Exhibit F-4
BESS Unit Commissioning Test Plan

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1. Definitions/Acronyms

Battery System	Set of Battery Racks connected to a single PCS
BMS	Battery Management System
RBMS	Rack level BMS – for each Battery Rack
BBMS	Bank level BMS – System level BMS for Battery System
BOP	Balance of Plant
CT	Current Transformer
CPR	Cardio Pulmonary Resuscitation
MV-01	Switchboard 480 volts
ESS	Energy Storage System
HMI	Human Machine Interface, can be local or remote
JHA	Job Hazard Analysis
LOTO	Lock Out / Tag Out
PCS	Power Conversion System, i.e., bi-directional grid connected power converter
Plant Controller	Master controller for the ESS
PPE	Personal Protective Equipment
PTP	Performance Test Procedure
PU	Power Unit; a combination of a single PCS with associated Battery System, and associated Control System
Reference Meter	Calibrated meter
RTAC	Real Time Automation Controller
SAT	Site Acceptance Testing
SCADA	Supervisory Control And Data Acquisition
SOC	State of Charge
SOH	State of Health
VT	Voltage Transformer
XFMR	Transformer

2. **Purpose**

This Commissioning Test Plan is to be conducted at the Owner's BESS Facility, located at [address]. Tests are conducted in a grid-tied configuration or islanded configuration based on the test. Equipment configuration during the test will be managed as is expected during commercial operations subsequent to successful completion of this test. The enclosures will be installed on concrete slabs at the site. The system is monitored by internal instrument transformers, external instrument transformers, and metering functionalities to monitor and record voltages, currents, power disturbances, etc.

This is a field test grid conditions can dominate the output of the system and as such, if it can be documented that grid conditions cause a result that appears to not meet the Pass/Fail Criteria, an exception may be taken. Contractor and the Owner will determine modified criteria or decide to re-run the test when the grid conditions have improved. Each test has a section for Notes/Test Conditions. Test conditions such as extreme weather or abnormal grid conditions should be noted.

Because of the amount of time required to run the entire test suite, some of the tests may not be witnessed by the customer. In such cases, Contractor will run the tests in advance and provide test data. Any testing to be run prior to witness testing shall be confirmed with the customer in advance.

A Power Unit (PU) consists of a single Power Conditioning System (PCS, bi-directional grid-connected power electronic converter) connected to a battery pack and associated control system. The ESS is monitored by internal instrument transformers, external instrument transformers, and power quality meters to monitor and record voltage, current, power disturbances, and harmonics.

Reference - Drawing XXX-XX (Drawing will be from Contractor drawing set, official drawing number will be finalized after contract signing).

3. **Safety**

The use of Personal Protective Equipment (PPE) during the performance of procedures outlined in this document is required.

Only authorized personnel will be allowed in the test area, and all authorized personnel and equipment operators will wear PPE in accordance with the arc flash labels relevant to that gear.

Authorized personnel will isolate and Lock-Out/Tag-Out (LOTO) all energy sources feeding a device to verify zero energy.
Before starting any procedure, be certain correct policies are identified and adhered to including but not limited to appropriate training, approach distances, safety equipment, Job Hazard Analysis (JHA), and LOTO.

At no time during the energizing, shall any personnel be within a distance of 50 feet of pad mount transformers and Switch Gear being energized, and covered under this procedure.

All personnel shall maintain this distance until specifically released by the Project Engineer.

Contractor will have personnel trained in CPR and proper PPE required for electrical installations including MV electrical equipment during the Project installation. In the event of a medical emergency, arc flash and/or fire, site personnel should call 100 or local emergency responders.

4. LOTO

LOTO is an acronym for Lock Out/Tag Out. A Lockout Device is a physical device which can be opened or removed only by means of a key.

A lockout hasp is designed to accept additional locks where multiple locks are required. If there is no space on a lockout hasp for additional padlocks, an additional lockout hasp must be attached.

Locks which can be opened by the same key shall not be used unless such locks are under the sole control of the individual who applied the lock(s).

Combination locks or locks with master keys shall not be used. Lockout devices shall be singularly identified by a Lockout Tag and shall not be used for other purposes.

A Lockout Tag is a distinctive durable tag (red and white in color), attached to the lock, that identifies it as a lockout device and identifies the individual who placed the lock.

The tag must be of standard shape, color, and size. Lockout tags shall be singularly identified (signed) and shall not be used for other purposes.

Contractors performing work that involves control of hazardous energy must have a hazardous energy program (i.e., lockout/tagout program) in accordance with 29 CFR 1910.147, 29 CFR 1910.269, and the applicable consensus standards.

5. Conditions Precedent to Performance Testing Procedure

FAT

Factory Acceptance Testing (FAT) of all relevant equipment including PCS, Battery Systems, auxiliary equipment, etc. have been successfully completed by Contractor at the OEM testing facility.

Control System Functionality

The BESS Facility Energy Management System (EMS) shall be successfully configured to receive data from the Battery System BMS, exchange data with the Owner device, transfer data to the Historian Server for the calculation, recording and archiving of data points.

Communications

6. Remote Terminal Unit (RTU) testing should be successfully completed during the commissioning process. The interface between Owner's RTU and BESS EMS system should be fully tested and functional prior to starting the rest of the Substantial Completion Test Procedures. This includes verification of data transmission pathway between the Owner RTU and BESS EMS.

