



More Wind Power for North Dakota

North Dakota is known as a major oil producer these days, but the Prairie State is also a leader in wind power, with the most recent project—the 107.5-MW Thunder Spirit Wind Farm powered by Nordex wind turbines—delivering clean energy to Montana-Dakota Utilities.

By Vicky
Boyd

With its commissioning in late 2015, the 107.5-megawatt Thunder Spirit Wind project near Hettinger, North Dakota, became the first wind farm built by ALLETE Clean Energy (ACE). But that doesn't mean the wholly-owned subsidiary of Duluth, Minnesota-based ALLETE Inc. is short on expertise.

"We have a group of individuals who have extensive experience both developing and constructing wind farms," said Wells McGiffert, manager of project development.

ACE was established in 2011 to acquire or develop wind, solar, biomass, hydro, natural gas, shale resources, clean coal technology, and other emerging energy projects.

Until the Thunder Spirit project, however, ACE had amassed operating wind assets totaling more than 550 MW by acquiring operating projects, rather than building wind projects.

When Wind Works Corp., the original developer of Thunder Spirit, approached ACE in 2014 about possibly acquiring the wind farm, McGiffert said it fit well into the company's goals.



The addition of the 107.5-MW Thunder Spirit wind project further diversifies the generation portfolio of Montana-Dakota Utilities, boosting its renewable segment to 20 percent.

In addition, Montana-Dakota needed to enhance its renewables to meet the renewable portfolio standard in Montana, the only state in which it provides service that has such a requirement.

"The addition of Thunder Spirit Wind further diversifies the company's generation portfolio, boosting the renewable segment to 20 percent," Neigum said.

As a publicly traded utility, Montana-Dakota is subject to oversight by the North Dakota Public Service Commission. Based on advance determination of prudence procedure, the commission found ownership of the wind farm offered significant savings for its customers. It took eight months for the utility to gain approval from the commission to acquire the project.

As part of the ALLETE family of companies, McGiffert said ACE had the financial wherewithal to make such a deal happen with Wind Works. ALLETE's Minnesota Power had just completed the final phase of the 500-MW Bison Wind Energy Project west of Bismarck, N.D. "We had a really good track record working with the North Dakota Public Service Commission," he said.

"With that experience, and being a publicly traded organization with strong credit, it gave ACE the credibility to build the project, and MDU gained comfort in our ability to deliver a good project."

The five-year extension of the federal investment tax credit as well as a North Dakota sales tax exemption on equipment used in power generation also enhanced the project's financial attractiveness.

"You take all of these credits, and what it does is it keeps the cost of the electricity lower for customers, and that's an important thing," McGiffert said.

Thunder Spirit, as originally proposed by Wind Works in 2011, was 150 MW. The Schenectady, N.Y.-based firm did much of the early development, such as conducting preliminary environmental studies, permitting, and signing leases with landowners representing about 12,000 acres.

The project was reconfigured for 107.5 MW, and Wind Works subsequently entered into a 25-year power purchase agreement with Bismarck, N.D.-based Montana-Dakota Utilities (MDU) for the full output.

The project also received an interconnection agreement to ensure it would tie into the existing power grid.

"Montana-Dakota Utilities needed capacity and energy to meet the growing demands of its customers, and Thunder Spirit Wind was a least-cost option," said Darcy Neigum, electric system operations and plan-

ning director for Montana-Dakota.

Wind Works encountered financing challenges and had notified ACE in August 2014 that it was interested in selling the project. After conducting due diligence, McGiffert said ACE quickly became interested in acquiring the wind farm.

"MDU had expressed interest that if we were to buy the project and were willing to turn around and sell it, they would be willing to purchase it," McGiffert said. "So we acquired Thunder Spirit and agreed to sell it to MDU once the project was built and operating, subject to regulatory approval."

Neigum said owning the wind farm was attractive because it would have residual value beyond the former 25-year PPA term and allow the utility to expand with economies of scale and existing assets.

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Nordex Group's supply agreement for the Thunder Spirit project included 43 N100/2500 turbines, with 129 160-foot fiberglass blades, 43 nacelles and drive trains, 43 hubs, and 43 towers. Nordex acquired the fiberglass blades from LM Wind Power and the towers from three suppliers—Vent, Dongkuk, and Korindo.

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ACE finalized acquisition of the project from Wind Works in November 2014. Even before that, Wind Works had conducted two public meetings to answer questions and address the concerns of local residents. As a result, the company adjusted the turbine layout to address worries about potential noise and other concerns.

