



SIEMENS

Ingenuity for life

Powered by
partnership.

Sustainable solutions for your
offshore wind power project

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

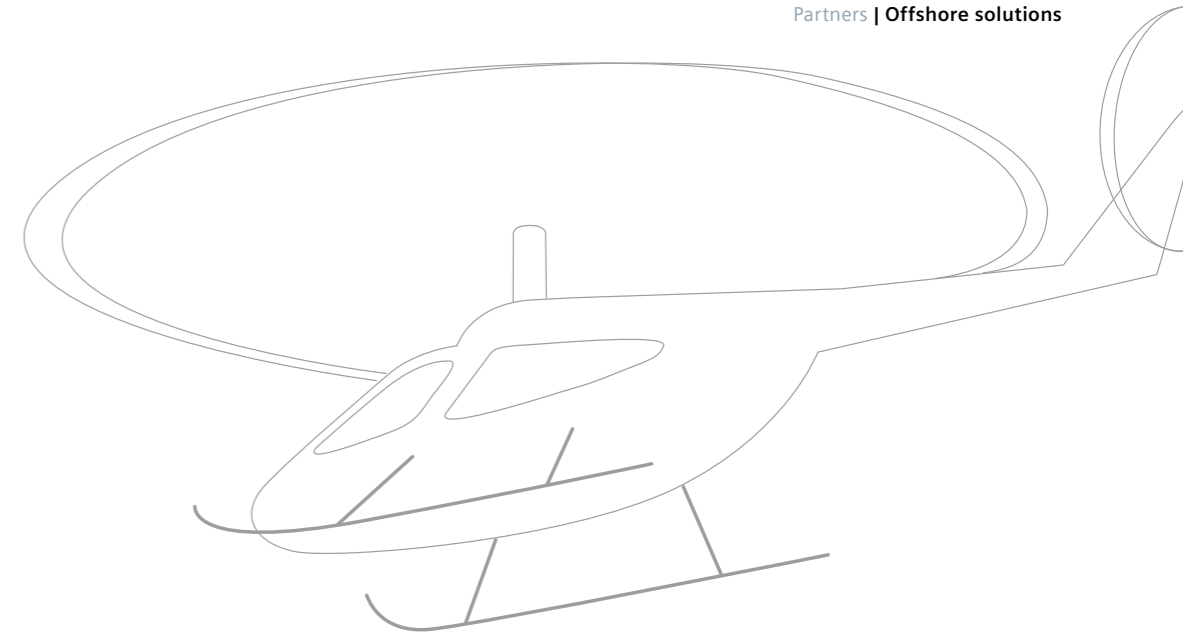
Invest in a partner who invests in you

We believe sustainable investments are powered by partnerships. Our employees work closely with you to help you achieve optimal long-term returns.

Every Siemens solution has one priority: you

We are committed to seeing the world from the point of view of our customers. This means the solutions we provide are driven by the benefits they deliver. This applies as much to our pursuit of absolute safety as to maximizing your return. Whether the invention of a new technology, evolution of an existing product, or simply finding a smarter way of working, we strive to lead the industry in delivering a lower cost of energy.

