

GE Power & Water
Renewable Energy

4.1-113

Offshore **Wind** Turbine

Proven technology –
built for purpose.

a product of
ecomagination



imagination at work



Proven technology... built for purpose

GE's 4.1-113 combines a proven design with GE's unparalleled reliable technology to deliver a genuine offshore wind turbine. The robust baseline design is intended specifically for the offshore environment, with reliability and availability as the primary design drivers. This is why the machine includes a direct-drive drivetrain, redundancy in the generator and converter, and in-situ repair capabilities, the combination of which provides unique value to offshore wind farm operators.

GE has a long history of successful product evolution with our onshore 1.5MW and 2.5MW platforms and we are taking the same approach with the offshore product line. By integrating improved cooling, carbon blades and GE's patented Advanced Loads Control technology already proven in our onshore fleet, GE has evolved the turbine from a 3.5MW machine with a 90 meter rotor to a 4.1MW turbine with a 113 meter rotor. The combination of GE's proven technology with the robust baseline design provides 43% more annual energy production while maintaining the track-record of the baseline design. On a monopile in water depths up to ~30m, this provides the optimum combination of low CAPEX plus highest yield.

GE's stringent design procedures result in a turbine intended and proven for high performance, reliability and availability. With six years operating history of the installed fleet of 3.5 MW turbines the design platform is well proven. In the harsh climate of coastal Norway, the fleet is already operating at availability levels higher than 97%. Such high availability results are due in part to its specific design and direct drive technology which means less maintenance downtime while reducing operating expenses significantly.

GE's overall wind power product strategy focuses on results vital to our customers' success and the world's energy needs. With a design strategy that emphasizes higher efficiency, increased reliability, maintainability and seamless grid integration, GE wind power solutions are ever-evolving powerhouses of precision.



Technical Data: 4.1-113

Operating Data

- Rated Capacity: 4.1 MW
- Cut-In Wind Speed: 3,5 m/s
- Cut-Out Wind Speed: 25 m/s
- Rated Wind Speed: 14 m/s
- Wind Class – IEC: 1b

Features

- Rotor Diameter: 113 m
- Swept Area: 9,940 m²

“Plug & play” approach to offshore wind

The logistical challenges of offshore installation, especially when compared to onshore projects, make it imperative to minimize the time spent offshore and thus reduce costs for our customers.

GE's 4.1-113 is building on the execution track-record GE has built onshore. With over 16,500 turbines installed, GE's 1.5 series is recognized as the most easily installed and commissioned onshore turbine. GE's 4.1-113 design takes ease of installation and commissioning to the next level. It allows for the machine to be connected, tested, and pre-commissioned in the factory prior to shipment.

Upon installation a single bundle of cables is dropped from the turbine's nacelle and connected to the switch gear, the only component that is configured down tower. Once the turbine is “crane ready”, the 4.1-113 should take no more than 7 days to install and commission which is a significant improvement on current market averages.

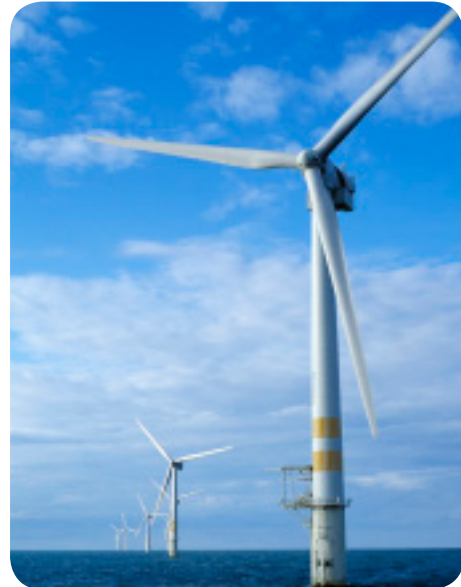


GE's 4.1-113... Reliable Power

Maximizing availability

As one of the world's leading wind turbine suppliers, GE provides support services extending from remote monitoring and fault resolution to complete operations and maintenance. Our field engineers remain dedicated to ensuring consistent turbine reliability. This knowledge has shaped GE's offshore Service strategy... minimize time at sea by focusing wind turbine design on the realities of working offshore with a healthy respect for and understanding of the offshore environment and its challenges.

GE's 4.1-113 design was formed with a simple goal in mind: to design a wind turbine that was suited specifically for the offshore environment and delivering the lowest cost of electricity to customers.



One key driver in lowering the cost of electricity is serviceability resulting in less downtime and more Annual Energy Production. That is why GE has placed such a heavy emphasis on designing in reliability and availability at the heart of the offshore turbine design. The 4.1-113 design eliminates maintenance-intensive parts of the yaw system and drive train, and will deliver lower operating expenses through longer intervals between planned maintenance and by minimizing the need for large jack-up barges through built-in modularity and redundancy.

World-Class Customer Service

GE's wind turbine fleet is one of the fastest growing and best-run fleets in the world. Utilizing our decades of experience in product services in the power generation industry, GE can provide advanced technology solutions to ensure optimal performance for your wind plant.

At GE, we also understand the need for flexible solutions—that's why we offer a complete program of wind energy service offerings tailored specifically to the needs of our customers. Our global wind services organization works with customers to develop comprehensive and customized service solutions for a range of scopes.

From 24/7 remote monitoring and diagnostics, to routine maintenance, to on-site support whenever you need us, we partner with you to best understand your requirements and to deliver the customized solutions to meet them.

Scale & industrialize

Supply chain development

GE considers Volume, Standardization and Optimization the key levers to deliver reduced cost of electricity. Through the unparalleled experience of ramping-up its onshore business, GE developed a unique model to industrialize the sector and deliver a consistent quality and high reliability product from day one.

In addition, GE's global approach to sourcing and supply chain management strategy provides our customers with high degree of flexibility and cost-competitiveness, building on our Lean Six Sigma expertise and wide array of quality and reliability engineers.

The offshore industry is at a similar position as the onshore industry was a few years back: trying to deliver both a massive ramp-up of installation and reduction in cost of electricity, and no other player in the industry is better equipped than GE to deliver on those goals.

Project execution

GE understands that grid compatibility, site flexibility, and on-time delivery are critical to the economics of a wind project. For that reason, the 4.1 MW wind turbine has been engineered for ease of integration and delivery to a wide range of locations.

Our global project management and fulfillment expertise offer customers on-time delivery and schedule certainty. Regardless of where wind turbine components are delivered, GE's integrated logistics team retains ownership and responsibility for this critical step. Utilizing the GE Energy Power Answer Center, our engineering and supply chain teams are ready to respond to any technical, mechanical or electrical questions that may arise.

As one of the world's largest power plant system providers, GE is uniquely positioned to provide customers with full-service project management solutions. With offices in North America, Europe, and Asia, our world-class Power Plant Systems division utilizes decades of fulfillment expertise in project management, logistics, plant start-up and integration from Gas Turbine, Combined Cycle, Hydro, and Aero plants.





Environmental Health and Safety, a GE Commitment

Maintaining high Environmental Health and Safety (EHS) standards is more than simply a good business practice; it is a fundamental responsibility to our employees, customers, contractors, and the environment we all share. GE is committed to maintaining a safe work environment. We incorporate these values into every product, service and process, driving EHS processes to the highest standards.

Powering the world...responsibly.

For more information please visit www.ge-energy.com/wind.



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