

# Field Incident Investigation Report: SN-X7-0105 Low Isolation Trip and Conduit Arc Blast

**Incident Reference:** INC-2024-119

**Site Location:** Northlake Peaking Station (Willmar, MN)

**Equipment Affected:** Gigavolt Megapack X-7000 (Unit Serial Number: SN-X7-0105)

**Incident Date:** October 22, 2024

**Investigating Lead:** Sarah Kowalski, Senior Electrical Safety Compliance Specialist

## Incident Overview

On October 22, 2024, at 03:14:08 CST, Megapack unit SN-X7-0105 generated continuous low isolation resistance alerts (ERR\_ISO\_109), with DC insulation dropping rapidly from 120 MΩ to 14 kΩ. Thirty-two seconds later, a secondary phase-to-ground flashover occurred within the lower high-voltage transition conduit, causing an automatic trip of upstream circuit breaker CB-301 and deploying the Stat-X aerosol fire suppression module. The installation sustained zero external casing breach.

## Telemetry & Environmental Chronology

- **03:11:45** — Environmental sensor SEN-HUM-04 reports internal cabinet relative humidity climbing from 45% to 92% RH following an unseasonal freezing rain storm.
- **03:13:50** — Inverter detects DC isolation resistance dropping through warning threshold (< 500 kΩ). Master BMS records warning log.
- **03:14:08** — DC isolation drops to 14 kΩ; master fault ERR\_ISO\_109 triggers automatic controlled shutdown.
- **03:14:40** — High-voltage arc flash occurs inside transition conduit CON-HV-TR01. Inverter DC overcurrent trip ERR\_INV\_404 logged. Main pyrofuses fire within 12 ms, isolating battery banks from external DC inverter capacitors.

## Teardown & Root Cause Findings

1. **Mechanical Inspection:** Inspection of conduit **CON-HV-TR01** revealed that the lower polyurethane expansion seal grommet (Grommet G-4) had become unseated due to thermal shrinkage in sub-freezing temperatures (-8 °C).
2. **Rodent Ingress & Moisture Penetration:** Field mice penetrated the unseated conduit grommet and chewed through the primary outer silicone insulation jacket of positive bus cable **CBL-HV-POS-01**. Melting ice runoff dripped directly onto the exposed conductor strands, establishing a low-resistance path to the grounded steel chassis and initiating the arc flash.
3. **Corrective Actions Taken:**
  - All field technicians must inspect and install stainless-steel mesh rodent guards (Part Number: **GRD-ROD-01**) over all enclosure penetrations on outdoor **X-7000** platforms.
  - Grommet material specification updated from polyurethane to cold-flex fluorosilicone (Part Number: **GROM-SIL-LT**) rated down to -50 °C.