Battery Energy Storage System Inspection and Testing Guidelines

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1 SCOPE

These Guidelines provide information on the Inspection and Testing procedures to be carried out by the eligible consumer at the end of the construction of a BESS System, in order to connect it to the Distribution Network in KSA. These Guidelines are providing the technical know-how and knowledge to the test engineers and contractors to help them conducting the commissioning successfully. SEC will never be accounted responsible for checking the execution of the below guidelines, SEC instead will be always interested only in the equipment that would impact the distribution network at the point of connection.

DISCLAIMER
The contractor, consultant and eligible consumer are the ultimate responsible for everything in the REG system and for the commissioning. SEC will inspect and commission these systems according to its internal checklist, focusing only on the components and equipment impacting the distribution network and the connection point.

Referring to the approved WERA regulations and SEC connection process, the inspection and testing are executed in Step 3 named as “REG Connection” phase. SEC’s responsibilities at this stage will be limited to the following:

- Inspect the REG system to verify the correspondence between the REG system and the documentation provided and approved during the Design Document evaluation stage:
  - Agree with the Eligible Consumer on the inspection date
  - Completeness of the documentation and its correspondence with the REG system on-site, as per SEC’s inspection checklist.
  - Inspect the presence of Interface Protection and required switches.
  - Witness Compliance test to be performed if necessary, during cold commissioning.
  - Temporary connection granted (known as “Limited Operational Notification”).
- Generation Meter installation if all tests have a positive outcome.

During REG Energization & Operation phase, SEC will have the right to witness the commissioning tests only if deemed necessary. SEC eventually will be responsible for issuing the “Final Operation Notification” and If deemed necessary, SEC is entitled to ask the Eligible Consumer to sign a REG System Operational Agreement. SEC will also check the commissioning report following SEC’s commissioning checklist.

1.1 Companion Documents

The documents listed hereinafter have to be considered a compendium of the current document. Therefore, they should be carefully read in addition to this.

[1] CESI_SEC-DREG BESS Component Specifications_v3.0 Final.docx
[2] CESI_SEC-DREG Best Practice for Design for BESS_v3.0. Final.docx
[3] CESI_SEC-DREG Connection Guidelines for BESS_v3.0 Final.docx
[4] CESI_SEC-DREG Health and Safety Requirements for BESS_v3.0 Final.docx
[5] CESI_SEC-DREG Inspection and Testing Checklists for BESS_v3.0 Final.docx
[6] CESI_SEC-DREG Manual for the maintenance for BESS_v3.0 Final.docx
[7] CESI_SEC-DREG Standards for Connection of BESS_v3.0 Final.docx

DISCLAIMER

For understanding the connection process for connection of BESS, users must refer to the common connection process document for REG systems. The connection process for all DREG systems is the same, and hence, all users shall be updated with the REG connection process which is applicable for BESS too.

2 REFERENCE DOCUMENTS

[1] DNV GL, Safety, operation and performance of grid-connected energy storage systems, September 2017.
[2] Saudi Building Code (SBC).
[3] IEC 60364-6 - Low voltage electrical installations. Part 6: Verifications
[4] IEC 61000-3-2 - Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤16 A per phase)
[5] IEC 61010 - Safety requirements for electrical equipment for measurement, control and laboratory use
[6] IEC 61557 - Electrical safety in low voltage distribution systems up to 1000 V AC and 1500 V DC
[7] IEC 62477 - Safety requirements for power electronic converter systems and equipment
[8] ANSI/NETA ATS-2017 - Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems
[9] IEC 62933-2-1:2017 - Unit parameters and testing methods - General specification
[10] ANSI C57.12.28-2005: Pad-mounted Equipment Enclosure Integrity
[11] ANSI Z535.4-2002: Product Safety Signs and Labels
[12] IEC 62619 or UL 1973 - Safety Requirements for Secondary Lithium Cells and Batteries or Standard for Stationary Batteries

