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WIND REVOLUTION

GREENVILLE INVENTOR BELIEVES HIS TURBINE WILL CHANGE AN INDUSTRY

By Ross Norton
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It didn't seem like a revolutionary question. "What are you hauling?" Truck drivers get that question all the time.

The answer, this time, was amusing to the driver and the asker. The driver was the great-grandson of the man who started Eli Bridge Ferris Wheels in 1900. Still in the family business, he was using company equipment to haul a gear box for a giant wind turbine. The man asking the question was Jerry Barber, amusement ride

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Jerry Barber has been tinkering with new ideas most of his life and has patented more than 60 innovations. (Photo/Ross Norton)

Anderson County manufacturers get Employer Impact Awards

Burriss Nelson, president of the Development Corp. of Anderson County and director of economic development for Anderson County, presents Matt Kelley, president of Kelley Engineering, with an Employer Impact Award. (Photo/Teresa Cutlip)

By Teresa Cutlip
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Kelley Engineering, Sargent Metal and Michelin received Employer Impact Awards recently during a meeting of Anderson County manufacturers, educators and economic developers.

"Every time we have a meeting we see new faces, and that's what it's meant to be," said Teri Gilstrap, existing industries manager with the Anderson County Economic Development office, prior to announcing the award recipients. "It's meant to be a networking opportunity for Anderson County manufacturers. The industries in Anderson County have an opportunity to get together and network and celebrate each other.

"We plan to have this event yearly to celebrate our industries," she said.

Kelley Engineering, in Piedmont, received the Employer Impact Award in the small category. The company specializes in designing and building custom automation equipment, as well as providing CNC machining and metal fabrication services to a variety of industries.

"This is really just a testimony to the

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When leaders forget themselves
Company-first CEOs sometimes forget about retirement plans.
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designer, inventor, manufacturer and entrepreneur.

"We both started laughing," said Barber, who lives in Greenville. "Every carny knows you don't put a gear box in the middle of an amusement ride."

To the man who for 18 years was the country's second largest manufacturer of amusement rides, it seemed absurd that the most advanced turbines in the wind energy industry have gear boxes.

"And I got to thinking about it and thought that's crazy because, of the 30 different rides we built, except for kiddie rides, we never put the gear box in the middle because they're heavy, expensive and they break down," said Barber.

And when Barber gets to thinking, he doesn't just consider the problem; he also starts looking for solutions. As two walls lined with framed patents attest, he often finds those solutions. This time he thinks he has discovered a better way to harness energy from wind by creating a turbine that is dramatically more efficient to build, maintain and operate.

His first innovation was to get rid of the gear box. In a traditional turbine, the energy is gathered at the center of what looks like a giant fan. A spindle comes out of that center and into a gear box. Barber put a ring around the outside of his blades, creating what looks like a giant bicycle wheel. That outside rim, as it spins, rolls over wheels that directly turn the generator to create electricity without a gear box.

Barber built a prototype in Oklahoma several years ago and his project started attracting attention from around the world, including some from Denmark, a country with a long history of wind technology and expertise. Wind power expert Jan Ibsoe came to the United States to meet Barber and they visited the Oklahoma turbine.

"First thing he said is we need more twist in the blades," said Tammy Barber, COO of what is now Barber Wind Turbines, based in Greenville.

So the Barbers hired another Dane, Christian Meldgaard of Composite Lab, to design better blades for what was then a five-blade turbine. The design at that point was a 230-foot tall turbine that looked like a giant bicycle wheel with 64 spokes supporting an outer rim with five large fan blades inside. The blades were six feet wide at the axle and three feet wide at the rim.

"I was talking to him (Meldgaard) on the phone and I told him that last year I came up with this crazy idea of, instead of having five blades, just put small blades on all the spokes," said Jerry Barber, who already had a patent pending for the idea. "But it was so way out there I was just afraid to mention it to anybody," he said.

Meldgaard was interested, though, so much that on the other side of the Atlantic he couldn't stop thinking about it. About a week later, he called again.

"He said, 'I did what you hired me to do; I put more twist in your blades but if you want my recommendation you need to do away with the five blades and go with these air foils,'" Tammy Barber said. She said Meldgaard explained that his analysis showed the air foils on the spokes would be more efficient at capturing wind and cost less to manufacture than the large blades. "He said it's completely revolutionary."

The design at this stage replaces the five big blades with air foils running the length of the spokes. The foils pitch and twist to adjust to the strength and direction of the wind. Construction of the second prototype is scheduled to begin by the end of the year and the Barbers think it will be generating and providing power in Concordia, Kan., around April of next year.

They're not the only ones who believe it will work.

