



compact, lightweight, more efficient,  
**powerful**



### The drive for affordable clean energy...

Rising pollution levels, increasing carbon emissions, volatile fuel prices, a desire for energy independence. These are among the factors that have fueled a tremendous increase in the use of renewable energy, with wind power being one of the major contributors to the overall energy mix.

Offshore wind power is the next great frontier for wind energy. Despite its tremendous potential, the market's growth has been limited because of the relatively high installation, construction, operation and maintenance costs for large turbines in the offshore environment.

Put simply, the industry continues to seek new technologies that lower both wind farm capital costs and operating and maintenance costs while raising energy yields. The result: lower Levelized Cost of Electricity (LCOE).

AMSC's advanced wind turbine generator technology fits this profile. These machines are smaller, lighter and more efficient – and pound for pound more powerful – than current solutions. They are optimized for the market needs of large offshore wind parks.

### AMSC direct drive superconductor generator technology significantly lowers the cost of offshore wind power through a more compact design and responds to the unique needs the industry is seeking.

For example, a 10 megawatt (MW) superconductor direct drive generator is under 5 meters in diameter and weighs approximately 160 tons, making it vastly smaller and lighter than other geared and direct drive technologies.

AMSC's superconductor-based generators enable reductions in the cost per MW of the complete wind park. Meanwhile, the operation and maintenance (O&M) of fewer, simpler, more reliable turbines can greatly improve the overall cost of electricity for wind parks. With a smaller and lighter nacelle, the superconductor generator potentially reduces the costs associated with the supporting mast structure, foundations and installation.

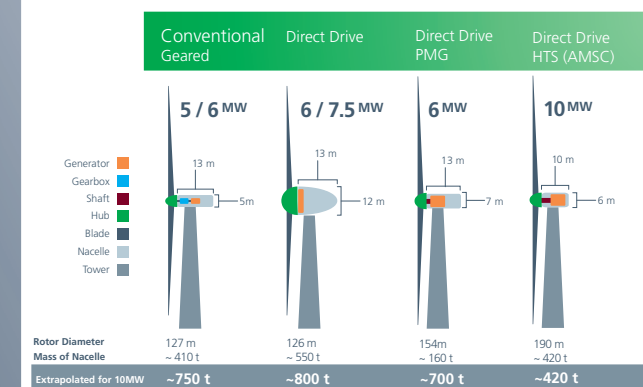
**All of this translates into more 'power per tower'.  
And more energy for less money.**

## AMSC's superconductor generator technology: smaller, lighter and more efficient machines, producing higher power ratings and energy yields and lowering installation, operating and maintenance costs.

Our 25 years of superconductor leadership are being combined with our holistic wind turbine design and power electronics expertise to develop the industry's most optimized offshore wind turbine generator.

A typical 10 MW superconductor generator will have a nacelle 10 meters long by six meters high, with a combined nacelle and rotor weight

that is about 420 tons. For comparison, a conventional direct drive machine, scaled up to the same nameplate capacity, may require a nacelle 13 meters long and 12 meters high, weighing some 800-900 tons. A geared turbine, meanwhile, would likely be topped with a nacelle 13-15 meters long and five meters high, weighing 750-850 tons.



### Solutions for large-scale offshore wind turbines

- The power density of superconductor wind turbine generators enables the implementation of larger, more economical turbines
- No gearbox. No couplings. Reduced mass
- Superconductor generators offer turbine and wind farm savings due to their power density, compact size and light weight
- Enables easy integration into the wind turbine mainframe structure
- Optimized solution – direct drive, medium voltage, full-scale conversion
  - Direct drive avoids gearbox failure
  - Medium voltage reduces nacelle copper bussing and wiring
  - Converter provides frequency matching, LVRT and power system stability
- High efficiency generator
  - Up to 96% efficiency
  - 94% efficiency with converter
- Air core, extreme light option available
- Superconductor windings generate high ampere-turns and flux density without the need for iron pole faces

AMSC's superconductor generator technology for wind turbines is based on the company's experience designing high-power superconductor ship propulsion motors for the U.S. Navy. In 2009, AMSC delivered and completed successful full-power testing of a 36.5 MW Navy motor. This was the first successful full-power test of an electric propulsion motor sized for a large Navy Combatant, and it doubled the Navy's power rating test record.



- **Increases the practical power rating of direct drive systems**
- **Avoids the requirement for large, maintenance-intensive gearboxes**
- **Reduces overall turbine costs due to its lightweight and compact design**
- **Lowers the cost of electricity throughout the turbine's life-cycle**
- **Simplifies the overall drivetrain design through its compact, integrated nature**
- **Enhances wind turbine reliability**



# HTS Generator Solutions

## About AMSC's Windtec Solutions™

AMSC's Windtec Solutions enable manufacturers to launch best-in-class wind turbines quickly, effectively and profitably. We provide conceptual and detailed designs for complete wind turbines and advanced drivetrain systems. In addition, we provide a broad range of volume manufacturing support services, including supply chain development, localization and employee training. Our offerings also include advanced wind turbine electrical control systems that ensure highly reliable and efficient power flows. Whether you are a new entrant or a proven wind turbine manufacturer, our commitment is to provide you with the solution that delivers competitive advantage, lowers the cost of energy and enhances your return on investment.

**We can do all of this for you; we are the partner you can turn to.**

## About AMSC®

AMSC (NASDAQ: AMSC) generates the ideas, technologies and solutions that meet the world's demand for smarter, cleaner ... better energy. Through its Windtec Solutions, AMSC enables manufacturers to launch best-in-class wind turbines quickly, effectively and profitably. Through its Gridtec Solutions, AMSC provides the engineering planning services and advanced grid systems that optimize network reliability, efficiency and performance. The company's solutions are now powering gigawatts of renewable energy globally and enhancing the performance and reliability of power networks in more than a dozen countries. Founded in 1987, AMSC is headquartered near Boston, Massachusetts with operations in Asia, Australia, Europe and North America.



## Talk to us about

- Solving your most complex power challenges
- Enhancing competitive advantage
- Improving your system's performance, reliability and profitability

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Whether you wish to make new advances in renewable technology, optimize power generation or delivery, or simply gain a better understanding of the issues you face, please get in touch. We're here to help.



smarter, cleaner  
... better energy

