

Standard Operating Procedure: End-of-Life Decommissioning, Disassembly & Recycler Handover

Purpose & Regulatory Compliance

This Standard Operating Procedure establishes technical and environmental safety protocols for decommissioning and disassembling grid-scale battery systems (X-7000, G-3500, and C-1200). All operations must comply with EPA Resource Conservation and Recovery Act (RCRA) universal waste rules, NFPA 855 stationary storage fire codes, and DOT hazardous materials transport regulations (49 CFR 173.185).

Chemical Discharge and De-Energization Sequence

Under no circumstances may a battery energy storage system be dismantled while holding hazardous electrical potential:

1. **Controlled Grid-Tie Depletion:** Connect system to local load bank or export active power to the grid until average cell voltage reaches lower cutoff:
 - **For LFP systems (X-7000, C-1200):** 2.50 V per cell.
 - **For NMC systems (G-3500):** 3.00 V per cell.
2. **Auxiliary Resistor Neutralization:** Connect auxiliary low-current discharge cart DISCH-AUX-100 across isolated rack strings. Bring pack voltage down to zero volts (0.0 V $\pm$ 0.05 V) across all terminals. Install copper shorting bars across string terminals after zero-energy verification.
3. **Lockout / Tagout (LOTO):** Verify main switchgear breaker CB-301 and intermediate cassette disconnects are physically locked and tagged.

Packaging, Transport, and Material Recovery Handover

- **Liquid Coolant Evacuation:** Drain all ethylene glycol coolant from chiller loops. Collect fluid in labeled 55-gallon steel drums for certified chemical reprocessing.
- **Packaging Classifications:**
 - Intact LFP cells (CEL-LFP-280) are packed into UN-certified heavy corrugated crates with non-conductive vermiculite absorbent bedding.

- Swollen or damaged NMC pouches (CEL-NMC-065) must be sealed in explosion-resistant steel drums filled with PyroBubbles fire extinguishing media.
- **Authorized Downstream Recyclers:** Hand over shipping manifests exclusively to certified Tier-1 closed-loop battery hydrometallurgical recycling partners (e.g., Redwood Materials, Li-Cycle) for recovery of lithium carbonate, nickel sulfate, and cobalt sulfate.