3 TERMS AND DEFINITIONS

Eligible Consumer – Any Person supplied with electricity services for his own consumption. In this context, this term will also be used to refer to a User owning a BESS. This term has also the same meaning of Customer, as defined in the Distribution Code. As per WERA Regulations, a Consumer is considered Eligible when it meets both the requirement of the same Regulations and the Connection Conditions as defined in the Distribution Code.
Inspection – examination of an electrical installation using all the senses in order to ascertain correct selection and proper erection of electrical equipment.
Interface Protection (IP) - The electrical protection required to ensure that either the BESS and/or any BESS Unit is disconnected for any event that could impair the integrity or degrade the safety and reliability of the distribution network.
Report – aggregate value based on series of records
Switch – Mechanical device capable of making, carrying and breaking currents in normal circuit conditions and, when specified, in given operating overload conditions. In addition, it is able to carry, for a specified time, currents under specified abnormal circuit conditions, such as short-circuit conditions.
Testing – implementation of measures in an electrical installation by means of which its effectiveness is proved (Note: It includes ascertaining values by means of appropriate measuring instruments, said values not being detectable by inspection).
Verification – all measures by means of which compliance of the electrical installation to the relevant standards are checked.
Applicable Laws - All laws, treaties, ordinances, judgments, decrees, injunctions, writs, orders, rules, regulations, interpretations and permits of any AHJ over the Project Site, or the performance of the Work, and the Contract Documents and each other document, instrument and agreement delivered hereunder or in connection with the Work, the Project, the Project Site, health and safety, or the environmental condition of the Work, the Project or the Project Site.
Applicable Standards - Governmental and industry standards and requirements to which the Work shall comply.
Inspection and Testing Procedures – Procedures elaborated herein for testing and commissioning.
Project Owner – Party that will own the battery energy storage system.
Supplier – The battery energy storage system supplier.
Point of Interconnection - The physical point at which User's Plant or apparatus is connected to the Distribution System.

4 GLOSSARY

The following acronyms and symbols are used throughout the document:

AC	Alternating Current
AHJ	Authorities Having Jurisdiction
BESS	Battery Energy Storage System
BMS	Battery Management System
EMS	Energy Management System
FRT	Fault Ride-Through
HVAC	Heating, Ventilation, and Air Conditioning
IEC	International Electrotechnical Commission
LV	Low Voltage
LVRT	Low Voltage Ride-Through
MV	Medium Voltage
POI	Point Of Interconnection
SAT	Site Acceptance Test
SCADA	Supervisory Control And Data Acquisition
SOC	State Of Charge

5 SAFETY REQUIREMENTS

The safety requirements during the commissioning phase are listed below:

- The BESS should be installed and commissioned by well-trained technicians since improper handling may cause electrical shock and/or thermal reactions and/or release of toxic and/or flammable gases.
- The BESS or its components should not be cut or opened to prevent the risk of fire or release of dangerous materials.
- Installation of a BESS will be guided by numerous codes, standards and regulations based on the location of the system in relation to the electrical meter and the built environment. If no standards exist current building, fire, electrical, plumbing and mechanical codes and standards would have to be applied in addressing the safety of a BESS installation.

6 BESS COMMISSIONING TEST

6.1 Overview

The BESS Commissioning Test is intended to verify proper BESS performance per manufacturer's specifications, and per BESS performance requirements. The test scope includes all BESS hardware/software components, SCADA system, metering points, and the point of interconnection (POI).

6.2 Requirements

Battery manufacturers may require that a representative be present to witness or conduct commissioning. The test should be conducted under environmental conditions included in the design specifications and deemed to be appropriate by the battery manufacturer.

The Project shall comply with WERA's Regulatory Framework and SEC's Distribution Code. Compliance with electrical safety and power quality is to be demonstrated via analysis and measurement wherever applicable. The supplier shall be responsible for conducting the analysis either in house or via a specialist 3rd party contractor and associated documentation proving compliance with relevant international standards shall be submitted to the Project Owner, who would in turn forward the same for SEC's reference. The Supplier shall engage with SEC's inspection representative(s) to supply relevant system information for system analysis and shall coordinate activities related to inspection, testing and commissioning to ensure compliance with WERA's Regulatory Framework and SEC's Distribution Code.

