BATTERY GUIDE

Off-Grid Battery Buyer's Guide

How off-grid batteries actually work — lithium vs. lead-acid, real runtime breakdowns, and how to size your bank for a Canadian winter.

Neighborhood Solar Store
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The battery is the heart of any off-grid or backup system — and the part most people get wrong. Here's how off-grid batteries actually work, and how long they'll really run your loads.

How an off-grid battery works

Your panels charge the battery during the day; the battery runs your loads at night and through cloudy stretches. Capacity is measured in **kilowatt-hours (kWh)** — how much energy it holds. A 5kWh battery holds 5,000 watt-hours: enough to run a 500W load for about 10 hours, or a 100W load for about 50 hours.

> **Lithium vs. lead-acid:** lithium ($LiFePO_4$) lets you safely use ~90% of its rated capacity and lasts thousands of cycles. Lead-acid should only be drained to 50% — so you need roughly double the capacity for the same usable energy. Lithium has become the off-grid standard for exactly this reason.

Real runtime examples (from a 5kWh usable bank)

LOAD	POWER	APPROX. RUNTIME
LED lights (whole cabin)	~50W	~100 hours
Fridge (average draw)	~120W	~40 hours
Starlink + laptop + phones	~150W	~33 hours
Small chest freezer	~200W	~25 hours
Microwave (bursts)	~1,200W	~4 hours total run
Well pump (short cycles)	~1,000W	~5 hours total run

Real runtime depends on how loads overlap and on temperature. These assume the load runs alone off a full 5kWh usable bank.

Sizing your bank

Bank (kWh) = daily use × days of backup ÷ 0.9 (for lithium). Want 2 days of autonomy on 6kWh/day? That's about a 13kWh bank — roughly three 5kWh wall-mount batteries.

The Canadian catch

- ☐ Lithium won't charge below freezing without built-in heating — keep the bank in a heated/insulated space, or buy heated batteries
- ☐ Cold temperatures temporarily reduce usable capacity — plan a little margin for winter
- ☐ Match your battery voltage to your inverter (most modern systems are 48V)

Want a free custom design for your setup?

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