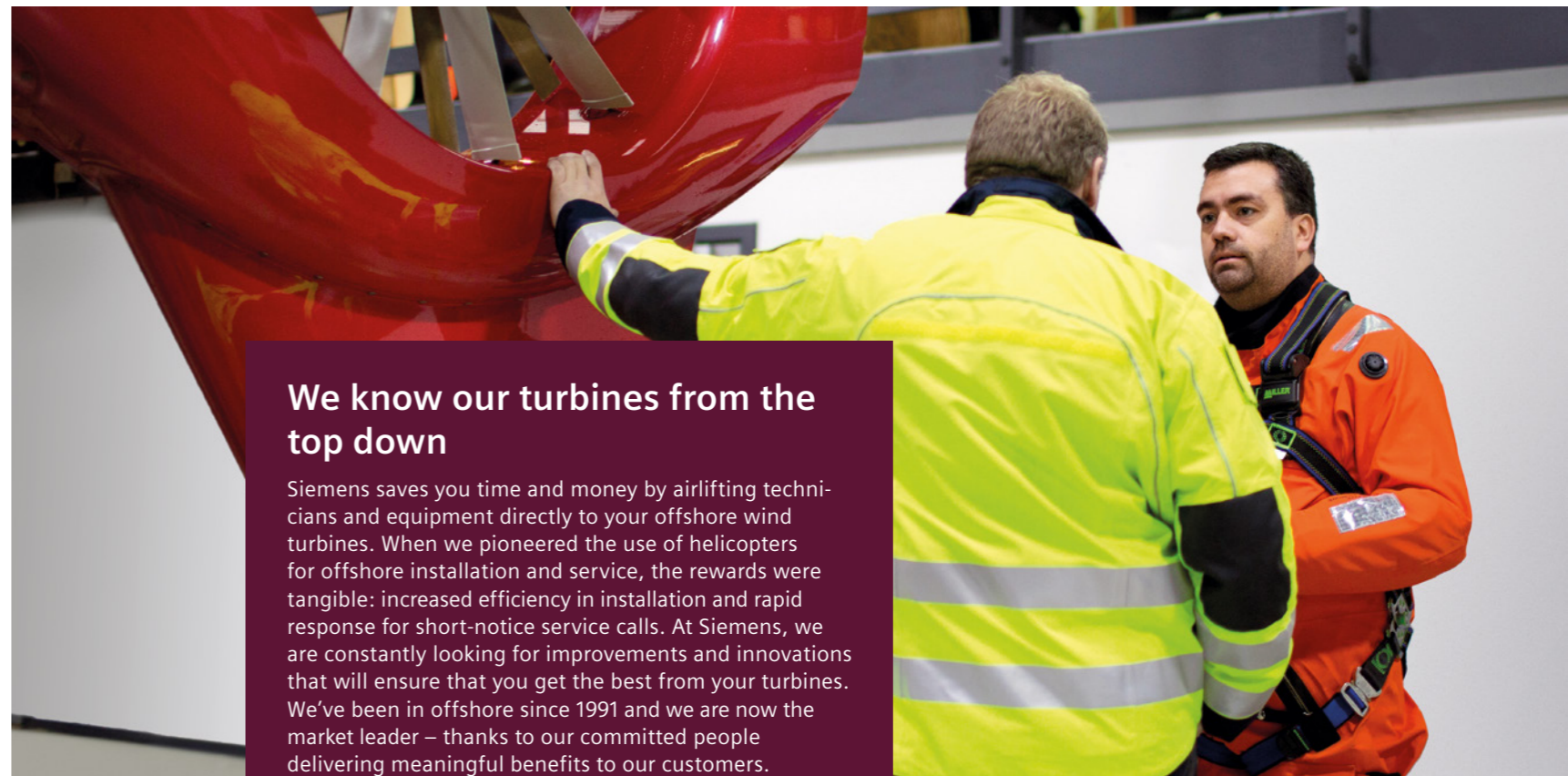
When you choose Siemens as your offshore partner, you choose comprehensive competences that go beyond wind turbines and service. Whether it is grid connection from Siemens Energy Management or financing from Siemens Financial Services, our internal partners are ready when you need their support.



Lowering costs, raising return on investment

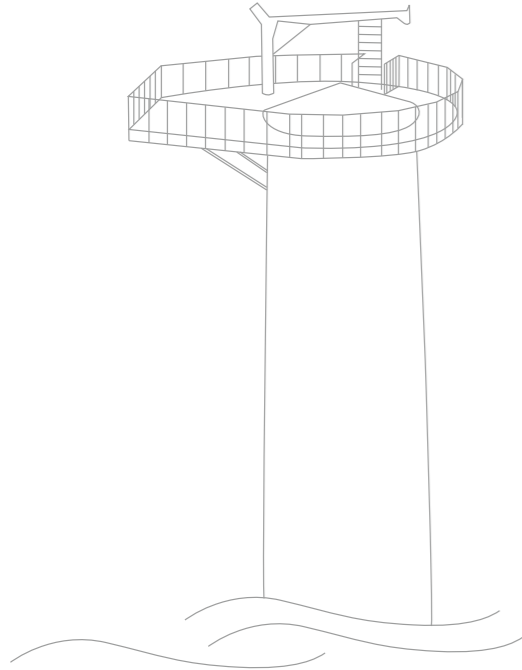
Offshore wind power is a long-term investment with outstanding potential, and like any long-term investment, the sustainability of your project is essential to ensure future returns. To achieve this goal as your partner, we put more than 25 years of offshore experience and our innovative capabilities to work on your behalf.