6.3 Test Procedure

The BESS Commissioning Test shall follow battery manufacturer's recommended practices for all activities to ensure compliance with warranty conditions. This should include at least:

i. Verification of interconnected battery rack or string functionality.
ii. Auxiliary equipment testing, including standard operational lighting, emergency lighting, and HVAC or other thermal management system functionality.
iii. Safety system verification, including smoke, gas, fire, heat, and other sensors and alarms, as well as relays, electrical protection systems and automatic emergency shut down.
iv. Verification of proper and reliable electrical performance given environmental conditions, system power flow to and from the grid interconnection.

v. Verification of the system's response to boundary condition set-points including but not limited to – active and reactive power requirement, voltage and frequency control, LVRT/FRT, ramp rate control and power quality requirements – which shall be programmed into the system's energy management system to ensure compliance with requirements of WERA's Regulatory Framework and SEC's Distribution Code.
vi. Verification of proper communication and reporting to the controller:
- Confirm communications between cell, module, rack, and battery management system (BMS).
- Confirm communication between meters/monitors/sensors and BMS.
- Confirm communication between BMS and higher-level controllers.

vii. Verification of BESS response to charge and discharge setpoints set by energy management system (EMS)/supervisory control and data acquisition (SCADA) systems.
viii. Verification of compliance with guaranteed performance as specified in the supplier's contract.
ix. Verification of BESS certifications.

7 BESS SITE TEST

7.1 Overview

After the installation of the BESS is completed, a site acceptance test (SAT) should be performed. SAT is an activity that marks an important milestone in the realization process of a BESS and concludes the installation process. The principle purpose of the SAT is to ensure that the system has been tested in accordance with approved test plans and to prove that the system is installed properly, is interfaced correctly with all other systems/peripherals, is implemented with the appropriate cyber security measures and is delivered per specification. The test procedure that is applied to a BESS needs to be appropriate to the scale, type, location and complexity of the system in question. This document describes a standard set of tests that shall be applied to all BESS.

7.2 Requirements

Testing of the electrical installation shall be conducted in accordance with The Saudi Building Code (SBC) issued by KSA in 2007 as well as requirements of standards including but not limited to IEC 60364-6, IEC 62619, and IEC 61000. Measuring instruments, monitoring equipment and methods shall be chosen in accordance with the applicable relevant parts of IEC 61557 and IEC 61010. If other measuring equipment and methods are used, they shall provide an equivalent degree of performance and safety. All tests shall be carried out where relevant and should be made in the sequence listed. In the event of a test indicating a fault, once that fault has been cleared all previous tests shall be repeated in case the fault influenced the result of these tests.

7.3 Test Procedure

i. The Supplier shall provide all Factory Acceptance Testing reports, demonstrating that the systems passed all applicable tests. Test reports shall be provided at least 30 days prior to planned installation.
ii. The Supplier shall provide a Site test Plan at contract execution.
iii. The Site test Plan shall be used to verify that:
    a. The Site Master Controller can communicate with the inverters, meters, and Battery System.
    b. The Site Master Controller can communicate with and manage BESS operations.

c. The BESS can be commanded to charge and discharge and does so without faults.
d. The system can withstand maximum expected fault levels, and all other requirements with as required by Connection Agreement and maintains compliance with WERA's Regulatory Framework and SEC's Distribution Code.
e. All system components meet or exceed the minimum target capacities and guaranteed performance levels for the battery system. BESS performance should be verified as described in:
    i. BESS Capacity Test.
    ii. BESS Response Time Test.
    iii. Signal Following Accuracy Test.
    iv. Grid Compliance Test.

iv. Testing shall comply with Good Industry Practices, Applicable Laws, and Applicable Standards.
v. All other requirements such as earthing, lighting, lightning protection, emergency supply (wherever applicable) and other services follow recommendations of SASO and/or the IEC as well as WERA's Regulatory Framework and SEC's Distribution Code.
vi. The Site test Plan will include a schedule, detailing the timeline and plan from design to delivery and commissioning, no less than 2 weeks prior to the initiation of work. This plan will include:
    a. Overall time frame, including key milestones
    b. Plans for factory testing, both component parts and as a whole, including detailed schedule, testing criteria, and acceptance criteria
    c. Site testing and commissioning plan, including detailed schedule, procedures, necessary tools required on Site, testing criteria, and acceptance criteria
    d. Progress reports if any delays are identified
    e. Remediation plans in the event of a component or system failure
vii. Project owner and/or its representative has final approval authority of the testing procedures identified by the Supplier, and these shall then be submitted to SEC prior to requesting their presence during SAT and Commissioning.
viii. Project owner shall have the right to request specific tests, if necessary, provided such test does not delay the production process or cause significant cost increase to agreed test plan and when critical compliance gaps have been identified.
ix. Project owner and/or its representative(s) shall have the right to witness all tests. As such, the Supplier will notify project owner of test dates no less than 2 weeks prior to each test.
x. The Supplier shall provide all necessary facilities and equipment for all tests.
xi. A draft Test Report shall be submitted to the project owner and/or its representative(s) by the Supplier within five (5) Business Days following the end of the Site test. The project owner shall have ten (10) Business Days to accept or reject the results of the draft Test Reports and provide in writing any comments on such draft Test Report. In the event that project owner rejects all or any part of the draft Test Report, Supplier shall, within five (5) Business Days thereafter address any comments of project owner and re-submit the draft Test Report to project owner. This procedure shall continue until project owner accepts the draft Test Report.

