

What battery chemistry should I use outdoors?

Short Answer: LiFePO4 for outdoor deployments

Lithium Iron Phosphate (LiFePO4) is the recommended battery chemistry for any permanent outdoor LoRa mesh installation. It is safer, more durable, and handles temperature extremes better than standard LiPo batteries. "Better at temperature extremes" mainly means greater high-temperature thermal stability and good cold-temperature *discharge* tolerance - it is not unlimited, and LiFePO4 still must not be charged below 0°C (see below).

Why Not LiPo?

LiPo (Lithium Polymer) batteries are the default on most development boards because they're inexpensive and compact. For an outdoor deployment, they have serious limitations:

- **Temperature sensitivity** - LiPo loses significant capacity below 0°C and should never be charged below 0°C (causes internal lithium plating and eventual failure). In any climate with freezing winters, an outdoor LiPo battery will degrade rapidly or fail entirely within 1-2 seasons.
- **Thermal runaway risk** - LiPo batteries can catch fire if punctured, overcharged, or deeply discharged and then recharged. Not ideal in unattended outdoor enclosures.
- **Short cycle life** - 300-500 full charge cycles. A solar node cycling daily would exhaust a LiPo in 1-1.5 years.

LiFePO4 Advantages

Property	LiPo	LiFePO4
Operating temperature	0°C to 45°C	-20°C to 60°C (discharge)*

Property	LiPo	LiFePO4
Cycle life	300-500 cycles	2,000-4,000 cycles
Thermal runaway	Yes (fire risk)	Much more resistant; thermal runaway is far less likely but not impossible under severe abuse/very high temperature
Nominal voltage	3.7V/cell	3.2V/cell
Energy density	~150-200 Wh/kg	~90-130 Wh/kg
Cost	Lower	Higher (but lower cost per cycle)

***Operating (discharge) range is -20°C to 60°C, but LiFePO4 must NOT be charged below 0°C without a low-temperature charge cutoff in the BMS** - sub-freezing charging causes lithium plating, which permanently damages the cell.

LiFePO4 Products for LoRa Deployments

Product lines and model numbers below are examples and change over time; verify chemistry, exact model number, and current availability against the vendor's catalog before buying (as of June 2026). Make sure any pack you select is genuinely LiFePO4 - some "lithium" jump-start and powersports packs are standard Li-ion, not LiFePO4.

- **Small cells (3.2V)** - EVE LF50K, EVE LF100 18650-format cells; use with a LiFePO4-compatible BMS
- **Integrated packs** - Bioenno 3.2V to 12.8V packs with built-in BMS; Dakota Lithium packs
- **12V packs** - For larger systems with 12V charge controllers; Battle Born and Dakota Lithium offer 12V LiFePO4 packs in roughly 10-100Ah sizes (confirm the exact current model number with the vendor)

Charge Controller Compatibility

LiFePO4 requires a charge controller set to LiFePO4 chemistry. Lead acid charge profiles will undercharge LiFePO4 (not a safety issue, but reduces usable capacity). A LiPo/Li-ion charge profile targets about 4.2V per cell; applied to a LiFePO4 cell (maximum ~3.65V) it overcharges the cell, which is a genuine safety concern. A quality LiFePO4 BMS should disconnect on overvoltage as a backstop, but you should not rely on that - verify your charge controller supports LiFePO4 mode before purchasing.

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