Throughout the lifetime of your project, our employees strive to lower costs and minimize risk in every aspect of the energy production process. They are committed to maximizing and maintaining the availability, predictability, and performance of your wind turbines – thereby boosting your return on investment.



We know our turbines from the top down

Siemens saves you time and money by airlifting technicians and equipment directly to your offshore wind turbines. When we pioneered the use of helicopters for offshore installation and service, the rewards were tangible: increased efficiency in installation and rapid response for short-notice service calls. At Siemens, we are constantly looking for improvements and innovations that will ensure that you get the best from your turbines. We've been in offshore since 1991 and we are now the market leader – thanks to our committed people delivering meaningful benefits to our customers.



Two platforms, one goal

Successful partnerships are built on the shared peace of mind that comes from a portfolio of proven products tailored to your individual needs.

Tried-and-tested solutions for your safe business case
The varied needs of our partners have shaped our dual-platform offshore portfolio. To maximize your energy output, we make significant improvements to tried-and-tested technologies, at minimized risk. Siemens offers offshore wind turbines from our two offshore product platforms: the Offshore Geared platform and the Offshore Direct Drive platform.

The Offshore Geared platform, for proven performance
The Offshore Geared turbine is our most popular offshore platform, for good reason. It's a high-output workhorse with a unique track record – the first geared turbines were installed in 1991 and are still running strong. The latest edition – the SWT-4.0-130 – delivers 15 percent more energy than its predecessor, the SWT-3.6. The latest design is an upgraded version of the popular SWT-3.6 family that has been installed more often than any other offshore wind turbine worldwide. Altogether, that makes more than 1,700 Offshore Geared units.

The Offshore Direct Drive platform, for a reliable investment

When our engineers set about increasing the performance of our Offshore Direct Drive turbines, they challenged the conventional approach of “bigger is better”. Instead of redesigning the proven platform, they chose a more cost-efficient solution: an incremental upgrade. That's why the next-generation turbine from the direct drive platform, the SWT-8.0-154, retains the basic structure – and advantages – of its predecessors, the SWT-7.0-154 and the SWT-6.0-154. But with an up to 10 percent increase in power output.

Solid testing, for a secure investment

When it comes to the reliability, durability, and sustainability of your products, we don't rely on calculations alone. The major components in all our platforms have to pass Highly Accelerated Lifetime Tests to ensure that they will continue to perform in the harshest possible conditions. Combined, our seven blade test stands in Aalborg, Denmark, and three blade stands in Brande form the largest blade testing facility in the world.

Extending our scope, for a reduced risk profile

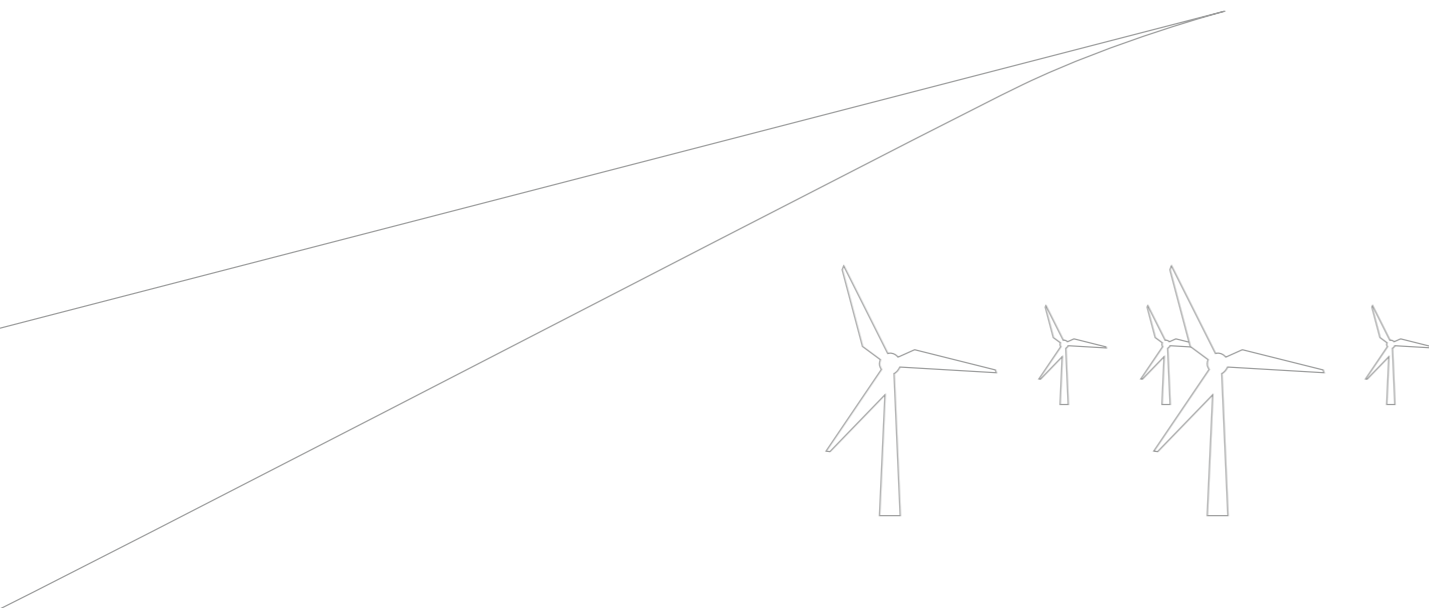
As offshore project sizes increase, so does the required capital. The trend is going toward developers now requesting capital from financial players such as investors, banks, pension funds, and infrastructure. These new players are interested in a simplified interface and reduced risk profile. Siemens is already executing extended scope projects.