7.3.1 Cyber Security Risk Assessment

When the BESS is installed and integrated into the system of the operator, a cyber security risk assessment should be performed especially when communication channels are being established between the system and the load dispatch centre of SEC, making sure all cyber security risks have been identified and mitigated appropriately.

The cyber security risk assessment should identify the threats to the system, preventive barriers for these threats and mitigation measures for these incidents. Furthermore, the robustness of these mitigation measures should be assessed, assigned to action owners and checked for completion, providing appropriate focus on the security implementation and awareness of all participants. Wherever applicable, the cyber security risk assessment should be part of the security management system defined by ISO 27001 standard. This cyber security risk assessment should be repeated periodically to make sure that new risks are correctly mitigated.

8 BESS PERFORMANCE TEST

The BESS performance test typically includes a capacity test, a response time test, a signal following accuracy test, and a grid charging capability test. The performance test will be performed periodically as required by contractual obligations.

A detailed test plan shall be prepared by the supplier in consultation with the Project Owner and/or its representative and shall be submitted to SEC prior of conducting tests and injecting or drawing any power from the distribution grid for their reference and approval wherever such approval is deemed necessary. If it is not possible to carry out the actual test with the BESS connected to the grid because of restrictions related to the grid, testing with a grid simulator, at a test facility, or back-to-back method (see Annex C of IEC 62933-2-1) should be used as a substitute, based on agreement between the supplier and the project owner. The use of a grid simulator should be done only if the simulator has been validated in terms of reproducibility of the grid characteristics by SEC or an independent third party accredited by SEC.

The test plan developed by the supplier shall in general maintain conformity with testing procedures mentioned under IEC 62933-2-1. General test procedures shall be outlined in this document as a minimum requirement in the following section, but these procedures shall be tailored to project specific requirements.

8.1 BESS Capacity Test

8.1.1 Overview

The BESS Capacity Test is a performance test to demonstrate that the BESS energy capacity, maximum charge and discharge power, and roundtrip efficiency are in compliance with operating requirements and contractual obligations. The test scope includes all BESS hardware/software components, SCADA system, metering equipment, and the POI.

