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Kotzebue wind turbines whirl up proven energy source

By Amy Schenck
For the Journal



The Kotzebue Electric Association operates 17 wind turbines, which last year generated 7 percent of Kotzebue's electricity. Photo/Amy Schenck/For the Journal

KOTZEBUE - Brad Reeve and the Kotzebue Electric Association lead the drive toward alternative energy. But when they first started looking at harnessing wind almost two decades ago, many thought they were out of touch with reality.

But the member-owned utility, under Reeve's guidance, decided to give wind a whirl, and in 1997 installed the first utility-grade wind turbines in Alaska.

In the decade since, the initial three wind turbines have grown into a farm that's 17 strong. And Kotzebue - located above the Arctic Circle - generates 7 percent of its electricity from wind.

This translates to a savings of 100,000 gallons of diesel per year, which at last year's prices amounted to \$250,000. This year's cost savings are expected to be well above \$300,000.

Kotzebue hangs on to the end of a peninsula that juts into the Chukchi Sea. Wind blows uninhibited year-round in the town of about 3,000 residents. There are no trees, mountains or other natural features to break up air movement; instead tundra stretches as far as the eye can see.

On a chilly day in late June, a mint smell from the tundra penetrated the air, while the sun circled overhead. The 24-hour sunlight bathed 17 giant steel structures in soft hues, while a rhythmic hum - from three-pronged blades slicing through the air - spilled over the otherwise quiet land.

In the distance, fog hung low on the ocean and a dirt road wound four miles back to Kotzebue; electric lines paralleled the road.

"We're glad we started when we did," said Reeve, the silver-haired general manager of the Kotzebue Electric Association. "It gave us a real leg up on development because we were able to take a risk early, when people really didn't believe in wind energy."

Many places in the state have since followed in Kotzebue Electric's footsteps. St. Paul Island, Selawik, Wales, Toksook Bay, Kasigluk and Pilot Point all have operational wind turbines. Numerous other projects are under development throughout the state.

Last spring the Alaska Legislature passed House Bill 152, which pumps \$250 million into renewable energy programs over five years; \$50 million is available this year.

In June the Denali Commission and the Alaska Energy Authority awarded \$5 million

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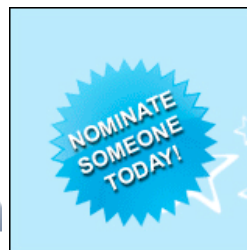


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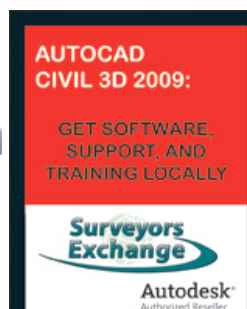
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to renewable energy projects throughout the state. Of the 33 projects that received funds, 11 are wind projects.

The \$5 million award served as a sort-of dry run for House Bill 152, said Peter Crimp, alternative energy program manager for AEA, the state agency charged with overseeing energy programs.

In addition to HB 152, the state Legislature also awarded \$25 million to subsidize development of a Fire Island wind farm off the coast of Anchorage. The state funds will be used to install an undersea transmission line from the island to Anchorage's energy grid.

The Kotzebue Electric Association began looking at wind energy in the early 1990s, during a time when people had little confidence it would work in Alaska.

Dozens of small wind turbines had been previously erected throughout the state, and most of them had turned out to be dismal failures, Reeve said.

Reeve, who moved to Kotzebue in 1974 and stayed, experienced this failure firsthand.

One of the three small wind turbines that had been installed in Kotzebue went "super sonic" during a blizzard. Reeve watched the blades disintegrate in the storm. The other two early wind turbines in Kotzebue experienced similar fates.

"You don't want those things flying at you," he said.

Despite widespread malfunctions, Reeve and others at Kotzebue Electric felt the idea of harnessing wind shouldn't be completely sidelined.

Back then, they sensed energy prices would climb and state assistance might disappear, Reeve said.