Financial solutions to support your project

Financing is a key component in developing a successful offshore wind project. Our focus on the energy sector is driven by a dedicated team of financing professionals, who understand the unique challenges our customers face. We provide developers with finance solutions across the capital spectrum, ranging from nonrecourse debt to equity. We are one of the few financial organizations with the flexibility to invest debt or equity in support of your offshore wind project.

Reducing costs of energy to raise your return

Our innovations reduce the cost of generating wind power.



Our top priority: your bottom line

To drive down the levelized cost of renewable energy and deliver maximum certainty for your investment, our employees analyze and innovate across the entire value chain. From innovative transportation concepts to self-monitoring load control systems, you benefit directly from our forward-thinking, cost-conscious approach.

Spend less, long term

To provide our customers with an accurate basis for long-term comparison of the cost of wind power, we developed the Society's Cost of Electricity (SCoE). The SCoE is a more holistic calculation than the conventional Levelized Cost of Energy (LCoE). By taking socioeconomic factors into account, it shows that wind power compares favorably to other energy sources.

Spend less on transport

In order to reduce costs, our logistics experts developed a system that simplifies transportation of offshore wind turbines from the factory to their final position out at sea. Combined with onshore precommissioning for components and the pioneering use of helicopters, their invention cuts costs before your turbine has completed a single spin.

Meet the team that moves beyond limitations

Transporting large offshore wind turbine components offers a number of challenges, such as complex lifting operations. Thomas Mortensen and Morten Johansen's teams responded with a tailor-made logistics solution based on the Roll-on/Roll-off method. The system uses frames to shift large components nearly at ground level, removing the need to lift and lower heavy parts. A special transport then takes the components directly onto a customized sea vessel – thereby ensuring safe, less expensive delivery, on schedule. Increasing our customers' profitability is always at the forefront of Siemens' approach, and we constantly question the status quo, pushing the boundaries of innovation. With ideas like Thomas Mortensen and Morten Johansen's new approach, we're always on the move.

Spend less on peripherals

Our wind turbines come with SCADA, a straightforward system for monitoring and remotely controlling key variables via a standard web browser – so there's no need to invest in an additional system. The same applies to the intelligent Siemens Integrated Control System (SICS). SICS delivers maximum flexibility in response to voltage and frequency control, fault ride-through, and output adjustment – for full conversion of the power your turbine generates.

The right connection for every wind power plant

Our latest innovations designed to reduce costs and optimize your business case include a new grid access solution for connecting near-shore wind power plants to the grid. This solution consists of an offshore transformer module attached directly to a wind turbine, acting as a distributed transmission asset. It replaces the conventional large-scale AC transformer platforms. Nominally rated in incremental 250 MW blocks, they can be linked together to provide the required transmission capacity even for large-scale wind power plants.