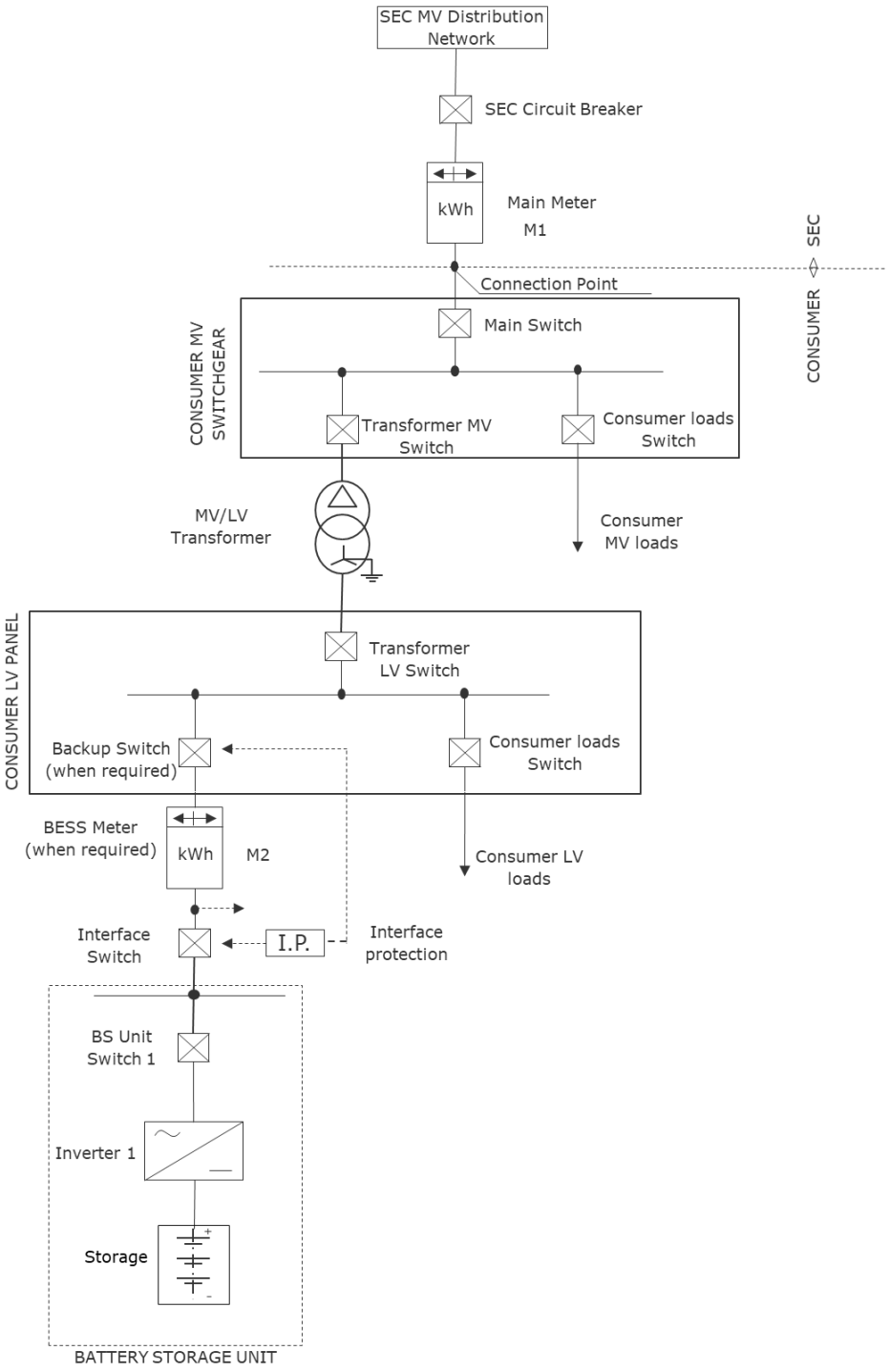

Figure 8-1: BESS connected to MV SEC distribution network through MV/LV transformer

8.1.2 Requirements

The BESS Capacity Test should be conducted under environmental conditions included in the design specifications and deemed to be appropriate by battery manufacturer and must not violate the warranty conditions of the system components. If required by the battery manufacturer, Supplier shall conduct the test with the presence of the manufacturer representative.

8.1.3 Test Procedure

The BESS Capacity Test shall be completed according to the following procedure:

