APPENDIX H

INTERCONNECTION DESCRIPTION AND SPECIFICATIONS

1. Description of the Interconnection Facilities

The electrical interconnection single line attached as Appendix H-1 (*Electrical Interconnection Single Line*) identifies the Interconnection Point, PREPA Interconnection Facilities, Resource Provider Interconnection Facilities, and metering locations.

2. Interconnection Point Specifications

Resource Provider shall perform and comply with the following interconnection specifications for the Resource Provider Interconnection Facilities. These specifications and standards do not constitute an all-inclusive scope of work. The Facility Study and System Impact Study shall determine the design as described in Article 3 (*Pre-Operation Period*) and may modify the single line set out in Appendix H-1 (*Electrical Interconnection Single Line*).

a. Codes and Standards Requirements:

All designs should be in accordance with the latest PREPA Design Criteria Documents, applicable ANSI/IEEE and NESC standards, and building codes. This includes standards and codes from the following:

1. the following PREPA design criteria documents or T&D Operator's equivalent documents (the "**PREPA Design Criteria Documents**" or "**DCDs**"):

   i. PREPA Civil Design Criteria;

   ii. PREPA Protection and Control Design Criteria;

   iii. PREPA Substation Design Criteria;

   iv. PREPA Transmission Design Criteria;

   v. PREPA Distribution Design Criteria;

   vi. PREPA Drawings and Specifications Design Criteria; and

   vii. PREPA Telecommunication Design Criteria;

2. NECA/BICSI 607, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings;

3. American Concrete Institute (ACI) Design Codes and Construction Specifications;

4. American Institute of Steel Construction (AISC);

5. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE);

6. American Welding Society (AWS);

7. American Wood Protection Association (AWPA);

8. Association of Edison Illuminating Companies (AEIC);

9. Building Industry Consulting Services International (BICSI);

10. Code of Federal Regulations (CFR);

11. Construction Specifications Institute (CSI);

12. Electric Power Research Institute (EPRI);

13. Federal Aviation Administration (FAA);

14. Federal Communications Commission (FCC);

15. Illuminating Engineering Society (IES);

16. Institute of Electrical and Electronics Engineers (IEEE);

17. Insulated Cable Engineers Association (ICEA);

18. International Electrotechnical Commission (IEC);

19. ITSIMM 6th Edition - Information Transport Systems Installation Methods Manual;

20. National Electrical Code (NEC);

21. National Electrical Manufacturers Association (NEMA);

22. National Electrical Safety Code (NESC);

23. National Fire Protection Association (NFPA);

24. NECA/BICSI 568, Standard for Installing Commercial Building Telecommunications Cabling;

25. North American Electric Reliability Corporation (NERC);

26. OSPDRM 5th Edition - Outside Plant Design Reference Manual;

27. Puerto Rico Building Code 2018;

28. Regulations per the Commonwealth of Puerto Rico;

29. Rural Utilities Service (RUS), United States Department of Agriculture;

30. RUS 1724E-300, U.S. Dept. of Agriculture Design Guide for Rural Substations;

31. TDMM 14th Edition - Telecommunications Distribution Methods Manual;

32. Telecommunications Industry Association (TIA);

33. ANSI/TIA 568.0-D, Generic Telecommunications Cabling for Customer Premises;

34. ANSI/TIA 569-E, Telecommunications Pathways and Spaces;

35. ANSI/TIA 606-C, Administration Standard for Telecommunications Infrastructure;

36. ANSI/TIA 607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises;

37. ANSI/TIA-1005-A, Telecommunications Infrastructure Standard for Industrial Premises; and

38. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.

b. Transmission Line Requirements:

1. Resource Provider shall perform the following tasks:

i. all ROW/Easement acquisition, including any studies, environmental permitting, real estate acquisitions, *etc*. required as per the Agreement;

ii. geotechnical soil borings, grounding tests, and studies along the transmission corridor and right of way;

iii. all applicable transmission designs and calculations typically found in typical transmission line design;

iv. stringing charts, engineered steel drawings, calculations, and PLS-CADD models of the transmission structures, including the applicable conductor size and OPGW (with 48 Fibers);

v. ampacity, shielding, and conductor sizing calculations for the transmission structure for the Interconnection Facilities;

vi. design and construction of foundations for transmission structures for the Interconnection Facilities;

vii. all transmission and distribution line design required for project completion; and

viii. evaluation of existing transmission and distribution poles that may be modified due to new conductors or equipment additions.

2. PREPA shall review and provide comments on all Resource Provider's drawings, submittals and design inputs for Resource Provider's transmission line design.

c. Telecommunication Requirements (in addition to the requirements as identified in paragraph (a) of Section 2 (*Interconnection Point Specifications*) of this Appendix I):

1. Resource Provider shall perform the following tasks:

i. install, wire, and program the SCADA Remote Terminal Units (RTUs) at the Resource Provider Interconnection Facilities and the Site;

ii. install and wire the telecommunication equipment for the Resource Provider Interconnection Facilities;

iii. programming the communication settings for the relays, meters, and all miscellaneous equipment connected to the RTU;

iv. installation of conduits for control cables from the equipment to the control house;

v. installation of telecommunications pathways at the Resource Provider Interconnection Facilities, including conduits, cable trays, racks, among others;

vi. provide and install telecommunications equipment power systems, with telecommunications equipment labeling and color-coding to comply with ANSI/TIA 606 Standard;

vii. program the DSM with the signal list provided by PREPA;

viii. design of the control house layout at the Resource Provider Interconnection Facilities and collector Site includes location, civil design, internal layout, electrical design for lightning, convenience outlets, battery bank, and 125Vac supply panels, disconnects, and other associated materials and localization areas for SCADA, DSM, and telecommunications equipment;

ix. programming the telecommunications equipment (routers, firewalls, and network equipment); and

x. install the fiber optic connections, including 48-fiber OPGW, pathways, and terminations for the protection relays to allow the Resource Provider Interconnection Facilities to be fully operational.

