VAISALA / SUCCESS STORY

WEATHER SOLUTIONS FOR ENERGY

Banking on Hub-Height Wind Data

EverPower operates seven wind farms across the US, and its wind and solar development pipeline has locations in multiple states from Washington to Maine. With terrain that varies from simple to highly complex and locations that experience typically harsh North American winters, the company finds that using Triton to provide on-site measurements is one of the most effective ways in reducing wind resource uncertainty in their energy assessments. ▶

EverPower uses Triton Wind Profiler as part of its wind resource assessment program to dramatically reduce uncertainty in wind resource and project energy estimates.

Challenge

- Sites with complex, highly turbulent wind regimes and complex terrain including hills, ridgelines, and heavily forested areas require extensive wind measurement to reduce the uncertainty in energy yield estimates.
- Off-grid locations and extreme weather conditions make it difficult to install and maintain a large network of met towers on site or to provide AC grid power for LiDAR units. Also in some locations, the site-specific atmospheric conditions limit the data recovery rates obtained from LiDAR technology.
- The challenges with met towers and LiDARs are more pronounced during the winter months, when wind resource is at its highest and data recovery is most critical. Budget constraints make it mandatory to justify investments in remote sensing by demonstrating good returns.

Solution

- Collocate a Triton with an onsite met mast for an initial calibration/correlatation study and then move it around project sites to measure wind resource, effectively using Triton as a "proxy met tower" network
- Use one Triton to easily add multiple measurement sites to projects with complex terrain and flow regimes
- Take advantage of Triton's low power requirements and high data recovery to measure wind in situations where LiDAR is impractical
- Control field maintenance costs with advanced technical training from Vaisala
- Get instantaneous, up-to-date information and maintain data integrity through Vaisala's SkyServe online data service
- Use Vaisala's daily monitoring service to maintain maximum equipment up-time

everpower™

EverPower is a fast growing developer, owner, and operator of utility scale wind projects in the US. EverPower is owned by Terra Firma, a leading private equity firm. With 752 MW of operational wind projects across seven sites, EverPower's goal is to contribute to the nation's clean energy supply.

Benefits

- Dramatically reduces uncertainty in wind resource and project energy estimates
- Improves bankable project data and internal energy yield assessments
- Controls maintenance costs and maximizes uptime using SkyServe
- Provides easy visibility of wind and solar data on an integrated software platform

"It's not a question, anymore, of whether the Triton technology pays for itself. It's become obvious that Triton is the right way to measure the wind for maximum returns throughout our development pipeline."

Jim Sardonia
Director of Wind Resource,
EverPower Wind Holdings, Inc.

Ready for winter: At the beginning of the season, wind resource analyst Miles Brkovich installs propane tanks that power Triton's snow-melting system and shorter brackets that optimize the angle of the solar panels for winter operation. The ease of servicing Triton in the field is one of its important advantages.

With ambitious growth goals and a U.S. policy environment that encourages rapid project development, EverPower Wind Holdings has plenty of reasons to accelerate the development of its geographically diverse project portfolio. With ridgelines, heavily forested areas, and off-grid locations, the use of standard met towers and LiDAR technology is naturally limited.

EverPower is overcoming these challenges by using the Vaisala Triton® Wind Profiler to conduct wind measurement campaigns on several of its project sites. Triton is a ground-based remote sensing system that measures wind at hub heights and has many applications in both project development and wind farm O&M.

Why EverPower Tried Triton: Complex Site Conditions and Climate Challenges

Jim Sardonia directs the wind resource program at EverPower, a Pittsburgh, PA-based developer and owner/operator of utility-scale wind projects. Sardonia is a meteorologist and an expert in met data analysis and site suitability with over eight years of experience in wind power, having spent five years as the manager of wind siting at Siemens North America before taking his position at EverPower in early 2014.

EverPower's first wind farm became operational in 2008; the company currently operates seven wind farms and 752 MW of wind power. Its wind pipeline includes projects across seven states, mostly in the PJM interconnection region.

Everpower's project pipeline includes many sites with complex wind flow, including non-linear ridgelines, hills with steep inclinations, and heavily forested areas. The wind regimes at these sites includes high turbulence and varying shear and wind resource within each project area. The complexity of both the terrain and wind flow regimes at the various sites require advanced measurement campaigns to better understand their projects' energy potential.

