

Case Study | OFF-GRID SOLAR-ELECTRIC SYSTEM with battery bank

South Nahanni Outfitters 62°48'36" N, 125°37'28" W

Background

In 2015, South Nahanni Outfitters installed a 6.1 kW solar photovoltaic (PV) system at its camp in the Root River drainage basin in the Mackenzie Mountains, northwest of Fort Simpson. The owner, Werner Aschbacher, had the system installed to reduce diesel consumption, save money, and reduce noise from running the generator.

The camp is occupied about 14 weeks a year, from early July to mid-October. Normally, around 10 people stay there at a time, but up to 30 can be at the camp at peak times.

Sunfind Solar Products Inc. of Red Deer, Alberta, supplied the system, which was installed by camp staff. An electrician retrofitted the existing generator, changing it from three-phase to single-phase power, which enables the generator to charge the batteries.

The system allowed South Nahanni Outfitters to drastically reduce its fuel usage and associated costs. The savings come not just from the solar panels themselves, but also from the batteries. Previously, the camp's generator had to run constantly to provide power. When little power is being used, a generator runs inefficiently. With the battery bank in place, the generator runs only when needed to charge the batteries. Since the generator is under a high load to provide that charge, it runs more efficiently when it is needed.



System overview

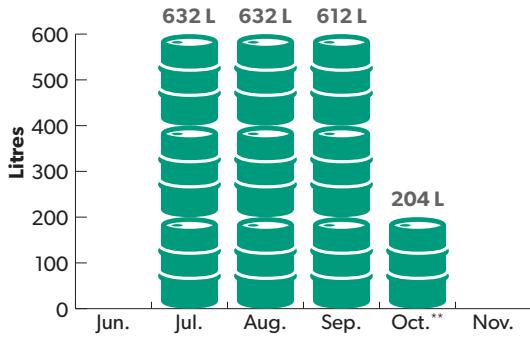
Item	Quantity	Description	Total Capacity
Solar panels	24	255 W each	6.12 kW
Inverter	1	Includes charge controller, power distribution panel, control panel and automatic generator start	6.5 kW
Batteries	16	6 V AGM batteries (48 V total)	37.4 kWh
Generator	1	Diesel-powered	25 kVA



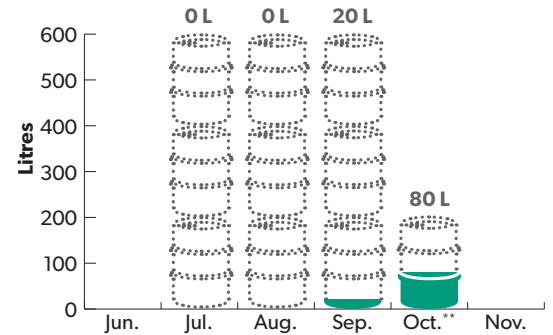
Ground-mounted racking of the solar panels at a 45-degree angle.

Estimated average monthly diesel consumption

Before PV installation



After PV installation



**Camp typically occupied until approximately October 10 each year.

The graphs above show the drastic reduction in diesel consumption seen at South Nahanni Outfitters after installing the solar PV system. What the graphs do not show is that there is ample solar power production from July to late September, which provides enough electricity to power the entire camp, meaning the diesel

generator does not need to be used. Once fall arrives, the weather conditions and the reduction in sunlight mean the solar array cannot produce enough power on its own and the camp has to run the generator to fully charge the batteries.

Annual electricity production

Estimated potential production, Jul. 1–Oct. 10 (based on RETScreen analysis)	2,300 kWh
Estimated power needed, Jul. 1–Oct. 10 (average 16 kWh/day)	1,600 kWh

Estimated payback

Capital cost (before funding)	\$33,000
AEA funding	\$11,000
Estimated payback with AEA funding	2.3 years
without AEA funding	3.5 years



The batteries and inverter that provide useful power to the camp.

Annual savings

Diesel (estimated based on diesel quantity flown in before and after the PV installation)	1,900 L (95% reduction)
Cost (estimated based on fuel savings and landed* fuel cost = \$5/L)	\$9,500
Greenhouse gas emissions (estimated based on diesel savings)	5.1 tonnes CO ₂ equivalent

*Cost of the fuel, plus the cost to transport it to site.

"At first we were wary of the capital cost required to invest in solar PV, but the AEA rebate helped push us to go for it. Now, after seeing how successful our solar PV system has been and how quickly the investment paid for itself, if I had a new camp, installing solar is the first thing I would do. Even if I didn't get a rebate I'd still do it this way. It just makes sense. It's also much quieter in camp without having a generator running regularly."

—Werner Aschbacher,
Owner of South Nahanni Outfitters