"We gained comfort from the fact that Adams County was very supportive of wind development," McGiffert said. "Adams County had taken steps to protect the residents by increasing certain setbacks above what the State of North Dakota required. That sent a strong message to the community that the county was going above and beyond what was required, so I think people felt comfortable about the wind project."

In late 2013, Wind Works had selected Hamburg, Germany-based Nordex Group as the supplier of the 43 N100/2500 turbines because of an established working relationship. Nordex's supply agreement included 129 160-foot fiberglass blades, 43 nacelles and drivetrains, 43 hubs, and 43 towers. Nordex acquired the fiberglass blades from LM Wind Power and the towers from three suppliers—Vent, Dongkuk, and Korindo.

All of the components were shipped through the St. Lawrence Seaway and offloaded at the port of Duluth, which has equipment to handle heavy cargo. Semi-trucks specially designed to handle the oversized components transported them through Minnesota, and in some cases also through a portion of South Dakota, to the site in North Dakota. Trucks took different routes, depending on their size and eventual destination.

Although most of the travel was on interstate highways, a small portion involved more rural roads, which needed widening at some intersec-



tions to allow for the trucks' wider turning radiuses. Once the materials were delivered, the intersections were reclaimed to their former dimensions.

The delivery schedule was carefully designed. "You adjust the schedule to try to get it to line up," McGiffert said. "You generally have a staging area that's relatively close to the site so you can stagger the trucks. It's really a neat logistics challenge. You have to get the parts to the right site at the right time. We did a pretty good job of doing just that."

Once the blades began to be delivered in August 2015, ACE invited local residents to a "blade-signing" ceremony at the site to further include them in the process and let them learn more about it.

"It was a very successful event," McGiffert said. "It was a great oppor-

tunity to celebrate the fact that the project was well under construction and share the excitement with the community."

Wanzek Construction of West Fargo, N.D., had done preliminary construction design work for Wind Works but wasn't under contract when ACE acquired the project. Because the West Fargo firm was "ahead of the game," ACE named it the engineering, procurement and construction (EPC) contractor in December 2014, with Wanzek providing nearly everything but the turbines.

"They supplied all of the engineering, all of the other parts—all of the construction was under Wanzek from the roadways, foundations, electrical, and erection," McGiffert said.

Wanzek turned to Colstrip Electric of Colstrip, Montana, for the electrical work.

Although Wanzek advertised for experienced local workers for the roughly 200 openings, the firm wasn't able to fill them all and brought in some of its own crew.

"There weren't as many locals as we had hoped for that had the experience to do the work," McGiffert said. "But Wanzek is based in North Dakota, so that was an important thing. We tried to hire as much local labor as possible."

Based on a geotechnical report that factored in the predominately sandy/clay soil and geological conditions, Wanzek went with a standard spread footing. Large rocks (deposited by a receding glacier eons ago) presented a challenge, but it didn't prove to be insurmountable.

Once workers excavated a foundation, they set rebar, configured the tower base, and laid electrical cable before pouring 47 truckloads of concrete.

Once the foundation had cured, the site was then backfilled before tower work began.

Beginning at the base, a crane lifted each of the tower's four parts into position where workers bolted them together.

The same high winds that made the site an attractive wind farm also created challenges during tower erection. So crews ended up working at night, since the wind typically died down after sunset.

With the help of a crane, workers hoisted the three blades into place and attached them to the hub while it was still on the ground.

The crane hoisted the nacelle to the top of the tower, where it was bolted in place, followed by the hub assembly, which subsequently was attached. When fully assembled, each turbine is about 430 feet from the top blade to the ground.

The same steps were repeated for each of the 43 turbines.

As each electrical circuit was completed, and turbines were completed, they were slowly brought online to begin generation.

The turbines are interconnected through four circuits of underground connection lines that tie into the project substation, which steps up the incoming power to 230 kV from 34.5 kV. From the substation, overhead transmission lines carry the electricity about a mile to an existing Montana-Dakota substation, where it is fed into the Mid-continent Independent System Operator Inc. (MISO) grid for distribution.

"The project's close proximity to Montana-Dakota's substation proved to be a good location from an inter-connection standpoint," McGiffert said.

The turbines are all connected through a Supervisory Control and Data Acquisition system (SCADA), which uses real-time data to forecast production peaks so MISO can make adjustments accordingly.

Formal construction began in May 2015, and the last turbines were brought online in December 2015.

Throughout the process, McGiffert said ACE kept Montana-Dakota apprised of the progress. "From our standpoint, we had excellent cooperation from MDU," he said. "It really was a good fit working with them all the way along. We kept them involved, so there weren't any surprises along the way. They were really supportive if issues came up because they knew we would take care of them."

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