SAMSUNG
WIND ENERGY SOLUTIONS
INNOVATION IS IN OUR GENES.
WIND TURBINES DESIGNED FROM TOP TO BOTTOM TO WITHSTAND HARSH WINDS AND CLIMATE LONGER THAN ANY COMPETITOR’S.

LONGEVITY
Samsung 2.x MW wind turbines are designed, tested and G2 certified to set a new standard in reliability and durability: the 25-year design life.
OUR ENTERPRISING SPIRIT IS YOUR DESTINY.
SAMSUNG SOLUTIONS FOR OFFSHORE,
OCEAN, AND COASTAL AREAS PROVIDE VAST,
UNTAPPED OPPORTUNITIES FOR WIND POWER.

Turnkey Solutions for Offshore
We hold our customer’s hand from the early planning stage
till stable electrical production is achieved and beyond.
With 36 years of experience in the shipbuilding and offshore
structure industries, we have everything it takes to deliver.
COMMITMENT IS OUR MIDDLE NAME.
SAMSUNG'S LEVEL OF SUPPORT IS LEGENDARY IN THE SHIPBUILDING INDUSTRY.
WE'RE EXTENDING THAT PROMISE TO THE WIND ENERGY SECTOR.

SERVICE AND SUPPORT

24/7 Real-time Remote Monitoring
Samsung’s support system for the operation and maintenance of our turbines continues for their entire life cycle. Samsung wind turbine solutions are backed by an expanding global service network.
QUALITY IS OUR STRENGTH.
WE BUILD IN A UNIQUE MANUFACTURING ENVIRONMENT WITH A COMMITMENT TO ZERO-DEFECT QUALITY.

With our line manufacturing system—another industry first—quality is guaranteed at every stage of production.
Samsung delivers the solutions to power tomorrow. Backed by nearly four decades of expertise in the design and construction of advanced marine vessels, offshore facilities, industrial infrastructure and intelligent systems and with some of the top names in wind power as our partners, we've created the first of what will be a family of wind turbines that will reach new heights of reliability, performance and value in the years to come.

WE INVENT:
new ways of powering the future

WE SOLVE:
dwindling fossil fuels with wind energy

WE DESIGN:
Reliable, durable wind turbines

WE RECONSIDER:
what customers should expect

WE INVENT:
new ways of powering the future
At Samsung, we know the ocean. With decades of experience in the design and construction of advanced marine vessels, offshore facilities, industrial infrastructure and intelligent systems, and with some of the top names in wind power as our partners, we’ve created the first of what will be a family of wind turbines that will reach new heights of reliability, performance, and value in the years to come.

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SOLUTIONS TO TOMORROW'S ENERGY CHALLENGES

A VIBRANT ESPRIT DE CORPS FILLS THE AIR AT SAMSUNG.
IT’S MORE THAN A FEELING, IT’S VERY REAL EVIDENCE THAT WE’VE FULFILLED
OUR VISION TO BUILD WORLD-CLASS WIND TURBINES THAT ARE WORTHY
OF THE SAMSUNG NAME AND OF YOUR INVESTMENT.

Dear prospective customer,

Samsung’s 2.x MW class wind turbines represent the first in a new family of advanced onshore and offshore wind solutions that we believe will bring new energy to the global marketplace. They’re designed to deliver best-in-class reliability and performance with a 25-year design life—20% longer than the industry standard.

While the wind industry is a new area for Samsung Heavy Industries, we’ve been hard at work in the energy sector for some time. In fact, we’ve been bringing innovative solutions to the vast challenges of tapping the oil and gas resources beneath the world’s seas and oceans for nearly four decades; our drillships, fixed offshore platforms, and floating production, storage, and offloading units are undisputedly the best in the business. And thanks to our wealth of expertise in mechanical and electrical engineering and manufacturing, we possess the resources and acumen to deliver fresh energy to the wind industry.