Streamlining processes

Cost-efficient manufacturing and installation require standardization and modularization fundamental to our approach. We have organized the components of our platforms, such as project-specific towers or blades, as standardized modules that can be used with different products. This reduces the total number of different components – as well as your costs.

Low-weight blades for high yield

The proprietary B75 IntegralBlade® our engineers developed for the Offshore Direct Drive platform is the lightest in its size. The blades are cast in one piece in a closed process and are therefore free of glue joints, which gives them optimum quality, strength, and reliability. The low weight reduces loads on the turbine and structure and makes them easier to transport and install, which of course reduces your costs, while the large size increases your yield.

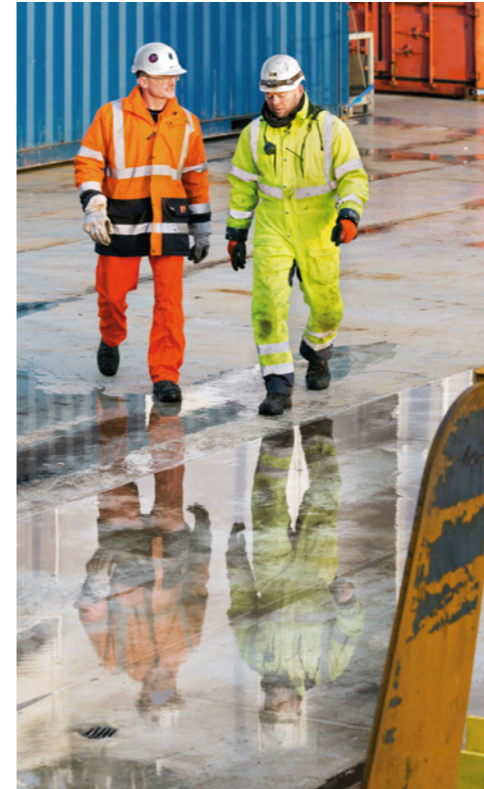
Controlling load

We look after your offshore wind turbine long after it's up and running. To ensure safety in high winds, our Turbine Load Control system continuously monitors structural loading. If loads exceed normal values, your turbine automatically adjusts itself to bring them back within the design envelope.



Safety and predictability first

Tailored, highly industrialized processes and our Zero Harm policy make offshore installation and maintenance safer, faster, and cheaper.



Best practice individually tailored to you

When you partner with Siemens to install your offshore wind turbines, you decide how far we should accompany you. We tailor the scope of each installation to your specific needs – from 100 percent equipment supply to carrying out the required work at sea.

Whichever scope you choose, you can look forward to the reliability, predictability, efficiency, and, above all, the added safety of a proven, highly industrialized process – and a team with more than two decades of offshore installation experience.

Reduced risks, reduced costs

We take full responsibility for your assets and our employees, which is why we never compromise on health and safety and have implemented a company-wide Zero Harm policy that anchors safety as a priority in everything we do. For example, to increase safety and minimize the working hours at sea, our installation teams preassemble as many components as possible on land. And when we reduce time spent at sea, we reduce costs as well. Once preassembled, special sea fastenings and working procedures ensure safe transport of your cargo to the offshore wind power plant site.

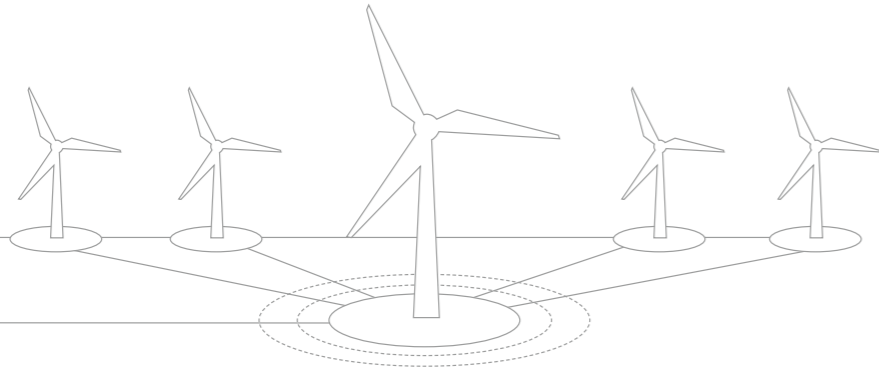
Intelligent innovations for a more efficient process

Once at sea, it takes more than the dedication of installation teams to safely and quickly assemble wind turbines in high wind speeds. Our teams rely on a patented lifting yoke that lets them move large components via remote control from the safety of the ship's deck – smoothly and steadily, piece by piece, blade by blade.