"We needed more data coverage at each site. We could have installed met towers, but it takes a lot of resources, time, and permitting," says Sardonia. EverPower also owns a LiDAR, but Sardonia cited some challenges with using the LiDAR. "The LiDAR must be on AC power, which severely limits the locations where we can site it." In addition, the LiDAR is "kind of finicky with recovery rates, depending on whether there are enough particulates in the atmosphere at the time. Sometimes in certain conditions in the winter months when winds are highest and data collection most important, the LiDAR recovery rates can be limited."

Sardonia chose Triton because he wanted the ability to move it from project to project and even between locations in each site without having to require AC grid power. In addition, Sardonia knew that Triton's low power requirements and robust design would allow him to use it in off-grid locations and in severe winter weather. ▶

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Performance

So how did Triton do? "Triton performed exactly as advertised," says Sardonia. "It's easy to move around, work on, and do routine seasonal adjustments like changing the angles of the solar panels to capture more sun in the winter, and refill the propane tanks that fuel the snow removal system. The Triton is totally self-contained—it basically powers itself and just requires minor checks and maintenance."

Sardonia has used the Triton on several sites already. "As a meteorologist, I find it exciting to see the higher-height wind data coming in on SkyServe [Vaisala's online data service] within minutes of installing the Triton," says Sardonia. "On one of our projects we were interested in getting data at hub height and above at one particular ridgeline. So we kept the Triton next to a met tower for over a year, for several reasons—to understand Triton's accuracy and data recovery, to get a good correlation, and to characterize the shear more accurately. We then relocated the Triton to an area more central to the project site, and it's been going on for over a year there now. The quality of the data in that long correlation test was excellent, the r-squared was extremely high and we are extremely confident in the wind shear profile, which is critical to this site."

Wind and Solar

In addition to their wind pipeline, Everpower is also expanding into solar project development. "We've recently acquired one of Vaisala's [SP-12] solar weather stations, and we're going to manage that through SkyServe. It's extremely convenient being able to manage both the Triton and the solar data through one online platform," says Sardonia. "It's very reliable—we just export the data and process it with our own proprietary algorithms. I really like SkyServe."

Taking It To The Bank

"We've successfully used Triton to reduce spatial uncertainty and do shear validation on a number of our projects," says Sardonia. "We have found that the banks' independent engineers (IEs) have been very cooperative in using Triton data as long as there's an initial correlation/calibration test with an onsite met mast. As long as you're collocated with a met tower in the beginning for a period of time and have that data to share with the IE, they feel very comfortable using that data—they'll use it just like a separate met tower in many cases."

Reducing Uncertainty and Improving Returns

Once Everpower had a significant amount of data from Tritons and towers on a site, Sardonia and his team began calculating how to best use the data to reduce uncertainty in their wind resource estimates.

"Using the Triton in addition to the tower data reduced the uncertainty in the P90 and P95 values, but it also refined the P50 value because we have a second measurement site. Uncertainties could be 10 to 11 percent with one met tower, but by adding the Triton to measure hub-height winds at these difficult sites you can drop it down to 5 or 6 percent. This makes a big impact in real dollars."

"Until recently, you heard a lot of talk about having a network of several met towers and maybe one Triton," says Sardonia. "Based on the results we've seen using just one Triton at several locations, we would like to turn that traditional strategy around—using one met tower and as many Tritons as we can get our hands on. Using one met tower and several Tritons would make our whole measurement program much more efficient, less costly, and we would obtain more accurate results because you are obtaining hub height data at more locations at a complex site. Plus, you can move the Tritons to the next project and reuse the instrument at other sites. Wind turbine hub heights are already being offered to 130 meters and higher, and the recommended guideline is to use a met tower at 75% of that height. That's a really tall and expensive tower requiring a monitored FAA light system—you could probably get two Tritons for what you'd pay for that kind of tall tower."

"It's not a question, anymore, of whether the Triton technology pays for itself," Sardonia adds. "For the price of one LiDAR or one tall tower, I can get two or three Tritons and have a much greater total reduction in uncertainty with less maintenance and man-hours needed to analyze the data. It's become obvious that Triton is the right way for us to advance and improve our measurement campaigns at our sites for maximum returns throughout our development pipeline." ■

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