2. PREPA shall perform the following tasks:

i. review and comment on all submittals and design input for all design phases for the telecommunications packages; and

ii. support the integration of the new equipment into the overall PREPA network.

d. Commissioning and Testing Requirements:

1. Resource Provider shall perform the following tasks:

i. all Outages and construction work sequence plans will be coordinated with and approved by PREPA;

ii. provide any revisions to the Testing Protocol and plans for PREPA's approval prior to performing any acceptance test and energization of any equipment;

iii. perform the acceptance and commissioning tests on the equipment and auxiliaries according to PREPA's practices and Applicable Standards at Resource Provider's collector site only, including voltage signals, current signals, relay outputs, breaker status, and cable continuity;

iv. perform grounding tests at all sites, including the transmission corridor;

v. perform testing on the interconnection of the transmission line;

vi. perform impedance testing to validate the proper installation of all transmission and high voltage conductors and bus;

vii. perform tests for the wiring of protection and control systems, RTU, DSM, Transient Recorder, and others associated services for the Resource Provider Interconnection Facilities;

viii. perform adjustments and operation tests for the protection and control systems;

ix. submit all test reports signed and sealed by a PR licensed electrical engineer for PREPA's review;

x. perform preliminary testing of the protection, control and telecommunication system and the integration into Resource Provider's SCADA system. Depending on the type of alarm or signal into Resource Provider's SCADA system, PREPA personnel may act as a witness to validate the input. PREPA will perform final validation and acceptance of the SCADA integration;

xi. perform operation tests for the telecommunication systems;

xii. perform operation tests for the DSM;

xiii. perform operation tests on the equipment and auxiliaries;

xiv. perform operation tests for the transient recorder;

xv. verification of the OTDR tests for fiber optic cable performed by Resource Provider for the following cables:

A. fiber cable between the Interconnection Point and the Facility;

B. fiber cable for interconnection to PREPA's network;

C. if applicable, fiber cable between new control room at Interconnection Facilities and meter cabinet located at the Interconnection Facilities, and

D. verification of telecommunications facilities and equipment installations performed by Resource Provider at the Resource Provider Interconnection Facilities.

This work includes verification, testing, configuration, and inspection of equipment specified by PREPA and materials, cable installation, and testing by Resource Provider;

xvi. submit all test protocols for PREPA approval; and

xvii. submit all test results in a test book for PREPA approval.

2. PREPA shall perform the following tasks:

i. evaluate the test results and settings of the protection relays for Interconnection Facilities;

ii. evaluate the test results and settings of the communication equipment at the Interconnection Facilities;

iii. witness all tests and commissioning of the electrical equipment installed in PREPA Interconnection Facilities;

iv. provide a PREPA's site representative and the required technical resources from PREPA to comply with the Milestone Schedule;

v. witness all tests and commissioning of the electrical equipment installed at the Interconnection Facilities and the Site;

vi. at existing PREPA sites where protection and control components are being updated, modified, or interconnected with, the tests should be done exclusively by PREPA;

vii. perform final SCADA tests by PREPA acceptance test personnel from the point where Resource Provider consolidates SCADA data and transmits it to the PREPA SCADA system;

viii. perform the acceptance and commissioning tests on the equipment and auxiliaries according to PREPA's practices and Applicable Standards at the PREPA Interconnection Facilities and remote ends; and

ix. perform end to end testing of all trips and controls by PREPA's Acceptance Tests Department personnel.

3. Other Requirements for Interconnection

Resource Provider shall ensure that it and its contractors under the Facility Construction Contract:

a. dispose of all garbage generated because of the work, in accordance with Applicable Law;

b. comply with all environmental laws, during and after construction, including:

1. submission of the Project Environmental Assessment to and receipt of approval from the Department of Natural and Environmental Resources of Puerto Rico and any other environmental, state and municipality Permits for the Resource Provider Interconnection Facilities;

2. all the terms and conditions established in the approvals of the submitted plans, Permits, and endorsement from Governmental Authorities; and

3. upon the completion of the Resource Provider Interconnection Facilities, the closing of any of the acquired Permits that require closure; and

c. mitigate any environmental concerns and deficiencies found by PREPA's personnel or any regulatory agencies caused by Resource Provider at any time.

APPENDIX K

MINIMUM TECHNICAL REQUIREMENTS

Capitalized terms used throughout this Appendix K have the meaning set forth in the Agreement, unless otherwise defined herein.

Resource Provider shall comply with the following MTRs:

1. Frequency Control and Regulation

a. Fast active power (P) source capable of continuously injecting or absorbing energy from the grid as a function of system frequency deviations to help manage and maintain frequency at 60 Hz.

b. Instantaneous and immediate active power (P) response of battery energy storage system ("**BESS**") proportional to frequency deviations from scheduled frequency.

c. The rate of active power (P) response of BESS to frequency deviations shall be established based on configurable PREPA selected droop characteristic (*i.e.* 5% droop characteristic or more responsive as PREPA requires SCADA). PREPA shall be able to program and configure the droop via SCADA from 1% to 5% in steps of 0.5% (*i.e.* 3.0%, 3.5%, 4.0%, 4.5%, 5%).

d. Frequency regulation deadband shall be available. PREPA shall be able to configure and program the deadband via SCADA. The configurable deadband range shall be at least from 0.02% to 0.5%.

e. BESS frequency control and regulation mode time response (full frequency response) shall be less than 1.0 second.

f. PREPA shall be able to configure and select frequency regulation range (upper injection/lower absorption limits) via SCADA up to a maximum of its nominal capacity (*i.e.* +/- 15 MW, +/- 20 MW). Asymmetrical frequency regulation ranges should be allowed (*i.e.* +15 MW/-5 MW, +10 MW/-20 MW).

g. Capability to operate in the frequency control and regulation mode and simultaneously control the voltage by the injection or absorption of up to the required nominal reactive power at the Interconnection Point: (i) the frequency regulation control shall operate decoupled from the voltage regulation control mode and shall not limit the required reactive power capability of the Facility at the Interconnection Point, and (ii) the voltage regulation control shall not limit the required active power capability of the Facility at the Interconnection Point.

2. Rapid Spinning Reserve and Fast Frequency Response

a. Instantaneous injection of reserve energy as a function of the rate of change and/or deviations of the system frequency in the event of a sudden loss of generation or unexpected ramp-up in demand.

b. Energy capability and power capacity to inject nominal active power output (at the Interconnection Point) in a range within the Discharge Duration, or such longer period as is possible based on the State of Charge and the discharge rate of Energy delivered from the Facility.

c. Injection of active power (P) within the first three (3) cycles of a specific frequency deviation trigger and/or a frequency rate of change trigger (PREPA shall be able to configure and select triggers).

   i. Total configurability for PREPA selection of the active power output, response time and response slope.

   ii. Total configurability for PREPA selection of triggers: frequency, rate of change of frequency and instantaneous/time delay combinations.

   iii. For example, the rapid reserve might be selected to trigger if frequency decays to 59.6 Hz at a rate > 0.25 Hz/sec or drops and stays between 59.0 Hz and 59.2 Hz for > thirty (30) seconds or drops below 59 Hz.

   iv. Total configurability for multiple sets of triggering combinations capable of being simultaneously active. The rapid reserve mode might be selected to trigger with Boolean or logical operators that combine active power output, response time, response slope, frequency limits, frequency rate of change and time delay.

d. The rapid spinning reserve mode shall provide a full output response time (95% of its final output value) of 100 milliseconds or faster, measured at the EMS level. PREPA shall also have the flexibility of selecting a limited rapid spinning reserve sub-mode from SCADA. In limited rapid spinning reserve sub-mode, the active power output, response time and response slope shall be configurable and programmable from SCADA in accordance with the triggering combinations and options previously discussed.