i. Turn on datalogging, record all parameters at 1 second intervals (or faster), and confirm data is being saved in an appropriate location.
ii. Ensure auxiliaries are available and are providing the required metering, protection, ambient conditions and other ancillary requirements for the operation of the BESS.
iii. Execute the following Cycle Steps:
   a. Command BESS to discharge at the maximum rated power until it reaches 0% rated state of charge (SOC) to prepare for the first full charge-discharge cycle.
   b. Command BESS to idle (zero power set point) for 2 hours, or time adjusted by the supplier based on battery technology and manufacturer's guidelines (if applicable).
   c. Command BESS to charge at the maximum rated power until it reaches 95% SOC.
      - The SOC value, cumulative energy at metering point, M1, and cumulative energy at metering point, M2 in *Figure 8-1*, and time at the beginning and end of the charge cycle shall be recorded.
      - The maximum AC power during this charge cycle shall be recorded as the Maximum Charging Rate.
   d. The BESS shall be charged from the prior level to 100% SOC at a current/voltage limited by the BMS.
      - The SOC value, cumulative energy measured at M1, cumulative energy measured at M2, and time at the beginning and end of the charge cycle shall be recorded.
      - The sum of cumulative energy measured at M2 from 8.1.3(iii)(c) and 8.1.3 (iii)(d) shall be recorded as the Charged Energy.
   e. At 100% SOC, command BESS to idle (zero power set point) at 100% SOC for 2 hours, or time adjusted by the supplier based on battery technology and manufacturer's guidelines (if applicable).
      - The SOC value, cumulative energy, and time shall be recorded.
   f. Command BESS to discharge at the maximum rated power until it reaches 0% rated SOC or as limited by the BMS.
      - The SOC value, cumulative energy measured at M1, cumulative energy measured at M2, and time at the beginning and end of the discharge cycle shall be recorded.
      - The maximum AC power during this discharge cycle shall be recorded as the Maximum Discharging Rate.
      - The cumulative energy measured at M1 during the discharge cycle shall be recorded as the BESS discharge capacity.
      - The cumulative energy measured at M2 during the discharge cycle shall be recorded as the Discharged Energy.

8.1.4 Acceptance Criteria and Performance Indicators

i. No critical warning/alarm thresholds shall be exceeded for the entirety of the test, including voltages and currents per the connection agreement, communication failures, temperatures per the component specifications, or safety-related alarms.
ii. BESS charging capability is found as the Maximum Charging Rate in from 8.1.3(iii)d, and BESS discharging capability is found as the Maximum Discharging Rate in from 8.1.3(iii)(f). Verify that the BESS power capability is within operating requirements, Guaranteed Power Capability, and contractual obligations, as applicable.

iii. Measured Round-Trip Efficiency (RTE) is calculated using the average cumulative energy across multiple cycle steps as shown in the equation below. Verify that the BESS RTE is within operating requirements, Guaranteed Roundtrip Efficiency, and contractual obligations, as applicable.

$$Measured\ Round\ Trip\ Efficiency\ (RTE) = \frac{Discharged\ Energy}{Charged\ Energy}$$

Where:

"Discharged Energy" is calculated during 8.1.3(iii)(f)

"Charged Energy" is calculated during 8.1.3 (iii)(d)

8.2 Response Time Test

8.2.1 Overview

The Response Time Test is a performance test to measure the response time of the BESS to reach rated power during charge or discharge from initial measurements taken when the BESS is at rest, per applicable agreements. The procedure for the BESS Response Time Test is described below. The test scope includes all BESS components and interconnection to SEC load dispatch centres wherever applicable.

8.2.2 Requirements

The BESS Response Time Test should be conducted under environmental conditions included in the design specifications and deemed to be appropriate by battery manufacturer. If required by the battery manufacturer, supplier shall conduct the test with the presence of the manufacturer representative.

8.2.3 Test Procedure

The BESS Response Time Test shall be completed according to the following procedure:

- Turn on datalogging, record all parameters at 1/4 second intervals or faster as required by contractual requirements, and confirm data is being saved in an appropriate location. Typical communication latency and response time is under several seconds; as such, manual recording of response times may not be possible, and results should be evaluated from SCADA data log.
- The response time shall be measured starting at T0 when the command signal is received and continue until the BESS discharge power output reaches its rated power capacity T2 as shown in Figure *8-2* below.

