South March BESS - Commissioning Plan

Location: 2555 and 2625 Marchurst Road, Dunrobin ON, Canada

Prepared By: Evolugen

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Project Description

Fitzroy BESS Inc., a subsidiary of Evolugen by Brookfield Renewable (Brookfield) in partnership with the Algonquins of Pikwàkanagàn and is proposing to develop the South March Battery Energy Storage System (BESS) Project (the Project). The Project will be in the West Carleton-March Ward in the City of Ottawa, Ontario. The Project is located on two leased parcels of land at 2555 and 2625 Marchurst Road, Ottawa, Ontario, and situated south of Thomas A. Dolan Parkway, west of Marchurst Road, and north of John Aselford Drive. The Project has a Development Area of approximately 9.0 hectares on approximately 84.5 hectares of property. The leased rural lots currently include two residential buildings with an access lane, naturalized areas with woodland and wetland, as well as limited noncommercial pasture use.

The Project is a 250megawatt (MW) energy storage facility that uses lithium ion (lithium iron phosphate) technology and is designed to store up to 1,000 megawatt hours of energy, providing four hours of continuous discharge at full capacity.

The Project will consist of 256 BESS containers at the start of commercial operations and will progressively increase to 307 BESS containers over the duration of the IESO Offtake Agreement. The additional BESS containers will be added through the augmentation process to maintain the required 250 MW capacity. This process is further detailed within the Augmentation Process Memo.250 MW capacity. This process is further detailed within the Augmentation Process Memo.

This report considers the full Augmentation Process (a total of 307 BESS containers). Its findings and conclusions are not affected by any stage of augmentation, from 256 to 307 BESS containers.

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Executive Summary

This Utility Battery Energy Storage System (BESS) Commissioning Plan outlines the procedures for commissioning the system's primary components, including the substation, 34.5kV collection system, BESS auxiliary power system, inverter transformers, BESS containers, EMS, and SCADA systems. The plan emphasizes comprehensive testing during commissioning phases to verify system safety, performance, and readiness. The successful completion of this plan will ensure the BESS is safe, reliable, and ready for commercial operation according to project specifications.

1. Introduction and Objectives

The purpose of this commissioning plan is to ensure the safe, reliable, and efficient operation of the Utility BESS. Objectives include verifying system functionality according to design specifications, ensuring compliance with applicable safety and operational standards, assessing communication and control system integrity, and confirming seamless operation of auxiliary power provisions to critical substation control enclosures.

The project infrastructure initially includes:

- **Energy Storage:** 256 Sungrow ST5015UX-4H-US Battery Units. Each unit is a 5 MWh liquid-cooled Lithium Iron Phosphate (LFP) system housed in a 20-ft container. Refer to the Augmentation Process Memo for details on Augmentation.
- **Power Conversion:** 64 Sungrow MVS5140-LS-US MV Skids (MVT), each with a 5140 kVA, 34.5 kV oil-filled transformer and an integrated SCC for local control. Refer to the Augmentation Process Memo for details on Augmentation.
- **Transmission Line:** A 4.5 km private 230 kV overhead transmission line using steel monopoles, and the section of underground 230kV cable.
- **Substation:** A project substation with 2 Main Power Transformers, 1 HVCB, disconnect switch, and associated equipment.
- **Ancillary Systems:** 20 EMS Controller Systems, underground MV and DC cabling in conduit, foundations for all major equipment, roadways, and a wet pond for stormwater management. The BESS area features a layer of washed gravel over an impermeable layer for step and touch protection and environmental containment.

2. Scope of Work

The commissioning plan encompasses the following major equipment and subsystems:

- Project Substation
- 34.5kV Collection System
- BESS Auxiliary Power System
- Inverters and BESS Containers
- EMS and SCADA Systems

3. Commissioning Procedures

3.1 Project Substation Commissioning

- Visual and mechanical inspections of breakers, disconnect switches, and busbars.
- Soak test on the main power transformer.
- Functional testing of transformer tap changers and control equipment.
- Protection relay testing, including primary and secondary injection tests for all relays.
- Verification of alarm and trip functionality including breaker diagnostics and communication.
- Battery system capacity testing and DC supply verification for powering the control enclosures.
- Auxiliary power supply verification for the substation control enclosure including:
    - Primary supply from the 34.5kV Medium Voltage (MV) bus.
    - Secondary backup power via the propane generator, connected through an Automatic Transfer Switch (ATS), ensuring seamless transfer on primary power failure.
- Control enclosure functionality checks, including annunciator panels and remote indications.
- Verification of SCADA interface points and communication protocols.

