

The image features a large, close-up view of the red and white blades of a wind turbine in the foreground, framing the scene. In the background, several offshore wind turbines are visible on a blue sea under a clear sky. The Siemens logo is positioned in the top left corner.

**SIEMENS**

Siemens G4 platform – 3.6-MW and 4.0-MW geared wind turbines

# The offshore workhorse – redefined

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



SWT-3.6-120



SWT-4.0-120



SWT-4.0-130

## Siemens, the offshore leader

Siemens has been a major driver of innovation in the wind power industry since 1980, when wind turbine technology was still in its infancy.

Technology has changed with the times, but Siemens' commitment to providing its customers with proven wind turbine solutions remains the same.

In recent times, the world has seen an intense increase in the nature and capacity of offshore wind power plants. Given the logistical challenges of offshore projects, where even the smallest issue can amplify costs, having technology that works and continues to work is paramount. That is exactly the right task for Siemens.

Drawing on more than 30 years of experience in the wind power industry, a strong focus on renewables, and a global network of highly skilled and trained employees, Siemens has proven itself to be a trustworthy and reliable business partner and will continue to do so in the future.

In 1991 we installed the world's first offshore wind farm at Vindeby in Denmark. From these modest beginnings to today, Siemens benefits from a track record that makes it the world leader in offshore applications. As the choice for the world's largest offshore wind power plant – the London Array – Siemens' geared wind turbines are paving the way for green energy to become the cornerstone of the global energy mix.

Over the years, Siemens has accumulated a vast amount of service experience offshore. Drawing on this substantial knowledge, the company has established a flexible range of service solutions that are designed to optimize the output of offshore wind turbines.

## Intelligent ways to drive down the cost of electricity

Wind power is coming of age. It is fast becoming directly competitive with traditional energy sources. Driving down the levelized cost of wind energy is a key target for Siemens as we strive to make wind power independent of subsidies.

Our new platform strategy is founded on the knowledge and experience of more than 30 years in wind power.

Standardization and modularization are fundamental to the platform approach, allowing us to streamline manufacturing installation and develop a lean design process.

Each of our products is now a member of one of four platforms: the Siemens G2, Siemens D3, Siemens G4, and Siemens D7. "G" denotes geared turbines, "D" signifies direct drive technology, and the associated numbers represent the predominant power rating.

The G4 platform comprises offshore geared wind turbines with a power rating of 3.6 MW and 4.0 MW.

### Evolution of the platform

Determined to create the right machine for the right application, Siemens has progressively adapted the G4 platform to provide customers with a greater choice of technologies to meet their needs. The SWT-3.6-120 was an incremental advance on the proven technology of the SWT-3.6-107, which had become the most popular offshore wind turbine in the history of Siemens Wind Power.

With the release of a 4.0-MW wind turbine – featuring a 130-meter rotor and a more powerful generator – Siemens has improved on a proven technology, allowing for increased power output and revenue while keeping investment risk low.



# The new SWT-4.0-130

## The next step in reliable offshore energy

While the 4.0-MW turbine is based directly on the 3.6-MW turbine, it features improvements based on years of operational experience. Its structure has been strengthened, making it even more robust. The optimized nacelle design also features an improved layout, optimizing the ergonomics during installation and maintenance.

Megawatt for megawatt, its simplified yet robust design makes it lighter than its predecessors. More importantly, the new larger rotor coupled with a more powerful generator increases net annual energy production by up to 15 percent at IEC I conditions. These improvements allow Siemens to drive down the cost of offshore wind energy.

## Enhanced design efficiency

A simplified tower design with fewer weld points has led to both lower weight and greater strength. Both the gearbox and generator have been updated to increase efficiency and resilience.

## A 130-meter rotor for a higher AEP

The 4.0-MW is equipped with 63-meter-long rotor blades, giving it a swept area of 13,300 m<sup>2</sup>, which is equal to approximately two football fields – and 18 percent larger than that of its predecessor. Combined with the added efficiency of the new geared drivetrain, the result is up to 15 percent more power output at IEC I conditions.

## Aeroelastic blades for greater lifetime output

Thoroughly proven on onshore wind turbines, the benefits of Siemens' aeroelastic technology have been extended to the offshore environment. The B63 blade used on the SWT-4.0-130 also features this blade technology.

A larger rotor traditionally increases the loads on a wind turbine, which calls for larger and heavier structural components. Siemens' aeroelastically tailored blade changes all that. The secret of this technology is found in the intelligently controlled torsional twisting of the blade when the rotor faces aerodynamic loading.

The result is optimized load characteristics at all wind speeds. In addition, the B63 blade benefits from Siemens' Quantum Blade Technology, meaning that the new larger rotor is barely heavier than its smaller predecessor while retaining excellent strength – as proven by extensive testing.

## Optimized and robust design

The upgrade to 4.0 MW has been achieved through minimum incremental upgrades, expanding on the same fundamental G4 platform design. By utilizing proven components and technologies to the greatest extent possible, Siemens has eliminated many of the variables traditionally associated with the introduction of a new product. The incremental upgrade approach also allows for a very short time-to-market.



The new larger 130 meter rotor is barely heavier than its predecessor while still retaining excellent strength

# Proven technology, advanced performance

## Siemens NetConverter®

The NetConverter® system offers maximum flexibility in the turbine's 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® technology

The rotors of the G4 platform benefit from blades 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, all glue joints – the potential weak points that could expose the structure to cracking, water ingress, ice formation, and lightning damage – are eliminated.

## Siemens WebWPS SCADA system

Via a standard Web browser, the Siemens WebWPS SCADA system provides a variety of status views of electrical, mechanical, meteorological, and grid station data as well as operation and fault status.