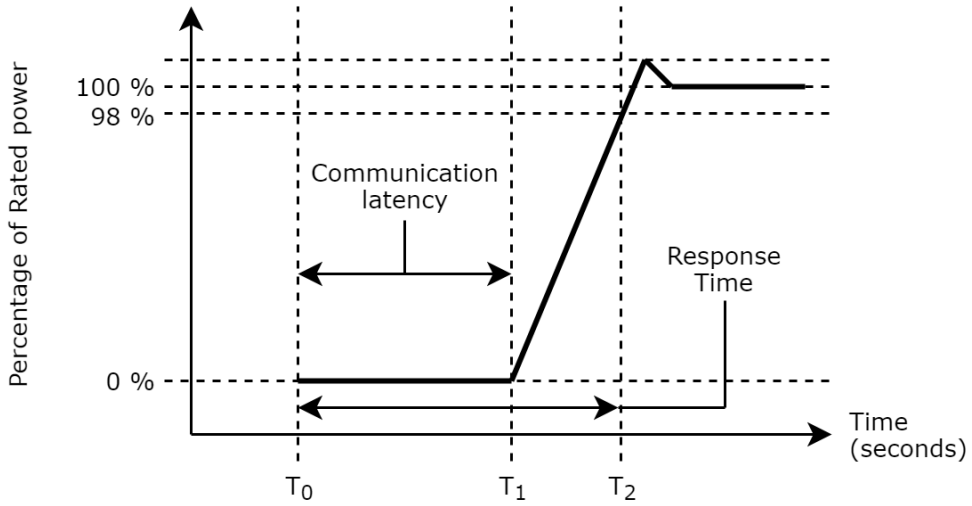

Figure 8-2: BESS Response Time Test

- The BESS shall be resting at approximately 50% SOC and shall be prepared to receive a control command.
- The SCADA shall be programmed to record the time instance T0 immediately following the initiation of the signal command requesting to change the BESS status from rest state to a discharge state.
- The SCADA shall be programmed to record the time instance T1 immediately following the BESS physical change in state.
- The SCADA shall be programmed to record the time instance T2 immediately following the BESS reaching a minimum of 98% rated power capacity.
- The power capacity of the BESS at T2 shall be recorded as PT2.
- The BESS shall be programmed to increase/decrease its power output/input per the battery manufacturer recommendations.
- The SCADA shall be used to start the response time test and shall be used to signal and record T0, T1, T2, and PT2.
- Response Time = T2 - T0.
- Ramp Rate = Rated Power/Response Time.

8.2.4 Acceptance Criteria

- No critical warning/alarm thresholds are exceeded for the entirety of the test, including voltages and currents per any applicable contractual agreements, communication failures, temperatures per the component specifications, or safety-related alarms.
- Verify that the response time is within operating requirements, Guaranteed Response Time, and contractual obligations, as applicable.

8.3 Signal Following Accuracy Test

8.3.1 Overview

The “Signal Following Accuracy Test” is a performance test to measure the accuracy of the BESS response to a specified charge or discharge command.

8.3.2 Requirements

The Signal Following Accuracy Test should be conducted under environmental conditions included in the design specifications and deemed to be appropriate by battery manufacturer. If required by the battery manufacturer, the supplier shall conduct the test with the presence of the manufacturer representative.

8.3.3 Test Procedure

The Signal Following Accuracy Test shall be completed according to the following procedure:

i. To commence the Signal Following Accuracy Test, the BESS must be charged to 50% SOC.
ii. Project owner shall issue a dispatch instruction to change the BESS output from zero (0) MW to a specified power amount. The power amount, represented in MW AC, will be decided at project owner's sole discretion and will be equal to at least 10% of the BESS Rated Power Output.
iii. The BESS shall ramp to the selected power amount and hold that output amount for three (3) minutes.
iv. After three minutes, the power output of the BESS shall be returned zero.
    A. Each minute following the project owner issued dispatch instruction, a meter reading of power, as measured in MW AC, shall be taken at the Measurement Point.
    B. After three minutes, the percent error between the three distinct meter readings and the power amount requested by project owner in the dispatch instruction shall be recorded.
    C. The average of the three percent errors computed in the 8.3.3(iv)(B) is recorded as the Signal Following Accuracy.
v. Project owner, at its sole discretion, may elect to repeat this signal following protocol up to (3) different times to demonstrate the BESS's ability to accurately follow a dispatch instruction.

8.3.4 Acceptance Criteria

- No critical warning/alarm thresholds are exceeded for the entirety of the test, including voltages and currents per any applicable contractual agreements, communication failures, temperatures per the component specifications, or safety-related alarms.
- Verify that the signal following accuracy is less than or equal to the contractually required Signal Following Accuracy level.

8.4 Grid Compliance Test

8.4.1 Overview

The Grid Compliance Test shall include tests that ensure that the BESS is able to receive and implement setpoints from the load dispatch centre (wherever applicable and deemed necessary) and that the BESS can operate while maintaining compliance with WERA's Regulatory Framework and SEC's Distribution Code.