Our first turbine, which entered commercial operation in Lubbock, Texas, in April 2010, represented the first model in a growing onshore and offshore solutions lineup. To meet the widest range of customer needs, we also offer variants for low wind and cold-climate areas. We’re now developing several other onshore models as well as 7 MW-class offshore models that we expect to bring to market in 2012.

Recently, we received full GL Renewables Certification for our 2.5 MW wind turbines (IEC class IIa). And with the skills and technology that enabled us to acquire that highly regarded certification, we are advancing further in the worldwide wind power market, as demonstrated by our recent MOU to export wind turbines to Macedonia.

Our performance in 2010 was strong, but the global economic climate remains uncertain. Volatility in the Middle East, financial crisis in southern Europe, and the effects of the horrific disaster in Japan make economic forecasts difficult. We intend to overcome any hurdles by continuing to develop innovative technologies while serving our customers with the highest level of quality, and anticipating their needs by offering timely, heartfelt service at every stage, empowering them to generate clean, reliable wind power today, and tomorrow.

Top-tier companies come and go, but those that thrive often lead the way by learning to put their backs to the wind to grow in the right direction, therefore remaining nimble. Samsung has continually embraced both innovation and the challenge of creating a better tomorrow. For these reasons, we expect to stand tall for many more decades to come. The trust and satisfaction that we generate together will make the world a better, more sustainable place. Thank you again for your interest in Samsung Wind Energy Solutions.

In-Sik Roh
President & CEO
Samsung Heavy Industries
We pledge:
100% customer satisfaction is our overarching objective

We support:
from planning to operation, we stand beside you

We design:
longer-lasting turbines

We innovate:
better quality control through constantly improved manufacturing practices

we introduce
Samsung Wind Turbines
engineered for reliability, optimized for performance, and built for easy maintenance. Samsung 2.x MW class turbines have a future that’s as unlimited as the wind that powers them.
Delivers quieter, class-leading aerodynamic performance with pre-bending and low-noise tip designs. Meets the highest IEC standards for lightning protection, with multiple receptors.

Blades
Continuously optimizes the angle of each individual blade to maximize power generation with electric drives. Significantly reduces blade root and shaft fatigue loads over collective pitch control systems.

Drive Train
Rigidly supports the main shaft with two high-performance bearings in a single housing. Minimizes external load transfer to gearbox with double-tapered and cylindrical roller bearings.

Auto Lubrication System
Features a permanent magnet design that delivers greater efficiency at low wind speeds than induction generators. Requires virtually no maintenance with a simpler brushless design.

Generator
Consists of three gear stages—one planetary and two helical. Mounted with a hydraulic mounting system to effectively dampen vibration. Equipped with a torque limiter on the high-speed shaft to prevent damage from extremely high loads caused by grid failure.

Auto Lubrication System
Maximizes power production with four intelligently controlled high-torque inverter-driven electric drives. Minimizes backlash at the start of rotation with an external hydraulic caliper brake.

Converter
Easily adjusted to meet any grid-connection requirement. Uses superior harmonic filtering for lower total voltage harmonic distortion. Features advanced zero-voltage ride-through capability to maintain grid connection during disturbances.
Experimental validation
Samsung 2.5 MW wind turbines are designed, analyzed, and GL-vali- 
dated to set a new standard for reliability and durability with a 25-year design life.

Drive train
We put our 2.5 MW wind turbine through comprehensive dynamometer testing at the U.S. National Wind Technology Center in Boulder, Colorado, to test power performance and quality, verify safety logic, and validate mechanical functionality and structural stability in different wind conditions.

Gearbox
We validated gearbox design life with HALT testing under GL observation. We also measured gearbox efficiency of well over 97% at rated torque through functional testing on a back-to-back test rig.
Pitch and torque control
Our advanced control system couples control of blade pitch and generator torque for optimal generating performance in all wind conditions. Below the rated wind speed, the system controls generator torque to maintain maximum power. Beyond the rated wind speed, it optimizes loads to maintain the generator at its rated power.