e. Capability to ramp down active power output at PREPA's pre-selected and configurable slope (MW/min or % of active power output/min) after system frequency is normalized and triggers pre-selected and configurable frequency window for a certain amount of time. BESS shall ramp down to PREPA's pre-selected and configurable active power output (10 MW, 5 MW, 0 MW, *etc*.) and be able to automatically make the transition and continue operating in frequency control and regulation mode in accordance with previously selected and configurable parameters. The active power automatic ramp down should have the capability of being manually interrupted and ramped down from SCADA.

   i. Total configurability of ramp down slope in MW/minute or % of active power output/minute.

   ii. Total configurability of active power output target to which BESS shall ramp down before making the transition to operate in frequency control and regulation mode.

   iii. Total configurability for PREPA selection of frequency triggers that initiate rapid reserve ramp down process: frequency limits of window range and time delay combinations that initiate ramp down.

iv. For example, rapid reserve ramp down might be triggered if frequency returns to 60 Hz +/- 0.1 Hz and stays in this range for at least twenty (20) seconds or returns to 60 Hz +/- 0.2 Hz and stays in this range for at least thirty (30) seconds.

f. Capability to ramp down active power output at PREPA's pre-selected and configurable slope (MW/min or % of active power output/min) after SCADA command is received from PREPA's Energy Control Center System Operator to automatically make the transition and continue operating in frequency control and regulation mode in accordance with previously selected and configurable parameters.

i. Total configurability of ramp down slope in MW/minute or % of active power output/minute.

ii. Total configurability of active power output target to which BESS shall ramp down before making the transition to operate in frequency control and regulation mode.

g. Capability to inject nominal active power output for 1.0 hour and simultaneously inject or absorb nominal reactive power at the Interconnection Point.

3. Dispatchable Generation Source

a. Injection of active power at the Interconnection Point for a limited period of time to cover temporary generation deficits or start-up fast generating units.

b. PREPA shall be able to select from SCADA the constant power output mode, active power (P) magnitude and time period.

c. Capability to automatically make the transition from dispatchable mode to frequency control and regulation mode in accordance with previously selected and configurable parameters after SCADA command is received from PREPA's Energy Control Center System Operator.

d. Capability to ramp down active power output at PREPA's pre-selected and configurable slope (MW/min or % of active power output/min) after SCADA command is received from PREPA's Energy Control Center System Operator to automatically make the transition from dispatchable mode to frequency control and regulation mode in accordance with previously selected and configurable parameters.

i. Total configurability of ramp down slope in MW/minute or % of active power output/minute

ii. Total configurability of active power output target to which BESS shall ramp down before making the transition to operate in frequency control and regulation mode

e. Capability to operate in the dispatchable generation source mode and simultaneously control the voltage by the injection or absorption of up to nominal reactive power at the Interconnection Point.

4. Voltage Regulation and Control

a. Dynamic reactive power compensation source capable of continuously injecting or absorbing reactive power (up to +/- nominal MVAR at Interconnection Point) as a function of system voltage deviations.

b. Voltage regulation strategy based 100% on power electronics technology (no passive components like capacitors or reactors, neither thyristor controlled or switched capacitors or reactors allowed to complement reactive power capability).

c. Constant voltage control is required (voltage set point control mode).

d. PREPA shall be able to adjust from SCADA the voltage regulation set points shall between 95% and 105% rated voltage at the Interconnection Point. Because the previous voltage regulation range could be expanded (for example up to 106%) if PREPA's internal analyses indicate that additional dynamic compensation is required for specific multi-contingency scenarios, the upper voltage set point limits should be totally configurable and adjusted from SCADA beyond the typical voltage regulation range.

e. The voltage regulation shall be based on direct measurement by means of new BESS dedicated potential transformers (that Resource Provider shall install) at the Interconnection Point.

f. The voltage regulation system strategy shall be based on proportional plus integral (PI) control actions with parallel reactive droop compensation. The voltage regulation droop shall be adjustable from 0 to 10% in steps not greater than 0.5%.

g. At zero percent (0%) droop, the voltage regulation system shall achieve a steady-state voltage accuracy of +/- 0.3% of the controlled voltage at the Interconnection Point. For voltage regulation droops between 0 and 2.5%, the voltage regulation system shall be calibrated such that a change in reactive power will achieve 95% of its final value no later than one (1) second following a step change in voltage. The change in reactive power should not cause excessive voltage excursions or overshoot. If a voltage overshoot is generated, it should be less than 1%.

h. For voltage regulation droops between 2.5% and 5.0%, the voltage regulation system shall be calibrated such that a change in reactive power will achieve 95% of its final value no later than 500 msec following a step change in voltage. The change in reactive power should not cause excessive voltage excursions or overshoot. If a voltage overshoot is generated, it should be less than 1%.

i. For voltage regulation droops between 5% and 10%, the voltage regulation system shall be calibrated such that a change in reactive power will achieve 95% of its final value no later than 100 msec following a step change in voltage. The change in reactive power should not cause excessive voltage excursions or overshoot. If a voltage overshoot is generated, it should be less than 1%.

j. The voltage regulation system dead band shall not exceed 0.1%.

k. The voltage regulation system shall be programmed to control and coordinate with local power transformers tap changers and local reactive power sources physically located in the switchyard.

5. Fast Dynamic Reactive Power Reserve and Voltage Support

a. Instantaneous or slope controlled (MVAR/sec) injection or absorption of reactive power triggered by and as a function of the rate of change and/or deviations of the system voltage.

b. Injection of reactive power (Q) within the first three (3) cycles of a specific voltage deviation trigger and/or a voltage rate of change trigger. PREPA shall be able to configure and select triggers.

i. PREPA shall be able to configure and select from SCADA the maximum final reactive power output value for fast dynamic reactive power reserve up to the nominal reactive power capacity.

ii. Total configurability for PREPA selection of triggers: voltage magnitude, rate of change of voltage and instantaneous/time delay combinations.

iii. For example, fast dynamic reactive power reserve might be selected to trigger if voltage decays to 0.95pu kV at a rate > 2.0 kV/sec or drops below 0.9pu.

iv. For example, a different value of fast dynamic reactive power reserve might be selected to trigger if voltage decays to 0.95pu at a rate > 1.0 kV/sec or drops below 0.93pu.

c. A full output response time (95% of its final output value) of 100 msecs. or faster is required. The maximum overshoot should not exceed 5% of the ordered change and the settling time should not exceed 150 msec, measured at the EMS level.

i. Capability to inject 120% of nominal reactive power output for three (3) seconds at required 100 msec. response time.

ii. Absorption of reactive power (Q) within the first three (3) cycles of a specific voltage deviation trigger and/or a voltage rate of change. PREPA shall be able to configure and select triggers.

iii. PREPA shall be able to configure and select from SCADA the minimum final reactive power output value for fast dynamic reactive power absorption, up to the nominal reactive power capacity of BESS.

iv. Total configurability for PREPA selection of triggers: voltage magnitude, rate of change of voltage and instantaneous/time delay combinations.

v. For example, fast dynamic reactive power might be selected to trigger if voltage increases to 1.1pu of the nominal voltage at a rate > 3.0 kV/sec or increases above 1.2pu of the nominal voltage.

d. A different fast dynamic reactive power might be selected to trigger if voltage increases to 1.1pu of nominal voltage at a rate > 2.0 kV/sec or increases above 1.15pu of nominal voltage.

e. Capability to inject nominal fast dynamic reactive power reserve or operate in voltage regulation mode depending on the system voltage conditions, and simultaneously inject nominal active power output for 1.0 hour at the Interconnection Point.