8.4.2 Requirements

The BESS Grid Compliance Test should be conducted under environmental conditions included in the design specifications and deemed to be appropriate by battery manufacturer and must not violate the

warranty conditions of the system components. If required by the battery manufacturer, Supplier shall conduct the test with the presence of the manufacturer representative.

The test scope includes all BESS components and interconnection to SEC load dispatch centres wherever applicable. A detailed test plan shall be prepared by the supplier in consultation with the Project Owner and/or its representative and shall be submitted to SEC prior at least (10) business days of conducting tests and injecting or drawing any power from the distribution grid for their reference and approval wherever such approval is deemed necessary.

If it is not possible to carry out the actual test with the BESS connected to the grid because of restrictions related to grid stability issues or power availability, testing with a grid simulator, at a test facility, or back-to-back method (see Annex C of IEC 62933-2-1) should be used as a substitute, based on agreement between the supplier and the project owner. The use of a grid simulator should be done only if the simulator has been validated in terms of reproducibility of the grid characteristics by SEC or an independent third party accredited by SEC.

8.4.3 Test procedure

The BESS shall be subjected to variation of the following parameters according to the agreed test plan which shall be shared with SEC prior to conducting these tests and shall ensure the project meets the requirements set forth in the connection agreement and in WERA's Regulatory Framework and SEC's Distribution Code. The tests shall be designed to check for operation of the system under variations of factors including but not limited to BESS power curve, four-quadrant operation, grid-following, and others as deemed necessary. These tests shall ensure that the operation of the BESS is in line with the requirements of WERA's Regulatory Framework and SEC's Distribution Code as well as the connection agreement:

i. Active power control
   Per SEC's Technical Standards for Connection of BESS, the active owner output of the of the BESS with rated capacity of 11kW or greater shall be controllable remotely as long as technically feasible. The exact response time required, and the accuracy of results obtained shall be directly drawn from the latest version of SEC's Technical Standards for Connection of BESS and SEC's Distribution Code
ii. Reactive power control
    a) **BESS with a with rated capacity of 11kW or greater**: when the voltage is nominal shall be capable of absorbing or supplying reactive power output at the connection point and within the range Q= [-0.33pu, +0.33pu] of rated capacity (assessed in MW for active power and as specified in the connection agreement). This requirement applies when the level of stored energy in the BESS is above a certain percentage of capacity guaranteed by the supplier, unless an alternative value of active power threshold is agreed upon in the connection agreement. For values of active power output below 20% of nameplate capacity, each BESS with registered capacity of 11kW or greater shall be capable of limiting its reactive power output at the interconnection point within the range Q=[-0.05 to +0.05] of rated power (based upon nominal voltage at the interconnection point). The implementation of these limits shall be instructed by the load dispatch centre and any alternative to the 20% value of Active Power threshold may be agreed to within the connection agreement. Further requirements shall have to be guaranteed based on the requirements of WERA's Regulatory Framework and SEC's Distribution Code.
iii. Frequency response and droop settings
   Per SEC's Technical Standards for Connection of BESS, the Active Power output of the BESS shall be controllable remotely from load dispatch centres as long as technically feasible. The exact response

time required, and the accuracy of results obtained shall be directly drawn from the latest version of SEC's Technical Standards for Connection of BESS and SEC's Distribution Code.

iv. Fault Ride Through and Islanding protection
    a) SEC's Technical Standards for Connection of BESS shall be submitted by the supplier to the manufacturer to ensure compliance with FRT and islanding requirements which shall be furnished in the form of a FAT report and shall be submitted to SEC for reference and approval (wherever deemed necessary).
    b) Ramping requirements: Following emergency or planned disconnection from the distribution system each BESS, and which is not Centrally Dispatchable, shall not automatically re-connected to the Distribution System without the prior permission of SEC. BESS shall not reconnect or increase output when the system frequency is above 60.2Hz.
    c) For BESS, facilities shall exist and be switchable in or out, whereby a settable power ramping rate, as agreed in the connection agreement, may be applied to the active power output so that the output shall not be increased with a gradient above the set value.

8.4.4 Acceptance Criteria

The tests shall be conducted in the presence of the project owner and/or its representatives as well as representative(s) from SEC and results shall be tabulated and compared against those furnished in the network connection agreement and SEC's Technical Standards for Connection of BESS. If found acceptable, the tests shall be deemed successful and shall be signed off by all parties.