

Power and Solar Systems

A repeater that runs out of power disappears from the network. Power system design is as critical as radio configuration for a reliable long-term deployment.

Why solar works for repeaters

MeshCore repeater firmware is designed for low power consumption. A repeater draws very little power when idle and slightly more when forwarding packets. This makes solar deployment practical even with modest hardware.

Sizing your power system

The goal: enough battery to run through several consecutive cloudy days, and a panel large enough to fully recharge on a typical sunny day.

- **Solar panel:** A 5 - 20W panel is reasonable example sizing for a low-draw repeater, but the right wattage depends on your load and your site's worst-month sun-hours. Mount it south-facing (in North America) and angle it roughly to match your latitude for best year-round output; if cloudy-season uptime is critical, tilt toward latitude +10-15 degrees to favor winter sun.
- **Battery chemistry:** LiFePO₄ (lithium iron phosphate) is strongly recommended for outdoor use. It tolerates cold *discharge* well, has a much longer cycle life than LiPo, and is significantly safer. **However, LiFePO₄ (like any lithium chemistry) must NOT be charged below 0 °C / 32 °F** - charging when frozen causes permanent lithium plating, reduced cycle life, and a fire risk. For cold climates, use a pack with a low-temperature charge cutoff in its BMS, or add a low-temp charge disconnect. Size for several days of runtime without any solar input - 3 - 5 days is a common minimum starting point; increase it for cloudy climates or critical links. For emergency-grade deployments, size the battery for your worst-case multi-day low-solar period (often longer than 3 - 5 days in winter) and validate it with a no-charge runtime test before relying on the node.
- **Charge controller:** Required between panel and battery. MPPT (Maximum Power Point Tracking) controllers are more efficient than PWM, especially in cold/temperate climates and on larger arrays. On very small systems the efficiency gain is modest, and a simple PWM controller is often sufficient and cheaper.
- **Fuse the battery.** Install an inline fuse in the battery positive lead close to the battery, sized per your controller and wiring. A LiFePO₄ cell can deliver very high fault current; an

unfused short can start a fire. Wire in order: battery → charge controller → panel.

Mains power

For rooftop installations with building power access, mains power plus a battery backup is more reliable than solar alone. Use a quality regulated supply and consider a small UPS to ride out brief power interruptions.

Power optimization

- Disable unused features: display backlight, Bluetooth, WiFi (if present on the board)
- Set a long **flood** advertisement interval for fixed infrastructure - the MeshCore default is commonly 12 hours, set via `set flood.advert.interval {hours}` (range ~3-168; verify in your firmware version). Note this is separate from the zero-hop `advert.interval` (default 0/off). More frequent ads increase power draw with minimal benefit.
- Do not set TX power higher than needed for your coverage goals - the power amplifier is the largest current draw during transmission. On a low-traffic repeater that spends most of its time receiving, idle/RX current may dominate total energy use, so also minimize wake/advertise frequency. TX power is also legally capped: 47 CFR 15.247 limits conducted power to 1 W (30 dBm) in 902-928 MHz, reduced dB-for-dB for antennas above 6 dBi.

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