Monitoring and feedback control
Our advanced control system incorporates a number of monitoring and feedback control features to increase availability. These include drive train monitoring as well as tower vibration feedback control, which adjusts blade pitch to dampen excessive vibration.

Optimized for performance
Wind is different everywhere. We are prepared. Optimum performance in any wind.
Condition monitoring system
Our advanced system continuously monitors vital drive train components in 13 locations, analyzing data with a signal conditioning system driven by the industry’s most extensive database. The system alerts the operator of abnormal operating conditions, allowing major issues to be proactively addressed to avoid more costly repairs down the line.

Auto lubrication system (ALS)
This system lubricates all major moving components—the main bearings, pitch bearings and drives, yaw bearing and drive, and generator bearings—at appropriate intervals for enhanced durability as well as significantly reduced maintenance time and frequency.

Built for Maintainability
We Calibrate
We Assimilate
We Accomplish

SAMSUNG WIND TURBINES ARE EQUIPPED WITH TIME- AND COST-SAVING FEATURES THAT HELP ACHIEVE HIGHER PROFITABILITY.
Certification by Germanischer Lloyd

Samsung’s first wind turbine was GL-certified in an unprecedented time of only 8 months. The fastest any turbine manufacturer was awarded the certification, it confirms Samsung’s design expertise and manufacturing ability.

Service and support

We are committed to providing 24/7 customer service with real-time remote monitoring and troubleshooting through our division headquarters in Korea and service centers in Houston and a growing number of other global markets. We offer annual on-site diagnostic services for the lifetime of our turbines. Our parts supply chain is prepared to provide service parts anytime, anywhere. We are also setting up training centers in major markets to provide courses to client operating staff and O&M technicians.

Competitive warranty

Backed by a global reputation for excellent quality and customer service, each Samsung wind turbine comes with a warranty that exceeds the industry average.

Quality management

Backed by ISO 9001-certified manufacturing facilities, we have established the Samsung Wind Turbine Quality Standard (SWQS) to ensure customer satisfaction and guide us forward to GL-type certification. Our turbines are built with quality-tested components subject to the Samsung Q-mark certification system. All tolerances and alignments of assemblies are strictly controlled through a real-time digital monitoring system (RTDMS). As in each of our other businesses, we are committed to delivering defect-free products.

HSE management

Risk management is a key element of our health, safety, and environment policy. We proactively identify hazards, assess risks, and implement necessary control measures. Our HSE management system satisfies all ISO 14001 and OHSAS 18001 requirements.
SOLUTIONS FOR ONSHORE

Wind is an abundant source of free power that can be economically tapped in most regions of the world. Our wind turbine family includes models designed for optimal generation performance in all wind conditions and regimes. Samsung’s onshore wind energy solutions cover IEC class Ib up to IIa sites.
Covering IEC wind classes Ib to IIa with 3 wind turbine models, for optimum performance at any wind site.

**Samsung’s Efforts to Offer Market Leading Products Will Continue.**

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### Samsung Onshore Wind Energy Solutions