7. Points of Contact

Item	Description	Company
1		
2		
3		
4		
5		

8. Site Access

Item	Description	Notes
1	Site Physical Address.	
2	Site Access Instructions	

9. Site Emergencies

Item	Description	Notes
1	Emergency Response plan for site.	Phone No. - TBD
2	Site Local Fire Dispatch Number.	100 and Owner contact
3	Emergency meet site.	Substation Front Entrance
4	Enclosure fire alarm horn and strobe locations.	Exterior of BESS enclosures

10. Testing

System Startup

Purpose:
Demonstrate the start-up sequence of the PU. This test will be performed on each individual PU.

Procedure:

1. Verify on the HMI that the PU AC input terminals are energized and voltage values are ~[xx] V AC.
2. Verify on the HMI that the PU DC input terminals are energized and voltage values are ~[xx] V DC.
3. Verify that inverter Operational State is "Off", as read on the HMI view.
4. Set the Control Mode to "HMI Control".

5. Start the PU from the HMI

Pass/Fail Criteria		
PU starts with no errors as demonstrated by PCS Unit state changing to "RunPQ" on HMI with 0 kW and 0 kVAr reported on HMI.		
Passed	Failed	Date:
Test Performed by:		
Test Witnessed by:		

Notes/Test Conditions

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System Shutdown

Purpose:
Demonstrate the shut-down sequence of the PU. This test will be performed on each individual PU.

Procedure:
1. Verify PU is running as demonstrated by PCS Unit state being "RunPQ" on the HMI.
2. Stop PU from the HMI.

Pass/Fail Criteria		
PU performs shutdown with no errors. PCS Unit state shall be in "Off" state on the HMI after step 2.		
Passed	Failed	Date:
Test Performed by:		
Test Witnessed by:		

Notes/Test Conditions:

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PCS Emergency Shutdown and Restart

Purpose:
Demonstrate the emergency shut-down and restart sequence of the PU.

Procedure:
1. Verify PU is running as demonstrated by PCS Unit state being "RunPQ" on the HMI.
2. Stop PU by pushing the emergency stop button.
3. Verify that the system has stopped.

4. Attempt to start the PU from the remote terminal.
5. Manually reset e-stop button and reset the system fault from the WebUI.
6. Attempt to start the PU from the remote terminal.

Pass/Fail Criteria		
PU stops immediately and opens PU main AC and DC contactors upon completion of step 2, PU state on HMI goes to "Fault" state. PU does not restart upon completion of step 3 (PU is in a latched fault state). PU starts successfully upon completion of steps 5 & 6 as demonstrated by a PU state of "RunPQ".		
Passed	Failed	Date:
Test Performed by:		
Test Witnessed by:		

Notes/Test Conditions:

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Battery Metering Verification

Purpose:
Verify battery metering and monitoring system on HMI. This test will be performed on each individual PU.

Procedure:
1. Verify battery current readings are present and refreshing on HMI.
2. Verify battery current readings are present and refreshing on HMI.
3. Verify battery temperatures readings are present and refreshing on HMI.

Pass/Fail Criteria			
Continually updating data for battery voltage, current, and temperature on HMI.			
Unit	Passed	Failed	Date:
1			
2			
3			
Test Performed by:			
Test Witnessed by:			

Notes/Test Conditions:

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Enclosure Unit Smoke Detection

Purpose:

Verify smoke detection circuit operates correctly and shuts down the PCS Units when smoke is introduced in the enclosure. If applicable, the fire suppression agent tank will be temporarily disconnected from the firing pin assembly during this test. It will be reconnected for normal operations once the entire ESS system has been commissioned.

Procedure for Enclosure 1:

Item	Description	Comments/Notes	Initials Owner	Seller
1	Verify all PU are running as demonstrated by PCS Unit state being "RunPQ" on the HMI.			
2	Locate the smoke detector on the inside ceiling of Enclosure 1.			
3	Use canned smoke sprayed on the orange sniffer tube connected to the smoke detector to activate the detector.			
4	Verify the PUs have shutdown, only in Enclosure 1 and not in the other Enclosures.			
5	Verify that the fire suppression tank pin has fired out of its housing.			
6	Verify that the alarm has been reported with a Fire Suppression Alarm to the HMI.			
7	Open the Enclosure1 doors to clear out the smoke.			
8	If applicable, reset the firing pin for the fire suppression tank.			
9	Reset the system fault from the HMI.			

<Reuse table for subsequent enclosures>

Pass/Fail Criteria					
All units fire suppression systems performed as stated in items 4, 5, & 6 of the procedure.					
Unit	Passed	Failed	Date	Initial Owner	Seller
1					
2					
3					
Test Performed by:					
Test Witnessed by:					

Notes/Test Conditions:

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Remote Power Setpoint Tracking

Purpose:
Demonstrate the capability of the BESS to follow remote active and reactive power setpoints. This test will be performed on each individual BESS.

Procedure:

1. Verify BESS is running as demonstrated by all PCS Unit states being "RunPQ".
2. Set control system state to manual mode via user interface (UI).
3. Write active power values [-xx, 0, xx] kW to manual active power input.
4. Write reactive power values [-xx, 0, xx] kVAR to manual reactive power input.
5. Record power levels as measured by reference meter and displayed in WebUI in the below table.

BESS 1

Active Power Command (kW)	**Active Power Response (kW)**	**Reactive Power Command (kVAR)**	**Reactive Power Response (kVAR)**

<Reuse this table for subsequent BESS>

Pass/Fail Criteria			
BESS measured response level shall be within the greater of ±2% of the expected response level or [xx] kW / [xx] kVAR.			
BESS	Passed	Failed	Date:
1			
2			
3			
Test Performed by:			
Test Witnessed by:			

Notes/Test Conditions:

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