6. Black Start Capability

a. The Facility shall provide for BESS start-up capability and full functionality during system blackouts.

b. The Facility shall provide for BESS start-up capability and full functionality during unavailability of external system generation sources.

7. BESS Full Functional Voltage and Frequency Operational Range and Ride-Through Capability

a. Low Voltage Operation Range:

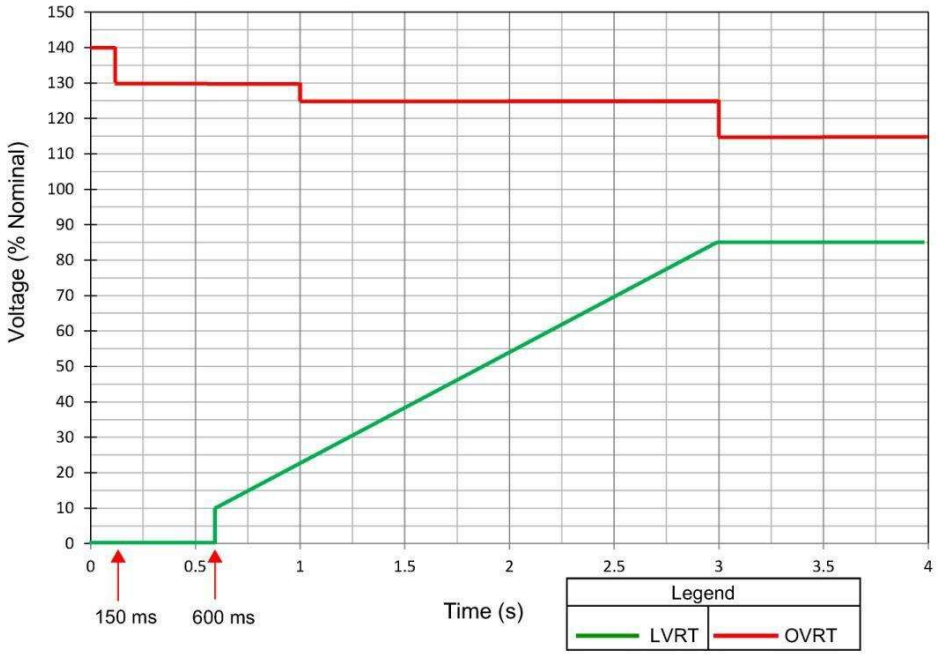


Figure 1 BESS Voltage Operational Range and Ride-Through Requirements

i. From Figure 1 (above), PREPA requires BESS to remain totally functional and online during three (3) phase and single phase faults down to 0.0 per-unit (measured at the Interconnection Point), for up to 600 msec.

ii. BESS shall remain online and continue operating during and after normally cleared faults on the Interconnection Point.

iii. BESS shall remain online and continue operating during and after backup-cleared faults.

b. High Voltage Operational Range:

i. PREPA requires BESS to remain totally functional and online during symmetrical and asymmetrical overvoltage conditions as specified by the following values (illustrated in Figure 1 above):

Overvoltage (pu)	Minimum time
1.4 – 1.3	150 ms
1.3 – 1.25	1 s
1.25 – 1.15	3 s
1.15 or lower	indefinitely

c. Frequency Ride Through (FRT)

56.0 – 63.0 Hz	No tripping (continuous)
55.5 – 56.0 Hz	20 sec time delay
< 55.5 or > 63.0 Hz	Instantaneous trip

8. Dynamic System Monitoring Equipment (DSM)

Resource Provider is required to provide, install, commission and maintain a dynamic system monitoring equipment that conforms to PREPA's specifications and signals list.

9. Modeling and Validation

a. Once final adjustments and parameter settings related with commissioning and MTR compliance tests are completed, Resource Provider shall submit a PSS/E Siemens – PTI Certified mathematical model and validation report. When referred to the mathematical model, this shall include but is not limited to inverters, transformers, collector systems, plant controllers, control systems and any other equipment necessary to properly model BESS facility for both steady-state and dynamic simulation modules.

b. Resource Provider shall submit user manuals for both BESS unit and BESS Facility models including a complete and detailed description of the voltage regulation system (VRS) and frequency regulation system model implementation. The mathematical models shall be fully compatible with the latest and future versions of PSS/E. Resource Provider shall use PSS/E standard models. In the case that Resource Provider submits user written models, Resource Provider shall keep these models current with the future versions of the PSS/E program until such time that PSS/E has implemented a standard model. Resource Provider shall submit to PREPA an official report from Siemens – PTI that validates and certifies the required mathematical models, including subsequent revisions. Resource Provider shall

submit the official reports and certifications from Siemens – PTI, otherwise the mathematical model shall not be considered valid.

c. Resource Provider shall submit Siemens – PTI certified PSS/E mathematical models of any kind of compensation devices (*i.e.* SVC, STATCOMs, BESS, *etc*.) used on BESS facility. Resource Provider shall use standard models provided with PSS/E. In the case that Resource Provider submits user written models, Resource Provider shall keep these models current with the future versions of the PSS/E program until such time that PSS/E has implemented a standard model. In its final form, the mathematical model shall be able to simulate each of the required control and operational modes available for the compensation device and shall be compatible with the latest and future versions of PSS/E. The model shall reflect final adjustments and parameters settings related with the control system commissioning process and shall be incorporated to the PSS/E mathematical model and tested accordingly by Resource Provider and PREPA system study groups. Resource Provider shall submit the official reports and certifications from Siemens – PTI, otherwise the mathematical models shall not be considered valid.

d. If Resource Provider provides user written model(s), then it shall provide compiled code of the model and maintain the user written model compatible with current and new releases of PSS/E until such time a standard model is provided. Resource Provider shall permit PREPA to make available Facility models to external consultants with a non-disclosure agreement in place.

e. Resource Provider shall submit a PSS/E model validation report. This report shall demonstrate PSS/E simulation results that show the model MTR compliance and performance, based on final adjustment and parameter settings of MTR and commissioning field tests. Resource Provider shall submit the official reports and certifications from Siemens – PTI, otherwise the mathematical models shall not be considered valid.

f. Additional details for the adequate PSS/E modeling and the contents of the PSS/E validation report can be found in PREPA's "Guidelines on PSS/E Mathematical Models" document.