A utility company had never been involved in any of the prior Alaska wind projects. Kotzebue Electric thought its expertise and trained personnel would give wind a better chance to succeed.

"I think that's the best thing we did, we made believers out of people again," Reeve said.

Reeve and Kotzebue Electric have won several awards for the work they've done to develop wind energy.

Of the 17 wind turbines in Kotzebue, 15 are down-wind machines made by Entegriy Wind Systems Inc., a company with offices in both Colorado and Canada. These machines function like weather veins, rotating as the wind changes direction.

They have fewer moving parts, which makes them advantageous, Reeve said.

In contrast, the two up-wind machines motor themselves into the direction of the wind. These turbines require a larger foundation, Reeve said.

Kotzebue Electric spends between \$40,000 and \$70,000 each year to maintain and operate the 17 turbines.

Compared to the machines found in the Lower 48, the 80-foot-tall turbines in Kotzebue are saplings. Each turbine in Kotzebue produces enough electricity to meet the needs of about 20 homes, while a Lower 48 machine could power roughly 400 of Kotzebue's homes.

The Kotzebue turbines run at full capacity when the wind blows at 26 miles per hour. In the last few years Kotzebue has recorded an average wind speed between 11.3 and 13 miles per hour, said Harry Lind, the station manager at the National Weather Service office in Kotzebue. However, wind speeds peak at 50 to 70 miles per hour - wind strong enough to destroy the turbines if precautions are not taken.

In the 11 years that Kotzebue Electric has operated wind turbines, it has learned a few tricks for adapting to an arctic environment.

The company is switching the color of the blades on the wind turbines from white to black because black harnesses solar energy more efficiently, which helps shed ice buildup.

When wind blows continuously at 50 miles per hour for than 10 minutes, tip brakes deploy to shut down the turbines. This prevents them from going supersonic.

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Heavy synthetic oil that is able to withstand extreme temperatures - both hot and cold - is used in the gearbox.

The pilings used to erect the first turbines have a refrigerant that extracts and dispels heat from the ground. The newer pilings are closely monitored, and should the refrigerant be needed to prevent permafrost melt, it can be easily added.

Also, Kotzebue Electric added platforms and extra places for maintenance crews to attach to the turbines. These add an extra level of safety, especially since much work is done in less-than-ideal weather, Reeve said.

While Kotzebue Electric has made great strides, it still faces many challenges - namely the weather.

The utility is not equipped to perform maintenance in sub-zero temperatures. As a result, three of Kotzebue's wind turbines sat idle last winter, waiting for the summer months, when they could be worked on.

In other places, such as the small village of Wales to the southwest of Kotzebue, maintenance on wind turbines is also hampered by the lack of parts and trained personnel. In Kotzebue, however, parts and personnel are available, the weather just has to be decent, Reeve said.

Another obstacle presented by wind energy is the variability in output from the turbines. Due to the dynamic nature of wind, measures are needed to prevent instability in the system.

If the energy output from wind is not closely monitored and controlled, the repercussions can be big. Today's electronics and appliances are becoming more sophisticated, while the electrical protection built into appliances and computers is staying stagnant, Reeve said.

Right now the electric company compensates for wind variability by having generators ready to kick in or turn off whenever the amount of energy produced by wind changes.

Within the next year, Kotzebue Electric hopes to install a flow battery. This battery, which would cost \$1.5 million and require its own building, would store energy from both wind and diesel generators in a liquid. It would allow the utility to at times turn off diesel engines and use just the wind. At other times, it would create better efficiency for the diesel engines themselves.

The barge carrying next winter's supply of diesel arrived recently. It cost \$4.37 per gallon, up from last year's price of \$2.53 - a 172 percent jump.

It's a hit made a little less painful by the utility's investment into wind.

"One of the good things about wind is that it's a hedge against fuel price increases like that," Reeve said. "It's not a silver bullet, but it does help reduce costs."



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