NEOVOLTA

Technical Product Notes

Optimal FLP Settings for Using a Hybrid Solar System as a UPS - Multiproduct

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Understanding Lithium Iron Phosphate, or LFP ($LiFePO_4$) Batteries

LFP batteries differ significantly from traditional lead-acid batteries, and proper care is essential for long life and optimal performance. Keeping LFP batteries fully charged for extended periods of time can lead to a slight capacity degradation. When not in active use, it's best to store them at around 50–60% state of charge (SOC).

LFP batteries also benefit from regular cycling, which helps maintain health and longevity. The ideal cycle range is 20–80% SOC. Additionally, occasional full charging to 100% SOC is important to keep the cells balanced.

The primary goal is to extend the battery's lifespan while keeping it ready for backup. It's important to understand that in a hybrid solar system, the inverter logic typically prioritizes daily charging of the battery using available DC solar, even if lower Time-of-Use (TOU) limits are set. This means the battery will often reach full charge regardless of discharge settings.

Constraints and Longevity Factors

- Constraint 1 (Solar Charge): The hybrid inverter prioritizes solar harvest, forcing the battery to the full 100% SOC whenever solar energy is available.
- Constraint 2 (Cell Balancing): The Battery Management System (BMS) requires periodic charging to perform vital cell-balancing procedures.
- Longevity Factor: Prolonged 100% SOC charge levels accelerate battery aging in LFP chemistry, causing irreversible capacity loss over time. Reducing how long the system remains at high voltage is critical as it improves safety and protects components.
- Cycle Life: LFP chemistry is robust; utilizing shallow cycles (=< 90% DoD) introduces significantly less wear than deep cycles.

Recommended Operational Strategy

Program the battery's TOU settings to set a **minimum discharge SOC,** this forces the battery to discharge as soon as solar stops charging and prevents the battery from sitting at a stressful 100% SOC.

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Option A:

- Set the battery SOC target to 90% for all six time slots
- Enable the Grid Charge setting in all six time slots

Option B (Recommended for regions with snow or low-sun winters)

- Set the battery SOC target to 90% for five out of six time slots
- Set one midday time slot (10:00 AM – 3:00 PM) to 100% SOC
- Enable the Grid Charge setting in all six time slots

Resulting Daily Cycle Profile

The system will execute a daily, shallow cycle because of the programmed limits:

1. **Option A: Charge Phase (Daytime)**: Solar forces the charge to 100% SOC, after which the BMS performs cell balancing.

2. **Option B: Charge Phase (Daytime):** When sufficient solar energy is available, the system charges the battery to 100% SOC. If solar is unavailable (e.g., due to snow-covered panels or extended cloudy periods), the selected grid charge setting will ensure the battery reaches 100% SOC. Then the BMS balances the individual cells.

3. **Discharge Phase (Evening/Overnight):** The system will immediately draw power from the battery, or will switch to grid power when the battery reaches the set SOC. Once solar production drops, the battery will discharge to the set point.
4. **Hold Phase (Night):** The system maintains the battery at the reserve limit (via grid) until solar charging resumes the next day.

Conclusion on Longevity

This strategy keeps the battery at 100% SOC for only a few hours per day (during peak solar and cell balancing) while maintaining a low-stress SOC for most of the day. Daily cycling of about 10% causes minimal wear and greatly preserves the battery's overall lifespan by avoiding continuous full charge."

Version	Revision Date	Brief Description of Change
V1.0	12/15/2025	Document Published