3.2 34.5kV Collection System

- Insulation resistance and voltage withstand testing.
- Calibration of protective devices and simulated fault operation testing.
- Breaker timing and coordination verification.
- Ground fault detection and response testing.

3.3 BESS Auxiliary Power System

- Verification and functional testing of all power sources to the BESS auxiliary system.
- Testing of uninterruptible power supplies (UPS), automatic controls, and emergency lighting systems.

- Validation of control feeds to critical auxiliary loads.

3.4 Inverter Transformer Commissioning

- Ratio, winding resistance and insulation tests.
- Vector group and polarity verification.
- Cooling system checks.

3.6 Cold Commissioning Activities (Grouped)

- **Inverter Cold Commissioning:**
    - Power-up of inverter units under no-load conditions with alarms monitored.
    - Firmware verification and updates applied as necessary.
    - Internal diagnostics and fault alarm testing.
    - Communication link tests with EMS and SCADA systems.
- **BESS Container Cold Commissioning:**
    - Verification of battery State of Charge and temperature sensor calibration.
    - HVAC system functionality tests.
    - Fire suppression system tests and safety interlock verification.
    - Battery isolation, grounding, and physical inspection.

3.7 Hot Commissioning Activities (Grouped)

- **Inverter Hot Commissioning:**
    - Stepwise loading of inverter units up to full rated power.
    - Verification of active and reactive power controls, including power factor correction.
    - Testing fault ride-through and anti-islanding functions.
    - Measurement of response times and control signal accuracy under load.
- **BESS Container Hot Commissioning:**
    - Controlled charge/discharge cycles with thermal monitoring.
    - Validation of Battery Management System (BMS) fault detection and alarm functions.
    - Safety system response testing including emergency shutdown sequences.
    - Cooling system performance verification under heating loads.

3.8 EMS and SCADA Commissioning

- Verification of communications with all field devices including relays, inverters, and sensors.
- Functional testing of control logic sequences, interlocks, and automated responses.
- Simulated alarm/event injections and operator response drills.
- Data acquisition system verification, ensuring data accuracy, secure timestamping, and archival.
- Operator interface and control panel functionality validation.

3.9 Cybersecurity

This section details the procedures for verifying the cybersecurity posture of the BESS control and communication systems.

- **Network Segmentation:** Verify that the operational technology network is logically and physically separated from the enterprise network.
- **Firewall Configuration:** Confirm that firewall rules are correctly implemented to permit only authorized traffic between network zones and external connections.
- **Access Control:** Validate password policies, user role permissions, and multi-factor authentication for all critical systems (EMS, SCADA).
- **System Hardening:** Check that all default passwords have been changed, unnecessary services are disabled, and software patches are up to date on all control system servers and devices.
- **Secure Communication:** Verify the use of secure protocols for remote access and data transmission.

3.10 Performance and Capacity Testing

- Execution of full discharge and recharge cycles at defined load profiles to measure usable capacity.
- Round-trip efficiency assessment.
- Verification of system response during rapid charge/discharge transients.
- Load-following and frequency regulation capability tests.
- Confirmation of compliance with grid interconnection and operational standards.

3.11 Safety and Quality Assurance

- Compliance with applicable safety standards, including lockout/tagout procedures and use of personal protective equipment (PPE).
- Testing and commissioning personnel will be properly trained, qualified, and supervised.
- All test equipment will be calibrated and used according to manufacturer instructions.
- Documentation of all anomalies, deviations, and non-conformances with a corrective action process prior to acceptance.

3.12 Documentation and Reporting

- Comprehensive recording of test data.
- Secure storage and management of commissioning records.
- Preparation of detailed commissioning reports summarizing tests performed, results, discrepancies, and final acceptance criteria.
- Inclusion of punch lists for outstanding items and their resolution status.

3.13 Environmental Considerations

- Adherence to all applicable environmental regulations.
- Procedures to minimize environmental impact including proper disposal of waste materials and noise mitigation during operation.

3.14 Training and Handover

- Operator and maintenance staff training covering system operations, emergency procedures, and routine maintenance.
- Handover of all relevant documentation including as-built drawings, O&M manuals, and commissioning reports to the operational team.
- Completion of initial site trailing with Ottawa Fire Services, in accordance with the requirements of NFPA 855, and the City of Ottawa Site Plan Agreement for the development.