

The “Off-Grid” Chalet in Quebec is designed to be energy efficient with superior thermal insulation

“Morningstar's technical support is outstanding and should be cited as an example. I did not expect to receive an answer for several days and I did not expect it to be so detailed. Everything is very clear. I am a Morningstar customer who is more than satisfied.”

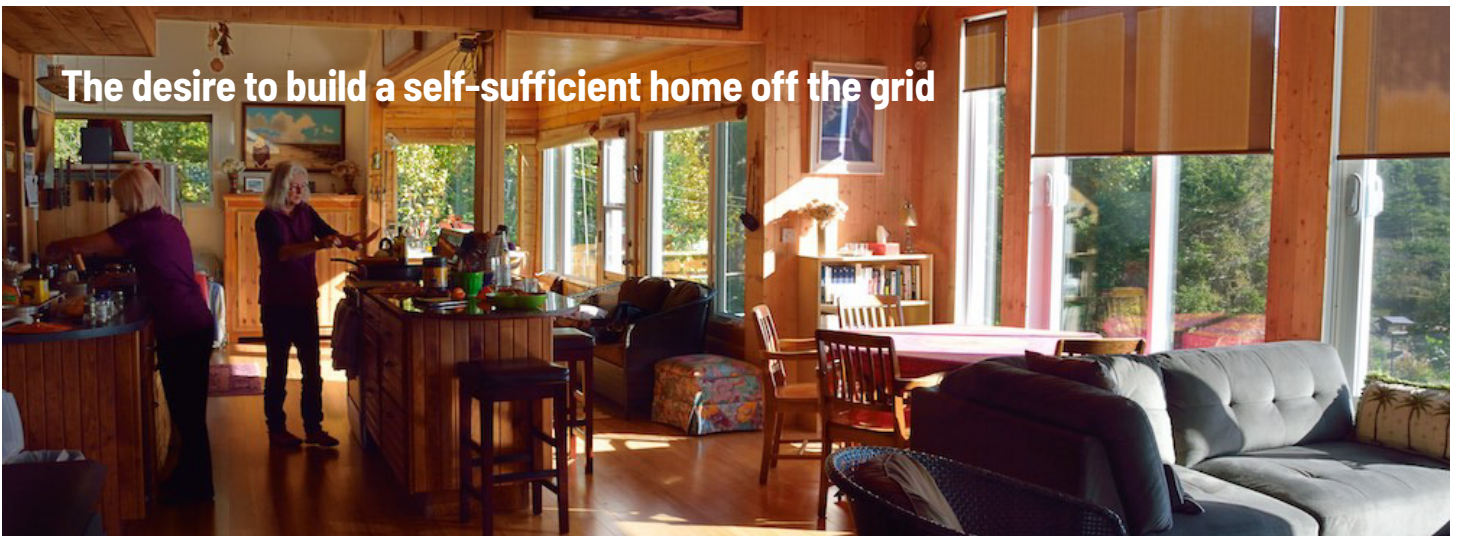
Summary

- Morningstar's technical support is instrumental in helping a customer build and maintain an off-grid dream home in Quebec
- The Morningstar TriStar-MPPT-45 solar controller provides the power necessary to sustain a home in the remote wilderness

When Guy Paquette, a professor/researcher and department head at Quebec City's prestigious Laval University decided to retire after a 35-year career, he selected an ambitious project: build a dream second home on the St. Lawrence seaway. The biggest obstacle however, was a location lacking running water and access to communications and electricity. Morningstar's technical support team was capable of addressing that third challenge, and fortunately for the professor having a reliable source of electricity on-site could facilitate taking care of his other needs in order to achieve his dream.

The goal was to design and build a home with “city comforts” in a remote wilderness, one that's self-contained and easy-to-heat. But the challenge of overcoming geography along with the lack of electricity, water, and a communication network proved to be more complex than expected.

The desire to build a self-sufficient home off the grid



Situation

Local temperatures vary from around 70 F in the summer to 30-40 F in the spring and fall. Because winter temperatures on the river can plummet to -20 or -30 F and the 6-8 feet of snow that falls each winter does not melt until May, roads are impassable until then and an on-site renewable energy system must be capable of autonomous, hands-off operation for some months. The cabin structure currently on the river property was not livable in winter due to the water from the surface well and the reservoirs freezing from mid-November until mid-May.

While temporarily living in the cabin with a wood stove and candles for some light, Guy Paquette began constructing his design: an off-grid chalet that's energy efficient with superior thermal insulation, built to take advantage of the best sun exposure.

Project

Initially, the project specified two solar panels and a 12V deep-cycle battery for lighting and radio. But subsequent in-depth analysis of the electrical needs indicated that it was better to use stored low-voltage DC electricity rather than convert it to typical 110V AC. Even after adding two panels and new batteries, the system was insufficient in meeting energy needs, especially in the fall when the duration of sunshine decreased considerably.

A revised plan included electricity based on solar and wind energy, using direct current (DC). Wood heating and propane gas would be used for appliances with high energy consumption such as the heater and stove. The water would come from a surface well. Wastewater would be treated in a septic tank and then in a septic field operated by gravity.

The professor took advantage of Morningstar's support. As Guy describes the process, "I followed with interest some Morningstar webinars that enlightened me on the general architecture of a solar system and the interest of using a MPPT controller." The ultimate solution required upgrading wiring and adding two more 24V panels, along with a Morningstar TriStar MPPT-45 solar controller.

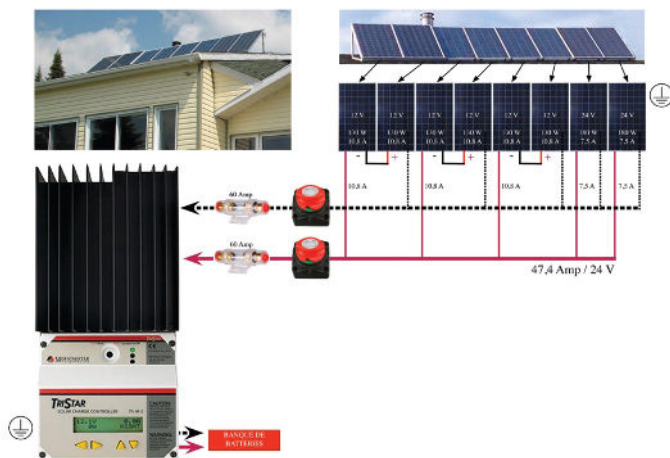
Solution

The Quebec off-grid residential solar electric system is comprised of:

- 6 panels of 12V pairs to obtain output current at 24V nominal voltage
- 2 panels of 24V, the outputs are coupled in parallel to bring the amperage to 47.4A
- Switches to cut the current between the panels and the charge controllers
- Two protection fuses
- Morningstar TriStar MPPT-45 charge controller

One result of this upgraded design is that the battery bank began charging much faster and the output of the system doubled in cloudy weather. The system also readily met the customer's electrical needs, running a 24V refrigerator, fan, water pump and many 12V LED lights and chargers. A high quality, hardwired pure signal inverter (24 VDC, 1800 W, 120 VAC) powers a television, computer, tablet, cell amplifier, tools and chargers. The water heater and cook stove operate with LPG (liquefied petroleum gas), and the main heating source is a high capacity wood stove.

The best project summary may be the final thoughts of the person living with it:



“Your TriStar MPPT-45 is the heart of the system. It has worked perfectly for three years and I have benefited from the technical support of Morningstar several times.”

-Guy Paquette