## High Wind Ride Through functionality

Wind turbines are normally programmed to shut down if the 10-minute mean wind speed exceeds 25 m/s. This may lead to significant challenges for the grid system if the turbines in large wind farms are shut down more or less simultaneously, for example, at the passage of a gust front.

The Siemens G4 platform supports grid stability with the High Wind Ride Through system. It replaces the fixed high wind shutdown threshold with an intelligent load-based reduction in output power at certain storm-level wind speeds.

## Power boost functionality

The Siemens Wind Power power boost functionality is a wind turbine control feature that increases the annual energy production of the turbine by raising the rating up to 5% depending on site conditions. The feature is implemented, operated, and controlled on each wind turbine.

## Vibration diagnostics service

Our vibration diagnostics service enables us to detect anomalies early on and prevent potential failures. This requires our diagnostics experts to analyze vibration patterns and compare them with values from the Siemens database. This database is founded on archived records from almost 10,000 Siemens wind turbines. Thanks to these analyses combined with predictive methods, we can optimize service planning and repair components proactively before serious damage can occur. Since July 2008, we have been able to detect 97 percent of all potential gear-tooth cracks and prevent them from becoming fatal.

## Service

With an increasing number of turbines being installed around the globe, consistency is essential for generating an optimal return on investment throughout a project's lifetime. Whether you operate wind turbines at inland, coastal, or offshore sites, our service team will craft an intelligent Siemens service solution that is custom-made for your needs. They will collaborate with you to deliver reliability and maximum output under all conditions.

## Ongoing improvements in safety

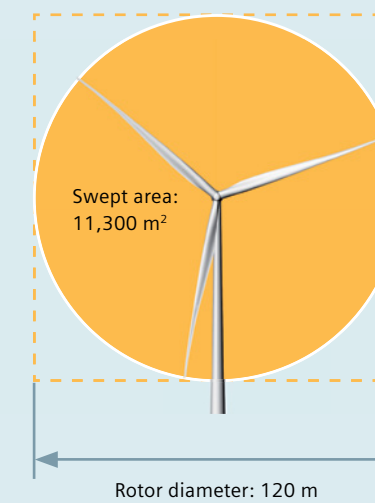
Safety is at the heart of all Siemens operations. From production to installation, operation, and service, Siemens strives to set the standard for a zero-harm culture. With the SWT-4.0-130, offshore maintenance has been rethought. Service technicians can enter the turbine via the heli-hoist platform or a conventional tower access, where a new gangway system enables safer access in rough sea conditions. The new, more spacious nacelle also provides technicians with optimized access to all key components.



SWT-3.6-120	
IEC Class	IA
Rotor diameter	120 m
Blade length	58.5 m
Swept area	11,300 m <sup>2</sup>
Hub height	Site specific
Power regulation	Pitch regulated

## Setting the scene for modern offshore wind power

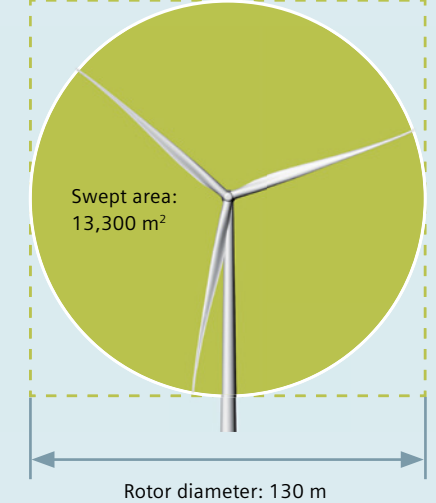
The design of this wind turbine is based on our long-term experience in offshore wind power. With a swept area 26 percent larger than its predecessor, it makes a giant leap forward with respect to energy yield. Compared with the SWT-4.0-120, the SWT-3.6-120 is a competitive choice for sites with capacity constraints.



SWT-4.0-120	
IEC Class	IA
Rotor diameter	120 m
Blade length	58.5 m
Swept area	11,300 m <sup>2</sup>
Hub height	Site specific
Power regulation	Pitch regulated

## Ongoing evolution of offshore wind power

Based on millions of operating hours and experience accumulated from the 3.6-MW class, the capacity upgrade to 4.0 MW is founded on confidence. The SWT-4.0-120 features the proven 120-meter rotor that has been used in offshore applications since 2009. This makes the installation of a 4.0-MW turbine suitable for environments where maximum tip-height restrictions apply.



SWT-4.0-130	
IEC Class	IB
Rotor diameter	130 m
Blade length	63.45 m
Swept area	13,300 m <sup>2</sup>
Hub height	Site specific
Power regulation	Pitch regulated

## The biggest and most advanced rotor in its class

By using advanced blade technologies, Siemens increased the 4.0-MW rotor diameter by another ten meters – and the swept area by an astounding 18 percent. This allows for a significant increase in energy production, and thanks to the aeroelastically tailored blade technology, this is possible without compromising the structural load.

The proven technology of the 3.6-MW, combined with the upgraded 4.0-MW, means the G4 platform is the perfect choice for a reliable and profitable investment.

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Siemens AG  
Wind Power and Renewables Division  
Beim Strohause 17-31  
20097 Hamburg, Germany  
[siemens.com/wind](http://siemens.com/wind)

For more information, please contact  
our Customer Support Center.  
Phone: +49 180 524 70 00  
Fax: +49 180 524 24 71  
(Charges depending on provider)  
E-mail: [support.energy@siemens.com](mailto:support.energy@siemens.com)

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