10. Power Management

The Facility shall provide adequate technology (communicating technology and the corresponding control equipment) and implement PREPA's power management requirements (ramp rate limits, output limits, curtailment).

11. Short Circuit Ratio (SCR) Requirements

Short Circuit Ratio values (System Short Circuit MVA at POI/BESS Facility MVA Capacity) under 5 shall not be permitted. Resource Provider shall install additional equipment, such as synchronous condensers, and controls as necessary to comply with PREPA's minimum short circuit requirements.

12. General

a. For batteries, replacement of individual cells or cell modules shall not interrupt BESS availability to the grid.

b. BESS shall have dedicated auxiliary electric power systems to serve BESS ancillary loads (HVAC, lighting, *etc*.) and be able to be auto-transferred to a reliable backup source.

c. BESS shall have a minimum round trip energy efficiency of 85% measured at the Interconnection Point.

d. PREPA shall define the BESS voltage level at the Interconnection Point. The Project shall include appropriate step-up transformers and required interconnection equipment, including any necessary augmentation or modification to existing substation or transmission facilities.

e. BESS control system shall integrate the following operational requirements:

   i. BESS controllers shall be compatible with the systems used in PREPA's System Operations Control Center and Energy Management System.

   ii. BESS shall be completely dispatchable.

   iii. BESS control system shall provide available energy forecasting.

   iv. Any operating function shall be capable of being remotely and dynamically selected and prioritized.

   v. Function parameters (*i.e.* droop setting) of any operating function shall be capable of being remotely modified.

   vi. Resource Provider shall fully describe and demonstrate how the proposed BESS control system(s) will operate.

The control system shall have the necessary hardware and software (*i.e.* firewalls & malware detection) such that it is compliant with the latest NERC CIP reliability standards for control system security requirements.

APPENDIX L

OPERATING PROCEDURES

GENERAL

1.0 Interaction with the Agreement

These Operating Procedures set out certain guidelines relating to the operation and maintenance of the Facility. As set out in Section 3.9 (*Protocols & Procedures*) of the Agreement, in the event of any conflict between the terms and conditions of these Operating Procedures and the rest of the Agreement, the terms and conditions of the Agreement shall prevail. Resource Provider acknowledges and agrees that its compliance with these Operating Procedures will not in any way relieve Resource Provider from any liability that it has under the Agreement.

T&D Operator shall be deemed to be acting as PREPA's agent in its implementation of the Operating Procedures, and Resource Provider shall have the same rights, privileges and defenses against PREPA regarding T&D Operator's actions as if PREPA had performed the functions assigned to T&D Operator thereunder.

Each Party shall confirm or update the contact information of this Appendix L by written notice to the other Party no later than sixty (60) days prior to Initial Synchronization Date.

2.0 Definitions

Capitalized terms used but not defined in this Appendix L (*Operating Procedures*) shall have the same meanings set forth in Section 1.1 (*Definitions*) of the Agreement.

In this Appendix L (*Operating Procedures*):

- "**Actual Discharge Capacity**" means, at any given time, the instantaneous amount of Energy (in MW) made available from the Facility at the Interconnection Point, based on prevailing ambient conditions and Facility availability at such time.

- "**Available Discharge Capacity**" means, at any given time, the potential maximum amount of Energy (in MW) that could be made available from the Facility at the Interconnection Point, based on prevailing ambient conditions and the availability of the Facility at such time.

- "**BESS**" means the battery energy storage system that comprises part of the Facility.

- "**Curtailment Level**" has the meaning set forth in Paragraph 4.9(c) of Procedure V.

- "**Disconnection and Curtailment Event Log**" means a record of any disconnection or connection event, regardless of cause, which is in the form attached in Appendix I.1 of Procedure I.

- "**Dispatch Center**" means each dispatch center operated by PREPA and/or T&D Operator.

- "**DSM**" means dynamic system monitoring equipment installed at the Facility.

- "**ECC**" means the energy control center operated by T&D Operator.
- "**EMS**" has the meaning set forth in Paragraph 4.2(b) of Procedure I.
- "**ESSA Operational Administrator**" means the representative appointed by T&D Operator to act as the operational administrator for energy storage services.
- "**Facility Status Report**" means the report to be delivered by Resource Provider to the ECC substantially in the form set out in Appendix 1.1 of Procedure I.
- "**MTRs Corrective Action Report**" has the meaning set forth in Paragraph 4.9(f)(f.2) of Procedure V.
- "**MTRs Non-compliance Report**" has the meaning set forth in Paragraph 4.9(f)(f.1) of Procedure V.
- "**RTU**" has the meaning set forth in Paragraph 4.1(a) of Procedure I.
- "**Waiting Period**" means the Force Majeure Waiting Period and/or the Grid System Waiting Period, as applicable.

PROCEDURE I. DISPATCH OF POWER AND CHARGING

1.0 Objective

This Procedure is intended to facilitate the dispatch of the Facility and coordination between T&D Operator and Resource Provider.

2.0 Scope of Procedure

This Procedure includes guidelines in relation to the following:

- dispatch of the Facility (Discharge Mode);
- charging of the Facility (Charge Mode);
- use of the Facility for storage of Energy (Storage Mode);
- voltage scheduling;
- voltage regulation;
- dispatching and/or curtailment during T&D Operator/Resource Provider declared Emergency conditions; and
- reporting on the status of the Facility.

3.0 Responsibilities

In accordance with Sections 6 (*Operation of the Facility*) and 7 (*Dispatching & Charging Obligations*) of the Agreement, the Parties agree, for the purposes of operations, dispatching, and charging of the Facility, that:

a. Resource Provider's personnel will contact the following T&D Operator ECC personnel:

Company	Title	Name	Phone
T&D Operator	Generation Shift Engineer	On shift	787-521-5064
T&D Operator	Principal Shift Engineer	On shift	787-521-5066

b. T&D Operator Dispatch Center personnel will contact the following Resource Provider's personnel:

Company	Title	Phone	Cell Phone	E-mail
Resource Provider (primary contact)				
Resource Provider (back-up contact)				

