

Renewable Energy Powers Research from Pole to Pole

This system on Alaska's West Coast uses a Morningstar SunSaver MPPT solar charge controller and SureSine inverter to drive a solar installation that powers a migratory bird study camp.

"In a high-altitude, low-temperature environment with reflective snow cover, the MPPT works incredibly well, providing about 20% to 25% more energy capture...I've measured it side by side...it's astonishing."

Tracy Dahl
Polar Power Expert

Summary

Tracy Dahl is passionate about developing sustainable solutions. His work as a professional motorcycle mechanic eventually led him to tinker with solar power. He and his wife have spent 25 years living off-grid. "I have forgotten what a utility bill looks like," he said.

When his mechanical expertise landed him a job as a snowmobile mechanic in the Antarctic, he saw an opportunity for renewable energy there as well.

Project

Dahl began working in polar research programs in the mid-1990s. Knowing how well solar could power his life back home, he was surprised that scientists weren't taking greater advantage of it in the Antarctic.

"Even though the wind was blowing all the time, and the sun was shining, there was very little renewable energy being used," he said. "It became my goal to get more renewable energy into the program."

Dahl's career as the first renewable energy expert on the Earth's southernmost continent began. He recalls that, at first, it wasn't an entirely welcome transition. Even with the known drawbacks of dirty, expensive diesel generation, it was predictable and familiar. Eventually, he started to win teams over by getting some small solar systems into the field.



“What really turned it around was when the researchers started coming back home saying how great it was to not deal with the dirty generators that needed frequent repair,” he said. “They wanted more renewables.”

Some additional Department of Energy funding really got the ball rolling and Dahl and his colleagues were able to do some larger projects. In 2000, he was asked to join a program in the Arctic. He switched poles and continues his work there today.

Solution

Throughout the past couple of decades, Dahl has done a variety of wind and solar projects including systems with a single solar panel, charge controller and battery; vehicles with DC and AC power; chalets at research stations; and complex projects like large autonomous power and communication systems with remote-control monitoring that run lidar, radar and other research equipment in some of the harshest, most remote locations on the planet.

He works closely with researchers to fully understand their needs, then designs systems according to their requirements and constraints. Different projects demand different solutions, but over the years he’s found that Morningstar products are always up for the challenge.

“Morningstar’s been around for quite a while,” he said. “I was using their charge controllers in the Antarctic in the late 90s and I’ve probably used every model that Morningstar makes at one point or another ever since.”

Dahl says that Morningstar charge controllers are his go-to solution because—in addition to their price point—they can withstand the difficult, condensing environments that often take out power electronics. He’s especially fond of the controllers’ maximum power point tracking (MPPT) capability.

“In a high-altitude, low-temperature environment with reflective snow cover, the MPPT works incredibly well, providing about 20% to 25% more energy capture than pulse width modulation (PWM) controllers,” he explained. “The cold weather pushes the panel voltage way up, but that doesn’t mean anything unless you can turn it into amps through the MPPT. I have actually measured it out side by side and it’s astonishing how much better it works in these environments.”

Dahl will occasionally incorporate energy storage with absorbed glass mat or lithium iron phosphate batteries due to their greater energy density. He’s also a fan of KiloVault-brand models with internal heaters. He finds success in placing batteries in coolers within lightly insulated buildings, discovering this “in a box, in a box, in a box” approach keeps out the cold.

Dahl developed a clever solution using a multi-azimuth method. By facing one solar module south, one east and one west, he can capture energy as the sun circles the sky, particularly during high summer.

“This will give you a 20-hour charging day without much difficulty, which dramatically reduces your energy storage requirement,” he said. “In one project in Alaska, we had a 500W continuous load and effectively powered it all summer with solar without having to run the backup power generator once.”

Result

Renewable energy’s flexibility and increasing affordability (both initial cost and comparatively low maintenance costs over time) have made it a success in the polar regions. “With the high fuel and energy costs in these remote Arctic locations, it doesn’t take long to see renewable energy systems pay off,” Dahl said.

The decreased cost also makes it possible to fund more research, some of which wouldn’t even be possible without using renewables—for example, atmospheric measuring and monitoring can be skewed from nearby diesel emissions.

Dahl looks forward to continuing to support Arctic projects with renewables through his employer Polar Field Services and using Morningstar products.

“Morningstar has come a long way, particularly with monitoring and control capabilities,” he said. “Modbus and Simple Network Management Protocol (SNMP) capabilities will enable us to pretty much do anything we want. I want to continue doing what I love, helping drive clean, sustainable solutions.”



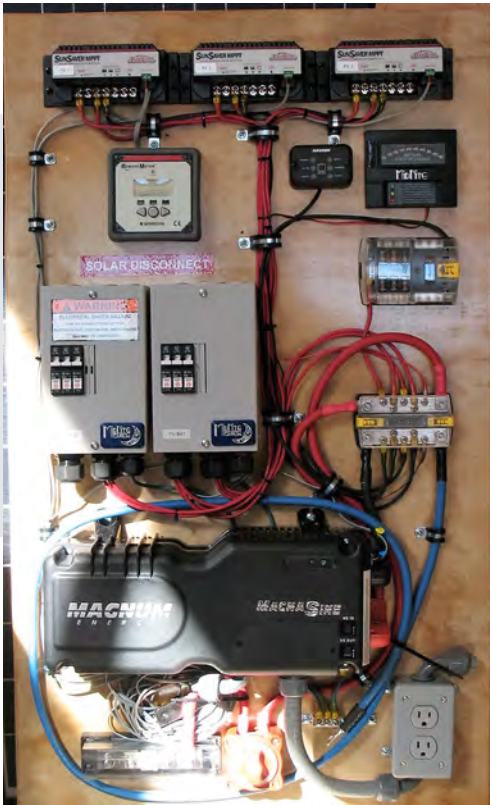
Barrow ITEX:

Dahl built four of these systems featuring Morningstar charge controllers and inverters. Continuously in the field on Alaska’s North Slope since the mid-2000s, more than a decade later, they are functioning just fine.



Building the Solar Chalet

Dahl found that facing arrays east, south and west could provide continuous power for this 500W solar chalet project in Alaska.



Morningstar SunSaver MPPT Charge Controllers

Dahl will often build complete power panels in his shop. The panels become the base of shipping crates. This one, equipped with industry-leading Morningstar SunSaver MPPT charge controllers, helps power a building at a year-round research station on the apex of the Greenland ice sheet, 10,600 feet above sea level.