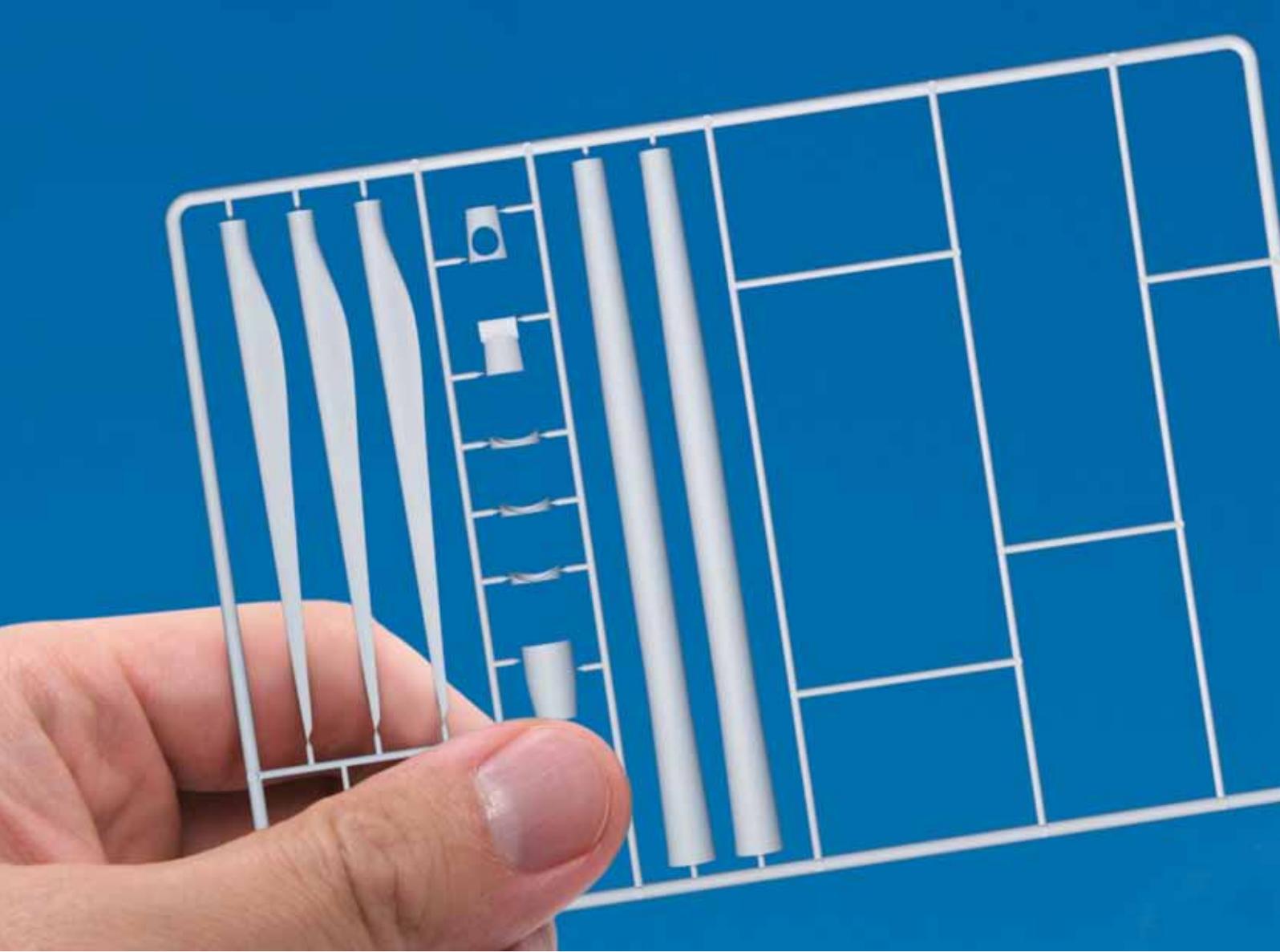


Fewer components, increased profitability

Siemens 3.0 MW direct drive wind turbines

www.siemens.com/wind

Answers for energy.