4.0 Procedure

4.1 General

a. Resource Provider will make the following data available to T&D Operator in real time, through the Facility's Remote Terminal Unit ("**RTU**"):

a.1 the Actual Discharge Capacity at the Interconnection Point (MW and MVAR);

a.2 the Available Discharge Capacity at the Interconnection Point (MW);

a.3 the State of Charge of the Facility;

a.4 the Facility disconnect status, and active ramp rates (UP and DOWN) (MW/min);

a.5 the Facility curtailment setpoint and "ENABLE/DISABLE" control point;

a.6 the real time voltage at the Interconnection Point of the Facility (kV);

a.7 the percent voltage regulation system droop setpoint;

a.8 the percent frequency regulation system droop setpoint; and

a.9 any other signals and/or data required by T&D Operator.

b. T&D Operator reserves the right to temporarily disconnect the Facility or curtail the Energy Storage Services if the Facility materially fails to comply with the MTRs. T&D Operator shall have no direct liability to Resource Provider in connection with any such disconnection or curtailment (including any payment liability or liability in respect of waiting time), without, for the avoidance of doubt, limiting the rights of Resource Provider as provided in this Agreement.

c. Before commencing work activities within the Facility that may create a risk of a Non-Scheduled Outage or Non-Scheduled Derating, Resource Provider shall first coordinate with the ECC and obtain by phone a work order for such activities, provided that Resource Provider

shall not need to obtain a work order if, due to the nature of an Emergency or risk to personnel or equipment, waiting for a work order is impractical or would increase the risks to personnel or equipment.

d. All communications regarding the status of the Facility between Resource Provider and T&D Operator personnel shall be confirmed by email to the corresponding representatives as soon as possible.

4.2 Dispatch and Charging of the Facility

a. Resource Provider shall operate the Facility to meet the MCC and to comply with Section 7 (*Dispatching & Charging Obligations*) of the Agreement.

b. Resource Provider shall ensure that the Facility control system integrates controllers that are compatible with the systems used in the ECC and T&D Operator's Energy Management System ("**EMS**") to automate the dispatching and charging process based on ECC anticipated operation and the conditions of the Grid System. The ECC shall control dispatch and charging via Automatic Generation Control (AGC) in accordance with each applicable Dispatch Notice or Charge Notice or as per system conditions.

c. Resource Provider shall not release Energy from the Facility over D^{max}. T&D Operator will monitor any violation of such limitation, and if any such violation occurs during normal operating conditions, T&D Operator shall notify Resource Provider of any such dispatch limit violation, and any excess Energy discharged from the Facility shall not be counted for billing purposes in accordance with the Agreement.

d. T&D Operator may require Resource Provider to disconnect the Facility or curtail the amount of Energy being discharged from the Facility to the extent expressly authorized by, and in accordance with, the terms of the Agreement.

e. Other than during the occurrence of any Permitted Outage Hour, Resource Provider shall:

e.1 if the ECC requires power from the Facility while the Facility is operating in Charge Mode, make the Facility available for dispatch, and discharge to T&D Operator in accordance with a Dispatch Notice, a quantity of Discharge Energy (expressed in MWh) that is available at the time of such request and for a duration that is determined based on the State of Charge at the time of such request; and

e.2 while the Facility is operating in Charge Mode, make the Facility available at the Interconnection Point for dispatch by T&D Operator in accordance with requirements specified in the MTRs.

f. While operating in Charge Mode, Discharge Mode, or Storage Mode, the optimal operation of the Facility shall be subject to T&D Operator guidelines and the EMS, taking into consideration the technical characteristics and limitations of the Facility (such as the C^{min}).

4.3 Voltage Scheduling

The voltage schedule shall be consistent with the Facility design, MTRs and based on the normally expected operating conditions for the Facility and the reactive power requirements of the Grid System. The voltage schedule is effectively +/-5% (0.95 – 1.05 per unit) of the nominal voltage at the Interconnection Point.

4.4 Voltage Regulation

a. The ECC will adjust the voltage regulation setpoint through remote control, provided that T&D Operator shall not require the Facility to operate beyond its required minimum design limits as specified in the MTRs.

b. T&D Operator will notify Resource Provider of the corresponding voltage droop setting of the Facility or any change to it as defined in the MTRs.

c. T&D Operator will monitor the response compliance of the Facility. If any violation of the MTRs occurs, Procedure V (*Monitoring and Enforcement of MTRs)* will apply.

4.5 Dispatch during T&D Operator Declared Emergency Conditions

If T&D Operator declares an Emergency, the ECC may disconnect the Facility or curtail the Energy Storage Services. Without limiting the generality of the foregoing, T&D Operator's control centers may require Resource Provider personnel to increase or decrease the discharge of Energy, to disconnect or delay synchronization of the Facility to maintain safe and reliable load levels and voltages on the Grid System, which shall in all cases be consistent with Prudent Utility Practices. T&D Operator and Resource Provider shall keep detailed records of each curtailment or disconnection event, calculate the corresponding waiting periods and determine if the event duration exceeded any applicable waiting period under the Agreement. Set out in Appendix I.1 of this Procedure are proformas for recording this information. The Parties shall reconcile these records for each event, in accordance with the procedures set forth in Appendix I.1 of this Procedure.

4.6 Facility Status Reporting

a. Resource Provider shall provide daily, before 5:00 am (Puerto Rico time), a Facility Status Report to the ECC in electronic form. The proforma for this status report is included as Appendix I.1 of this Procedure.

b. Resource Provider shall immediately notify the ECC if, after delivery of the Facility Status Report, there is any pertinent change in Resource Provider's Facility status.

APPENDIX I.1 CURTAILMENT OR DISCONNECTION DURING EMERGENCIES OR FORCE MAJEURE

1.0 Curtailments and Disconnection Events

a. Curtailment (changes of the scheduled dispatch or charging) or disconnections due to Force Majeure or an Emergency, including due to a Grid System Event or Force Majeure:

a.1 If T&D Operator declares an Emergency or an event or circumstance of Force Majeure occurs, T&D Operator may curtail the Energy Storage Services or disconnect the Facility.

a.2 T&D Operator shall provide written notice, as soon as practicable after the occurrence of an Emergency or any other event or circumstance of Force Majeure, with particulars of the event and its estimated duration.

a.3 If T&D Operator has disconnected the Facility due to an Emergency or Force Majeure, the ECC shall notify Resource Provider when the Facility is able to reconnect to the Grid System. Prior to reconnection of the Facility, Resource Provider shall: (i) confirm to T&D Operator that the Facility is able to reconnect to the Grid System (including the date and time the Facility is available to reconnect); and (ii) notify T&D Operator of the availability of the Facility to charge and discharge Energy in compliance with the MTRs.

a.4 Resource Provider shall keep a detailed record of each disconnection or curtailment event caused by an Emergency or Force Majeure and, after the Commercial Operation Date, shall notify T&D Operator if the aggregate duration of these events exceeds any applicable Waiting Period for an Agreement Year, including any applicable Grid System Waiting Period or Force Majeure Waiting Period.

a.5 Included at the end of this Appendix I.1 is the form of Disconnection and Curtailment Event Log that Resource Provider shall complete and submit in accordance with Paragraph 2 of this Appendix I.1 for each disconnection or curtailment event caused by an Emergency or Force Majeure. The Parties shall reconcile these records for each event in accordance with Paragraph 2 of this Appendix I.1.