Barber Wind Turbines announced this month that the company was awarded a statement of feasibility from DNV GL, a global quality assurance and risk management company that includes testing and certification of renewable energy ideas among its services.

"It took seven months and a weeklong meeting in London, but it was worth it," Jerry Barber said. "If they say it's certified, then it's going to do what the engineering says it's going to do."

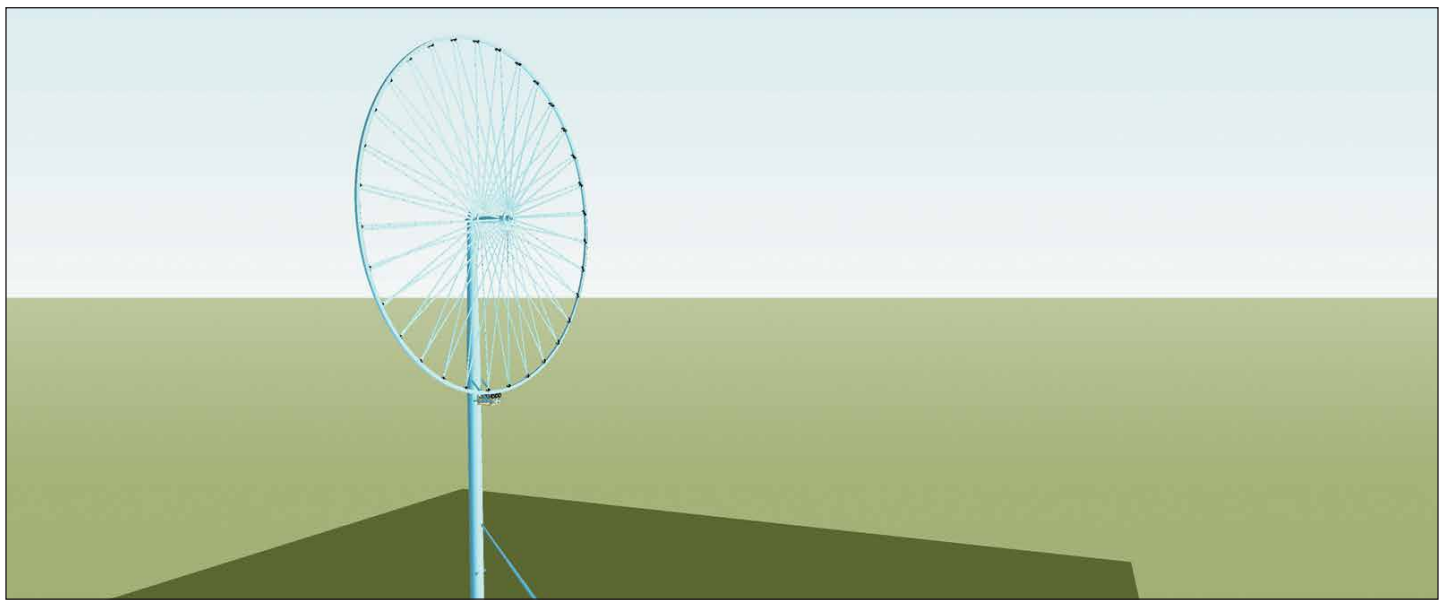
Tammy Barber said the certification will make moving the technology to market much more manageable.

"We knew it was new technology and we wanted to mitigate some of the concern for installing new technology," she said. There are three markets in the industry. Small wind is for providing or supplementing energy at a single site, such as a home. Big wind is what people think of when they see giant turbines at wind farms. Those turbines are typically 1.5 megawatts or larger and create large amounts of electricity that can be moved over the largest transmission lines.

Barber Wind Turbines is looking at the market in between.

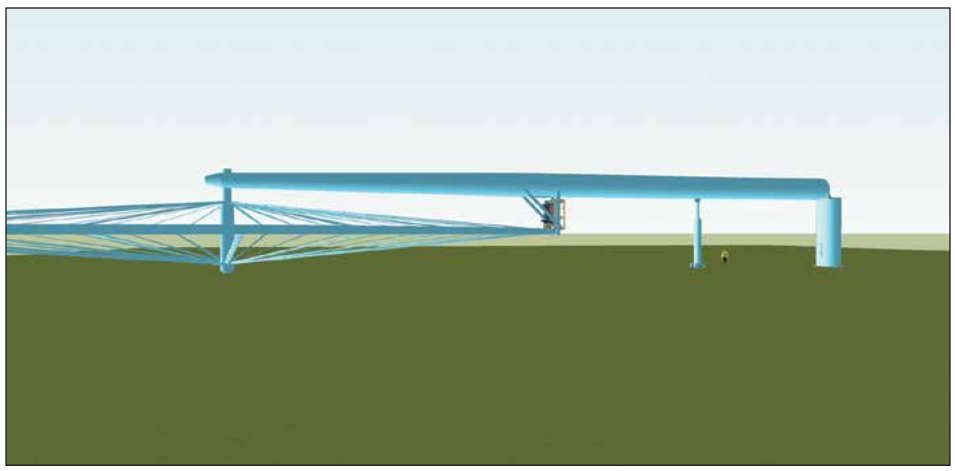
"The one in the middle is called distributed generation," she said. "We chose to launch in that market because there's hardly any competition in it." There are also fewer regulations to tackle.

