

Size Matters: The Next Big Thing In Wind Turbines

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In the race to supply the world with carbon-free renewable energy, there have been encouraging signs in wind power, with costs there falling by half over the last decade. How might a turbine manufacturer get those prices even lower? Go big.

Back in the 1980s, the blades of commercial wind turbines could trace a circle as wide as an NBA basketball court, but there's been plenty of room to grow since then. This week GE launched its biggest wind turbine yet. The machine comes with a colossal rotor whose diameter spans the length of more than one-and-a-half [American football fields](#).

That means that each blade is as long as the entire wingspan of a Boeing 747-8. It would take 2 minutes for the average person to walk from the tip of one turbine blade to the other (15 seconds if you're Usain Bolt).

It's hard to fathom machines on that scale, yet they're on course to get even bigger over time as manufacturers seek to make turbines that can generate more energy by reaching the faster wind speeds in loftier heights, and by growing in size. The bigger the blades, the more homes the turbine can power.



Bigger is better when it comes to capturing wind energy — the larger a turbine's blades, the more homes it can power. GE's new 4.8-158 turbine is a mammoth with blades as long as the wingspan of a Boeing 747-8. Among the largest onshore wind turbines on earth, it's powerful enough to provide 5,000 European homes with electricity. Images credit: GE Renewable Energy

Wind turbine manufacturers have been racing to go large because

longer blades can cover more area and gather more wind flow. That hasn't been so necessary in windswept landscapes like the vast rolling hills of Northern California, but it comes handy in parts of Australia, Germany, Turkey and other regions in mainland Europe where wind speeds are milder. "The good wind sites have been taken," says Minesh Shah a project manager for GE's next-generation turbines. "Getting as much energy from one turbine as you can is important."

GE's latest turbine, called the 4.8-158 because it generates 4.8 megawatts and has a 158-meter rotor, hits a milestone. It's the largest the company has ever made and is one of the largest onshore turbines on the planet. It will also generate 30 percent more energy than GE's previous turbine, which produced a maximum of 3.8 megawatts. Each new unit is powerful enough to provide electricity for 5,000 residential homes in Europe. And despite the leap in size, it's also quieter than the previous turbine release at 104 decibels.

Building bigger and bigger turbines isn't as simple as it sounds. Larger machines are typically heavier and harder to engineer. So while turbine blades have traditionally been made from fiberglass, the new ones are made with carbon to cut down on weight. The turbine's tower — which scrapes the sky by reaching as high as 240 meters, or more than two-thirds of the Eiffel Tower — also contains less steel. There are lighter materials for electrical components in the rotor as well, Shah says.

Thanks to smarter technology, wind turbines also are becoming more economical and energy efficient, just as cars have. The materials used in the rotor, sourcing, logistics, the software that plugs into the turbine — everything makes a difference. To that end, the 4.8-158 uses GE's next generation control systems to continuously optimize the power production given prevailing wind conditions. It also integrates GE Digital's Asset Performance Management (APM) system to detect issues sooner, turn

unplanned service activities to planned, and ultimately lower the cost of operations.

GE's 4.8 MW onshore wind turbine with 158m rotor diameter



GE, which has been launching new turbine platforms like the 2 MW and 3 MW machines approximately every four years, expects that customers for the new turbine will pay 15 percent less in maintenance costs because of new features like real-time diagnostics, which can help them avoid the expense of sending large cranes to carry out repairs. The new turbine also should live longer. “We’re designing for a 25-year life,” says Shah, adding that with the right site conditions, its lifespan could stretch even further. “If you can go to 25 and 30 years, the cost of electricity goes down.”

Auctions for renewable energy around the world already have been driving

down the cost of renewable electricity, but there's been some push and pull on prices thanks to changes in government regulations. The feed-in tariffs that some governments offered to subsidize wind energy are now being reduced or eliminated. "In consequence, wind has to stand on its own," says Shah, adding that society is moving in a direction of wanting more clean energy, "but not wanting to pay more."

Bigger turbines can fortunately address that need. With the 4.8-158, those costs can fall even further.