2.0 Completion Procedure for Disconnection and Curtailment Event Logs

Within forty-eight (48) hours after the conclusion of any event of disconnection or curtailment, Resource Provider shall: (i) complete an entry in the relevant Disconnection and Curtailment Event Log; and (ii) submit the Disconnection and Curtailment Event Log to T&D Operator. The information recorded in the Disconnection and Curtailment and Event Log shall include:

- the incident number and type of incident (i.e., curtailment, disconnection, or both);
- the event start and end dates, duration, and curtailment/disconnection percentage, whether the event start time shall be the time that the Facility de-synchronizes from the Grid System, or curtailment begins, and whether the event end time shall be the time the Facility re-synchronizes with the Grid System, inclusive of the typical time for start-up and synchronization, or when the curtailment ends;
- the cause of the incident;

- the corrective measures taken by T&D Operator or Resource Provider in response to the incident;
- any additional relevant details regarding the incident;
- the date and time the Facility is available to deliver Discharge Energy and the Available Discharge Capacity of the Facility that can be discharged in compliance with the MTRs; and
- allocation of time towards any applicable Waiting Period for the event under consideration and any time that exceeds the applicable Waiting Periods.

Within forty-eight (48) hours after receipt of the Disconnection and Curtailment Event Log from Resource Provider, T&D Operator shall either acknowledge the Disconnection and Curtailment Event Log by counter-signing the entry and returning it to Resource Provider or shall otherwise raise any issue regarding the Disconnection and Curtailment and Event Log with Resource Provider.

3.0 Completion Procedure

a. Resource Provider shall procure that Resource Provider's shift supervisor shall complete the following sections of the attached proforma to facilitate communications with the T&D Operator Shift Engineers relating to the Facility status:

a.1 date of the report;

a.2 status of the Automatic Voltage Regulator (AVR) for the Facility;

a.3 status of the control system for the Facility (Voltage Regulation & Control, Frequency Response, etc.);

a.4 status of the BESS component of the Facility;

a.5 status of the DSM;

a.6 status of any other equipment deemed necessary based on the specification of the Facility;

a.7 a summary of the operating conditions of the Facility; and

a.8 the causes of any restrictions to active or reactive loading.

Force Majeure
Curtailment or Disconnection Event Log

Incident No: _____ **___ Curtailment ___ Disconnection**

Event Start Date	Event Start Time	Event End Date	Event End Time	Duration (hh:mm:ss)	Curtailment %

Cause of Incident: _____

_____

Corrective Measures: _____

_____

Additional Details: _____

_____

Facility Capable to Deliver Electrical Power Charge/Discharge from (mm/dd/yy, hh:mm:ss:) _____ **% of Capacity:** _____

Force Majeure Waiting Period[1]	
	Agreement Year to Date
Aggregate Hours under curtailment for Agreement Year	
Time exceeding waiting period for Agreement Year	
Incidents	

Note 1: Totals include all applicable incidents

Recorded By: Record Date:

Grid System Event or Other
Curtailment or Disconnection Event Log

Incident No: _____ **___ Curtailment** **___ Disconnection**

Event Start Date	Event Start Time	Event End Date	Event End Time	Duration (hh:mm:ss)	Curtailment %

Cause of Incident: _____

_____

Corrective Measures: _____

_____

Additional Details: _____

_____

Facility Capable to Deliver Electrical Power Charge/Discharge from (mm/dd/yy, hh:mm:ss) _____ **% of Capacity:** _____

Grid System Waiting Period[1]	
	Year to Date
Aggregate Hours under curtailment for Agreement Year	
Time exceeding Grid System Waiting Period for Agreement Year	
Incidents	

Note 1: Include if curtailment or Disconnection is due to a Grid System Event.

Recorded by: _____
Record Date: _____
Confirmed by T&D Operator: _____
Confirmation Date:

FACILITY STATUS REPORT

Resource Provider Company Name

Date / Time submitted: _____

Submitted by (Resource Provider): _____

Equipment	Status	Value	Comments
Control System			
Voltage Regulator			
Energy Storage System			
Facility Capacity			
Switch Yard			
Protection System			
Meteorological System			
Etc.			

Supervisor in charge: [Name] ***Phone: (xxx) xxx-xxxx***

— End of Procedure I. Dispatch of Power Discharging —

PROCEDURE II. SCHEDULING OF DISPATCHING AND CHARGING

1.0 Objective

This procedure is intended to facilitate the scheduling of dispatching and charging between T&D Operator and Resource Provider.

2.0 Scope of Procedure

For each Day during the Supply Period, Resource Provider shall provide to T&D Operator daily before 5:00 am, a written, accurate estimate for that Day of the Facility Availability (as defined in Appendix F).

3.0 Responsibilities

In accordance with Section 7 (*Dispatching & Charging Obligations*) of the Agreement, the Parties agree that for the purposes of scheduling the dispatch or charge the Facility:

a. T&D Operator personnel will contact the following Resource Provider personnel and utilize Appendix II.1 to provide the dispatching/charging schedule:

Company	Title	Name	Phone	E-mail
Resource Provider	Operations Manager			
Resource Provider	Plant Manager			

b. Resource Provider personnel will contact the following T&D Operator personnel:

Company	Title	Name	Phone	E-mail
T&D Operator	Director System Operations	Raphael Gignac	787-354-5223	raphael.gignac@lumapr.com
T&D Operator	Manager Energy Management	Salvador Serrano Menendez	787-521-5066	salvador.serrano@lumapr.com
T&D Operator	Director Supply-Side Contracts Administration	Brian Walshe	303-949-4646	brian.walshe@lumapr.com
T&D Operator	Generation Shift Engineer	On shift	787-521-5064	
T&D Operator	Principal Shift Engineer	On shift	787-521-5066	

4.0 Procedure

4.1 Facility Next Month – Hourly Charging and Dispatching Schedule

Between Days 15 and 20 of each Month, T&D Operator will provide to Resource Provider an estimated hourly schedule for the charging and dispatching of the Facility for the immediately following Month, including an estimate of the total amount of Energy to be dispatched/charged in MWh during that Month. T&D Operator will provide these estimates to Resource Provider for planning purposes only and, during the operation of the Facility, the estimated hourly schedule is subject to automatic and instantaneous change by T&D Operator, including in accordance with the EMS.

4.2 Startup /Shut Down Notifications

During normal electrical system operating conditions, Resource Provider shall use commercially reasonable efforts to provide T&D Operator with twenty-four (24) hours advance notice to either start up or shut down the Facility. These notices must be given orally and confirmed by email.