Outstanding performance with
50 percent fewer parts

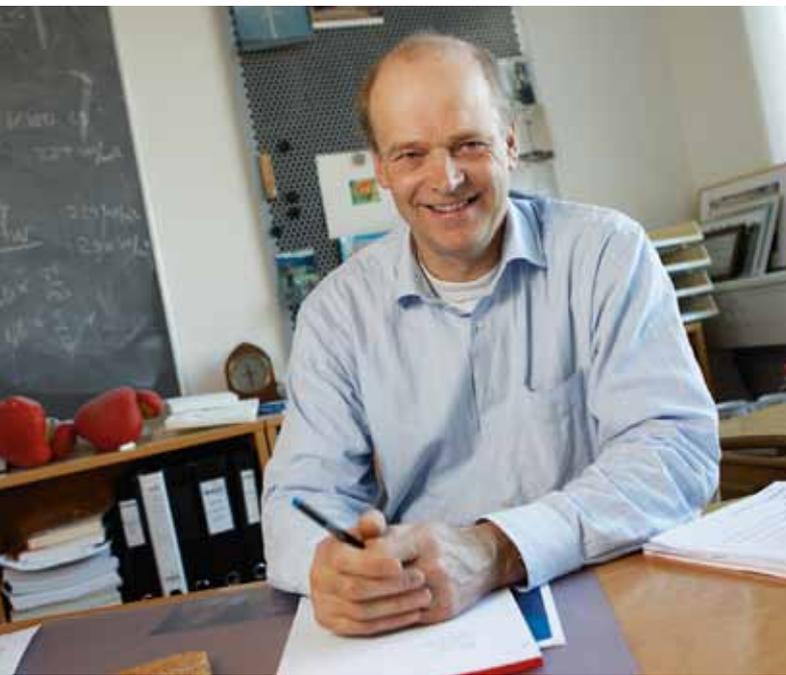


As wind power plants develop capacities similar to conventional power plants, power generation companies throughout the world are striving for greater efficiency and cost-effectiveness.

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



Siemens 3.0 MW direct drive wind turbines offer innovation through the consistent implementation of a highly efficient generator concept. With half the parts of conventional geared turbines and much less than half the number of moving parts, the direct drive wind turbines are easy to maintain and extremely reliable. The compact design allows for cost-effective transportation on standard vehicles in most markets.



“Fewer components, increased profitability! What once was only a dream is now ready for serial production. Comprehensive testing has shown that our direct drive wind turbines are 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 3.0 MW direct drive wind turbines, 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 3.0 MW wind turbines carefully balance all these factors in a compact system that optimizes 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 3.0 MW direct drive wind turbines also have 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 3.0 MW direct drive wind turbines have a dual cooling system that provides an even cooling of the generator. The coolant life expectancy is also increased, aiding both reliability and performance.

The five key components in a wind turbine – the blade, rotor hub, nacelle, tower, and controller – all 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 3.0 MW machines are “light” enough to be carried on trucks commonly available in most major markets.

The dimensions of this 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.

The size of the 3.0 MW wind turbine’s nacelle offers the clear advantage that the nacelle can be 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 makes 3.0 MW direct drive turbines ideally suited for virtually any field of application.



Expertise in practice: 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' NetConverter® system. This system is characterized by full conversion of the power generated, efficiently decoupling generator and turbine dynamics from the grid.

The NetConverter® 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 3.0 MW turbine are manufactured using patented IntegralBlade® 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 3.0 MW turbine has efficient lightning protection. Its overall basic construction is based on the international standard IEC 61400-24 Lightning Protection Level I.

