

Field Incident Investigation Report: SN-G35-0142 Thermal Runaway Event

Incident Reference: INC-2024-088

Site Location: Apex Solar-Plus-Storage Microgrid Facility (Bakersfield, CA)

Equipment Affected: Gigavolt PowerStation G-3500 (Unit Serial Number: SN-G35-0142)

Incident Date: August 14, 2024

Investigating Lead: Dr. Elena Rostova, Senior Failure Analysis Specialist

Executive Summary

On August 14, 2024, at 14:22:11 PST, PowerStation unit SN-G35-0142 experienced an isolated cell thermal runaway event within Rack 3, Module Tray 4. The automatic safety systems successfully contained the fire within the cabinet enclosure. The emergency aerosol fire suppression system deployed as designed, preventing fire propagation to adjacent battery racks or neighboring commercial infrastructure.

Timeline of Telemetry Events (Extracted from bms_telemetry.json)

- **14:18:02** — Chiller system reports ERR_HVAC_502 (Compressor Overload). Cabinet ambient temperature climbs from 32.1 °C to 46.8 °C over a 4-minute window.
- **14:20:45** — Rack 3 Module 4 reports an escalating temperature gradient on sensor T_MOD_03_04 with a rate of change $\Delta T = 3.8$ °C/min.
- **14:21:55** — Terminal voltage of Cell 14 drops precipitously from 3.72 V to 1.84 V; slave BMS triggers ERR_BMS_301 followed by ERR_BMS_708.
- **14:22:04** — Master BMS triggers Stage 2 Emergency Escalation: drops main breaker CB-301 and triggers the Stat-X aerosol generator.
- **14:22:11** — Optical smoke detectors activate. Off-gas sensors confirm carbon monoxide (CO) concentration > 450 ppm within cabinet compartment.

Physical Inspection & Root Cause Analysis

1. **Inspection Findings:** Module Tray 4 was extracted post cold-site certification (72 hours post-event). Cell 14 exhibited full pouch casing rupture along the top seal seam. Neighboring cells exhibited scorch marks but retained casing seal integrity.
2. **Root Cause:** Teardown of Cell 14 at the Gigavolt Failure Analysis Lab revealed foreign metallic particulate contamination (copper burr measuring 380 µm) introduced during electrode calendering at the Tier-2 pouch cell manufacturing plant (**Apex Cell Tech Corp**, Batch: LOT-ACT-2024-03A).
3. **Corrective Actions Taken:**
 - Immediate warranty recall issued for all modules using Batch LOT-ACT-2024-03A.
 - Supplier Apex Cell Tech placed on provisional quarantine pending ultrasound inspection of calendering slitters.