<table>
<thead>
<tr>
<th>Model</th>
<th>S2.5-90</th>
<th>S2.5-100</th>
<th>S2.3-103</th>
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</thead>
<tbody>
<tr>
<td>Rated power (MW)</td>
<td>2.5</td>
<td>2.5</td>
<td>2.3</td>
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<tr>
<td>Wind class</td>
<td>IEC class Ib/IIa</td>
<td>IEC class IIb/IIIa</td>
<td>IEC class IIIa</td>
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<tr>
<td>Rotor diameter (m)</td>
<td>90 (295.3 ft)</td>
<td>99.8 (327.4 ft)</td>
<td>103 (337.9 ft)</td>
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<td>Cut-in speed (m/s)</td>
<td>3.0 (6.7 mph)</td>
<td>3.0 (6.7 mph)</td>
<td>3.0 (6.7 mph)</td>
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<tr>
<td>Cut-out speed (m/s)</td>
<td>25 (55.9 mph)</td>
<td>21 (46.9 mph)</td>
<td>21 (46.9 mph)</td>
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<tr>
<td>Drive train</td>
<td>Main bearing</td>
<td>Two bearings (DTRB + CRB), single housing</td>
<td>One-stage planetary, two-stage helical gear</td>
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<tr>
<td>Gearbox</td>
<td>Type</td>
<td>Support</td>
<td>Output shaft</td>
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<tr>
<td>Generator</td>
<td>Rated speed (rpm)</td>
<td>1,650</td>
<td>2,640 (KW)</td>
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<td>Converter</td>
<td>Type</td>
<td>Pulse-width modulated</td>
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<td>Cooling</td>
<td>Frequency</td>
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<td>Pitch bearing</td>
<td>Two-row ball bearings</td>
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<td>Yaw</td>
<td>Yaw drive</td>
<td>Electric, 4 drives</td>
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<tr>
<td>Tower</td>
<td>Height</td>
<td>80 m (262.5 ft), 100 m (328.1 ft), custom heights available</td>
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<tr>
<td>Operating temperature</td>
<td>-10℃ to 40℃ (Cold Climate Package: -30℃ to 40℃)</td>
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### Future Onshore Wind Energy Solutions

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<th>Model</th>
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<th>S3.0-1XX</th>
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<tr>
<td>Rated power (MW)</td>
<td>2.39</td>
<td>2.7</td>
<td>3.0</td>
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<td>Wind class</td>
<td>IEC class IIb/IIIa</td>
<td>IEC class Ib/IIa</td>
<td>IEC class Ib/IIa</td>
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<tr>
<td>Rotor diameter (m)</td>
<td>&gt;105</td>
<td>&gt;105</td>
<td>&gt;105</td>
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<tr>
<td>Expected product release</td>
<td>April 2013</td>
<td>July 2013</td>
<td>July 2013</td>
</tr>
<tr>
<td>Capacity factor (%)</td>
<td>&gt;50%</td>
<td>&gt;50%</td>
<td>&gt;50%</td>
</tr>
</tbody>
</table>
Solutions for offshore oceans and coastal areas offer vast, untapped opportunities for wind power. Our upcoming offshore wind farm solutions will leverage our world-class wind turbine, offshore facility and installation vessel manufacturing capabilities to deliver competitive turnkey solutions.
At Samsung, we know the ocean. With decades of experience as a major force in the construction of offshore facilities such as oil and gas production systems and drilling platforms, we are now in the process of developing turnkey offshore wind farm solutions. In addition to advanced offshore turbines, these solutions will include the installation of a state-of-the-art management and control system, offshore substation, and subsea cabling to connect the farm to the grid, ensuring the highest level of wind farm reliability, integration, and performance.
Shipbuilding
Since we delivered our first vessel in 1980, we have booked orders for or delivered more than 855 ships to customers around the globe. Today we are a global leader in high-tech, value-added specialty ships such as Arctic shuttle tankers, LNG carriers, ultra-large container ships and passenger ships.

Offshore Facilities
Over the past three decades, we have helped oil and gas majors around the globe bring the vast energy resources beneath the oceans to market. Today we are a global leader in innovative offshore facilities such as drillships, crude and LNG FPSOs, floating offshore structures and fixed platforms.

Engineering & Construction
Starting out as a residential builder in 1981, we have expanded and grown to become one of Korea’s premier general engineering and construction firms. Today we are committed to building tomorrow’s landmarks-projects and facilities that are unparalleled in beauty, usability, technology, quality and durability- that will stand the test of time.

Wind power
We joined the renewable energy revolution in 2008 when we launched development of our 2.5 MW onshore wind turbines. Today we are in the process of developing a full lineup of onshore and offshore solutions as we set up an integrated global sales, service and manufacturing network that will power our emergence as a global industry player. Electric drive systems reduce maintenance costs by eliminating the need for the regular inspection and maintenance required by hydraulic drive systems.