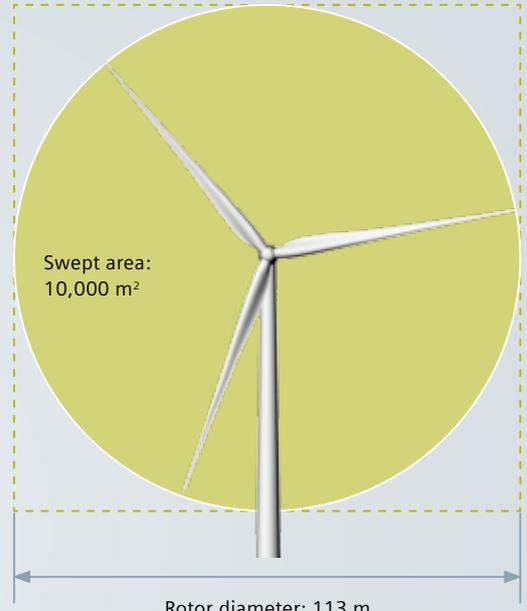
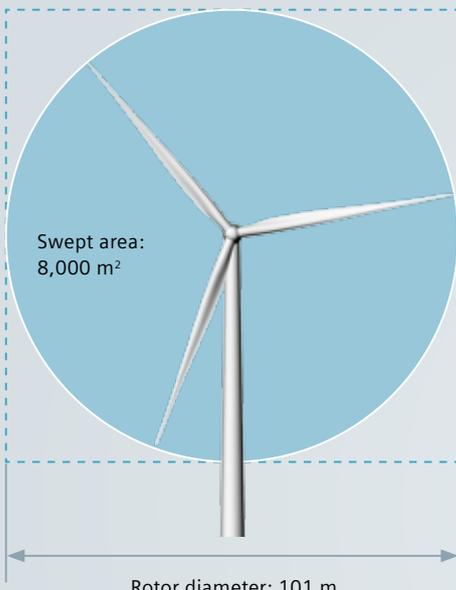
Towers

Siemens provides the ideal tower type for any site. The well-known and proven tubular steel tower has become a standard that enables quick installation.

The new steel shell tower for tower heights above 115 meters allows for hub heights up to 142.5 meters. Moreover, its components meet with standard transportation requirements, so it can be erected at sites with tight access, such as mountains and woodland.

Rotors

The three different rotor diameters available make 3.0 MW direct drive wind turbines the ideal choice for a wide range of wind conditions.



SWT-3.0-101

IEC Class	IA
Rotor diameter	101 m
Blade length	49 m
Swept area	8,000 m ²
Hub height	74.5 – 99.5 m*
Power regulation	Pitch regulated
Annual output at 7.5 m/s	10,500 MWh
Nacelle weight	73 t
Rotor weight	60 t

SWT-3.0-108

IEC Class	IB / IIA
Rotor diameter	108 m
Blade length	53 m
Swept area	9,150 m ²
Hub height	79.5 – 99.5 m*
Power regulation	Pitch regulated
Annual output at 7.5 m/s	11,100 MWh
Nacelle weight	73 t
Rotor weight	60 t

SWT-3.0-113

IEC Class	IIB
Rotor diameter	113 m
Blade length	55 m
Swept area	10,000 m ²
Hub height	79.5 – 142.5 m*
Power regulation	Pitch regulated
Annual output at 7.5 m/s	11,800 MWh
Nacelle weight	73 t
Rotor weight	67 t

* site specific

SWT-3.0-101

The toughest turbine for the roughest conditions

The SWT-3.0-101 is designed to cope with the highest of wind speeds and the roughest turbulence. Extreme wind conditions place tremendous loads on a turbine. The SWT-3.0-101 is built to deliver reliable performance under the world's harshest operating conditions.

The SWT-3.0-101 utilizes the same rotor as Siemens' SWT-2.3-101 geared machine. Through the application of proven components, Siemens balances innovation with security of investment.

SWT-3.0-108

Durable choice for strong wind conditions

When winds are strong, but the site conditions less complicated the SWT-3.0-108 offers a superior combination of large rotor and robust design.

The new B53 quantum blade of the 108m rotor is the first full-scale application of Siemens' innovative aero-elastic blade design, which allows a larger rotor diameter and higher energy output without increasing structural loads. As a result, the SWT-3.0-108 turbine provides lower cost of energy at moderate-to-high wind conditions.

SWT-3.0-113

Getting the most out of moderate conditions

Offering the largest rotor in the Siemens 3.0 family, the SWT-3.0-113 is designed to increase energy output at sites with moderate wind conditions.

Once again the competitive edge of a Siemens turbine is based on innovative blade design. The B55 quantum blade applies new airfoils and redesigned tip and root sections, resulting in maximum energy output for this size of turbine. Furthermore, due to a lower rotor speed the SWT-3.0-113 has reduced noise emission. The combination of high energy output and low noise level makes the SWT-3.0-113 the ideal choice for most inland sites across the globe.

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