

GV-SOP-COMM-201

Standard Operating Procedure: Megapack X-7000 Site Acceptance Testing (SAT) & Grid Synchronization

Scope and Objective

This Standard Operating Procedure governs the final Site Acceptance Testing (SAT) and cold/hot commissioning sequence for the **Gigavolt Megapack X-7000** (Model: **X-7000**).

Satisfactory completion of this procedure is legally required prior to commercial operation date (COD) sign-off and transfer of operational liability to the utility customer.

Pre-Energization Cold Inspection Checklist

Before closing DC disconnect switches or engaging auxiliary power feeds:

1. **Torque Verification Audit:** 100% audit of all internal M6 aluminum busbar studs on battery sub-modules (**MOD-LFP-X7**). Fasteners must verify to 8.0 N·m (± 0.2 N·m) using a calibrated digital torque wrench. Apply torque seal paint strip across each nut-to-stud junction.
2. **DC Bus Insulation Resistance (Megger Test):** Apply 1,000 V DC test potential between the positive DC bus and cabinet chassis ground, and between the negative DC bus and cabinet chassis ground. Insulation resistance must exceed 100 M Ω for 60 continuous seconds. Any reading below 50 M Ω indicates dielectric breakdown or moisture intrusion and halts commissioning immediately.
3. **Liquid Glycol Coolant Loop Pressure Test:** Pressurize the cooling loop to 2.8 bar (40.6 psi) using dry nitrogen. Verify zero pressure drop over a 60-minute hold window. Top off with approved 50/50 ethylene glycol and deionized water mixture; purge all entrained air pockets through service valve SV-3 until coolant flow rate sensor **SEN-FL-022** reads steady at ≥ 42 L/min under manual pump test mode.

Step-by-Step Hot Commissioning Sequence

1. **Auxiliary Power Up:** Energize 480 V AC 3-phase auxiliary service transformer. Confirm cabinet heating elements (**HTR-CAB-100**) and BMS control power come online without triggering auxiliary circuit breakers.
2. **Master BMS Heartbeat Synchronization:** Connect service laptop running Gigavolt Service Tool v4.1 to port **ETH-SERV-01**. Confirm all 24 sub-module slave balancing boards (**BMS-CAS-LFP**) report healthy CAN communication (**ERR_BMS_301** = clear).
3. **Pre-Charge Sequence Verification:** Command contactor close via software interface. Monitor DC bus pre-charge voltage ramp: bus potential must reach 95% of battery open-circuit voltage within 850 ms through resistor **RES-PR-50** before main vacuum contactor **CON-MAIN-800** pulls in.
4. **Grid-Tie Synchronization:** Enable AC utility breaker. Inverter DSP firmware (**v2.4.11-b** or higher) will lock Phase-Locked Loop (PLL) to utility frequency (60.00 Hz $\pm$ 0.05 Hz). Ramp active power output in 10% steps up to 1,750 kW nominal while monitoring thyristor junction temperatures.