Following assembly, the installation crew puts your turbine through its paces prior to commissioning. Some tests are performed automatically by the turbine controller; the installation crew takes care of the rest – you can rely on our teams to ensure that your investment starts to pay off on time.

Connected thinking

Siemens Service is committed to comprehensive care for the lifetime of your turbines.



The four pillars of our partnership

For increased return on investment throughout a project's lifecycle, you need service that is both smart and proactive. We aim to maximize the performance of your assets with support and maintenance in four key areas:

Remote Diagnostics

The figures are impressive. Our diagnostics experts monitor more than 10,000 turbines, and our diagnostic center in Brande collects over 200 gigabytes of new data every day.

Remote Diagnostics in operation since:
1998

Permanent staff on-site:
130+ experts

Amount of data in the database:
150 terabytes (2016)

Number of measured anomalies:
6,000+ per week

Diagnostic warnings to service teams:
500+ per week

Reliability

Whether wind is steady or stormy, you need to know that your turbines will thrive for their designed lifetime. For your unique requirements, we have developed flexible service solutions to keep your turbines running and enhance your ROI. Smart diagnostics and innovative offshore logistics boost uptime and performance.

Reassurance

To obtain maximum benefit, you need to achieve the highest level of wind turbine availability possible. We have invested knowledge, experience, and technical expertise to produce a range of premium time and yield-based service options that will meet this need and surpass expectations.

Optimization

Service means more than just maintenance and repairs. To offer you permanent asset optimization, once your turbine is installed we continue to improve on it – ensuring that you profit from the ongoing development of our technology.

Knowledge

Especially in the field of wind energy, knowledge truly is power. You can now choose from diverse modules that offer multiple opportunities to investigate and better understand your turbines – from data interfaces to hundreds of training courses. By utilizing Siemens' own decades of experience and expertise, you can reach new heights in the industry.

Committed to a sustainable future

For more than 30 years we have helped transform the wind power sector, but one thing has never changed: our commitment to our partners. You can rely on the support of our teams for the entire lifetime of your turbines. On your behalf, our employees constantly pursue innovation and improve on proven products, ensure availability, and tailor our extensive service portfolio to the specific needs of your project. With more than 2,100 turbines installed offshore and a total capacity of roughly 7.3 GW, we have a vested interest in maintaining sustainable partnerships with our customers. That means you can rest assured that your wind power investment is secure in the long term.



London Array

With Britain keen to maintain its leadership in offshore wind power, three world-leading renewable energy companies commissioned the world's largest wind power plant to date. Given the prestige and scale of the project, a reliable long-term partnership was essential. In addition to supplying 175 Offshore Geared platform turbines, Siemens was awarded a five-year contract to service the plant and also provided financing in the form of debt capital to further support the project.

Capacity: 630 MW
Turbines: 175 x SWT-3.6-120
Turbine rating: 3.6 MW



DanTysk

When the Swedish energy company Vattenfall and the German utility Stadtwerke München awarded one of the country's largest-ever offshore contracts to Siemens, they cited experience as a major factor. Siemens is the only partner with the experience in operating an offshore wind power plant of this kind across the entire lifecycle of the system. Siemens supplied the turbines, service, and grid connection for DanTysk.

Capacity: 288 MW
Turbines: 80 x SWT-3.6-120
Turbine rating: 3.6 MW



Gemini

This North Sea installation is the largest-ever project-financed offshore wind power plant. It is 70 percent financed by more than 20 external investors, with another 20 percent supplied by shareholder equity via Siemens Financial Services. The majority stakeholder, Northland Power, praised the solid structure and global offshore leadership that the Siemens partnership brings to the project. Siemens will supply and service the turbines for at least 15 years and, as part of the equity consortium, Siemens Financial Services provided equity toward the total shareholders' investment of almost €500 million.

Capacity: 600 MW
Turbines: 150 x SWT-4.0-130
Turbine rating: 4.0 MW

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