Distributed energy from a Barber Wind turbine, at 800 kilowatts (or 0.8 megawatts),



For Barber's second prototype, the five big blades are gone and the spokes will be fitted with air foils that are more efficient at capturing wind. (Image/Provided)

The 220-foot 800kW land-baesd prototype installed in Hooker, Okla., has evolved into the gen-2 BarberWind Turbines 800kW. Jerry Barber in this photo is standing on the generator platform. (Photo/Provided)



Calling on his experience making amusement rides, Barber designed a turbine that can erect itself without a crawler crane. The process can be reversed to avoid hurricane winds or for maintenance. (Image/Provided)

Barber's world

- The turbine electrical components will be manufactured in Easley by Patriot Automation.
- The blades will be made in Newberry by Valmont Composite Structures.
- Most of Barber's patents were related to the amusement ride industry, including some that became famous, such as the Tower of Terror at Disney's Hollywood Studios.
- Barber was the first supplier of Mossberg shotguns to Russia. He exported pump shotguns by the container load until Russian companies copied the designs.
- Along with his son Todd, Barber is the co-creator of the Reef Ball and founder of the Reef Ball Foundation. The Reef Ball is used to restore dying reefs around the world.

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can provide enough power for about 300 homes in the United States. For markets like the Caribbean, where homes use less power, that number doubles, Barber said.

Island communities around the world typically use diesel to power generators at a cost that ranges from 25 cents to 45 cents per kilowatt hour. He said the Barber turbine can produce it for as little as 2.3 cents per kilowatt hour. The levelized cost of energy produced by a Barber turbine over 25 years is expected to be half of the cost of energy produced by the giant turbines, the Barbers said. That includes the cost of transporting, setting up and maintenance, and those aspects of the Barber turbines are also influenced by his experience manufacturing equipment for traveling carnivals.

Everything needed to create a Barber turbine will fit in 40-foot shipping containers, and it doesn't take highly specialized training or a crawler crane to set up or maintain the turbine. In fact, part of the design allows the turbine to be assembled on the ground and then erect itself and — if necessary for maintenance or a hurricane — it can lie back on the ground. That's why the Barber turbines are feasible for islands, he said.

> ***"It's an amusement ride without the seats. All I've done is moved technology out of the amusement ride industry and into the wind energy industry."***
>
> **Jerry Barber**
> inventor and chariman of the board
> Barber Wind Turbines

"You don't realize how many islands there are around the world and most of them have people living on them and they're on diesel. They also don't have cranes," Barber said. But many of them import a lot of goods so they have the equipment and infrastructure to move shipping containers. "Anywhere a 40-foot container can be taken, our turbine can be installed," he said.

By eliminating the gear box and making the turbines more mobile, the Barber Winds design has tackled the most expensive elements of installing, operating and maintaining large transmission turbines, the inventor said.

"The big turbines require highly trained technicians working from cranes; basically a bunch of carnies can maintain our wind turbines," Jerry Barber said. "It's an amusement ride without seats. All I've done is moved technology out of the amusement ride industry and into the wind energy industry." GSA

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How wind turbines work

Staff Report
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Wind turbines work on a simple principle: instead of using electricity to make wind — like a fan — wind turbines use wind to make electricity. Wind turns the propeller-like blades of a turbine around a rotor, which spins a generator, which creates electricity.

Wind is a form of solar energy caused by a combination of three concurrent events:

- The sun unevenly heating the atmosphere
- Irregularities of the Earth's surface
- The rotation of the Earth.

The terms "wind energy" and "wind power" both describe the process by which the wind is used to generate mechanical power or electricity. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity.

A wind turbine turns wind energy into electricity using the aerodynamic force from the rotor blades, which work like an airplane wing or helicopter rotor blade. When wind flows across the blade, the air pressure on one side of the blade decreases. The difference in air pressure across the two sides of the blade creates both lift and drag.

The force of the lift is stronger than the drag and this causes the rotor to spin. The rotor connects to the generator, either directly (if it's a direct drive turbine) or through a shaft and a series of gears (a gear box) that speed up the rotation and allow for a physically smaller generator. This translation of aerodynamic force to rotation of a generator creates electricity.

Source: U.S. Department of Energy