Consistent with Section 6.4 (*Non-Scheduled Outages and Deratings*) of the Agreement, Resource Provider shall use commercially reasonable efforts to notify T&D Operator of any Non-Scheduled Outage or Non-Scheduled Derating no later than 5:00 pm (Puerto Rico time) on the third (3rd) Business Day prior to the Day that such Non-Scheduled Outage or Non-Scheduled Derating will occur.

In the event of an unexpected Non-Scheduled Outage or Non-Scheduled Derating, Resource Provider shall provide notice to T&D Operator by telephone as soon as reasonably practicable and, in all cases, no more than fifteen (15) minutes following the occurrence of such Non-Scheduled Outage or Non-Scheduled Derating. Resource Provider shall, as soon as reasonably practicable thereafter, provide T&D Operator with a notice that includes:

a. the event or condition causing the Non-Scheduled Outage or Non-Scheduled Derating;

b. the date and time of such event or condition;

c. the expected end date and time of such event or condition;

d. for Non-Scheduled Deratings, the Available Discharge Capacity during such event or condition, and

e. any other information reasonably requested by T&D Operator.

APPENDIX II.1 DISPATCHING/CHARGING SCHEDULE FILE FORMAT

Dispatching, charging or storage schedules should be provided in ASCII space delimited format as shown in the example below and in a text format. The information shall include hourly discharging. It shall also include the average and peak amount of Energy that is to be discharged at the Interconnection Point.

Example: Assume the net MWh profile changes from 70 MWh to 0 MWh in twenty-four (24) hours. The data for the next twenty-four (24) hours will be generated in a format consistent with the following:

NAM ZZZZZZZZ

SNT YYYYMMDD 010000 0

MWP YYYYMMDD 010000 0 70.000	70.000	70.000
MWP YYYYMMDD 020000 0 60.000	00.000	00.000
MWP YYYYMMDD 030000 0 50.000	00.000	00.000
MWP YYYYMMDD 040000 0 70.000	00.000	00.000
MWP YYYYMMDD 050000 0 60.000	00.000	00.000
MWP YYYYMMDD 060000 0 50.000	00.000	00.000
MWP YYYYMMDD 070000 0 70.000	00.000	00.000
MWP YYYYMMDD 080000 0 60.000	-40.000	-40.000
MWP YYYYMMDD 090000 0 50.000	-50.000	-50.000
MWP YYYYMMDD 100000 0 70.000	-70.000	-70.000
MWP YYYYMMDD 110000 0 60.000	-60.000	-60.000
MWP YYYYMMDD 120000 0 50.000	-50.000	-50.000
MWP YYYYMMDD 130000 0 70.000	-70.000	-70.000
MWP YYYYMMDD 140000 0 60.000	-60.000	-60.000
MWP YYYYMMDD 150000 0 00.000	00.000	00.000
MWP YYYYMMDD 160000 0 00.000	00.000	00.000
MWP YYYYMMDD 170000 0 70.000	70.000	70.000
MWP YYYYMMDD 180000 0 60.000	60.000	60.000
MWP YYYYMMDD 190000 0 50.000	50.000	50.000
MWP YYYYMMDD 200000 0 70.000	70.000	70.000

MWP YYYYMMDD 210000 0 60.000	60.000	60.000
MWP YYYYMMDD 220000 0 00.000	00.000	00.000
MWP YYYYMMDD 230000 0 00.000	00.000	00.000
MWP YYYYMMDD 240000 0 00.000	00.000	00.000

The first record in the file contains the Facility name. The second record in the file contains the date and time the file was created. The third record contains the hourly amount of Discharge Energy in MWh. The fourth record contains the average megawatt output of Energy from the Facility in MW. The fifth record in the file contains the peak megawatt output of Energy from the Facility in MW. If within the twenty-four (24) hour period there are additional changes to the MWh profile (such as mid-hour curtailments), a record should be written for every inflection point of the MWh curve.

— End of Procedure II. Scheduling of Dispatching and Charging —

PROCEDURE III. SCHEDULED OUTAGES, NON-SCHEDULED OUTAGES, SCHEDULED DERATINGS AND NON-SCHEDULED DERATINGS

1.0 Objective

This Procedure is intended to facilitate the coordination and management of Scheduled Outages, Non-Scheduled Outages, Scheduled Deratings, and Non-Scheduled Deratings of the Facility between T&D Operator and Resource Provider.

2.0 Scope of Procedure

These Procedures apply in relation to the following notifications:

- Scheduled Outages;
- Non-Scheduled Outages;
- Scheduled Deratings; and
- Non-Scheduled Deratings.

3.0 Responsibilities

In accordance with Section 6 (*Operation of the Facility*) of the Agreement, the Parties agree that for the purposes of Scheduled Outages, Non-Scheduled Outages, Scheduled Deratings and Non-Scheduled Deratings,

a. Resource Provider's personnel will contact the following T&D Operator personnel:

Company	Title	Name	Phone	E-mail
T&D Operator	Manager Energy Management	Salvador Serrano Menendez	787-521-5066	salvador.serrano@lumapr.com
T&D Operator	Director System Operations	Raphael Gignac	787-354-5223	raphael.gignac@lumapr.com
T&D Operator	Director Supply-Side Contracts Administration	Brian Walshe	303-949-4646	brian.walshe@lumapr.com

b. T&D Operator personnel will contact the following Resource Provider's personnel:

Company	Title	Name	Phone	E-mail
Resource Provider	Plant Manager			
Resource Provider	Operations Manager			

4.0 Procedure

4.1 General

In accordance with Section 6 (*Operation of the Facility*) of the Agreement, if the Facility has a Scheduled Outage, Non-Scheduled Outage, Scheduled Derating or Non-Scheduled Derating and such Outage or Derating occurs or would occur coincident with a T&D Operator declared Emergency, then at T&D Operator's request, Resource Provider shall make commercially reasonable efforts, consistent with Prudent Utility Practices to reschedule (with T&D Operator's approval) the Outage or Derating or, if such event has already commenced, to expedite the completion thereof.

4.2 Scheduled Outages or Scheduled Deratings

a. Resource Provider shall submit to T&D Operator a Scheduled Maintenance Program for each Year in accordance with Section 6.3 (*Scheduled Maintenance*) of the Agreement.

b. Resource Provider shall submit the proposed Scheduled Maintenance Program using the form attached as Appendix III.1 to this Procedure and will include the following information:

b.1 the date and time of commencement of each Scheduled Outage or Scheduled Derating;

b.2 the available capacity of the Facility during the Scheduled Outage or Scheduled Derating (if any), including in respect of a Scheduled Derating, the Energy Storage Services available during such event;

b.3 details of the maintenance activities to be completed during the Scheduled Outage or Scheduled Derating; and

b.4 the expected duration of the Scheduled Outage or Scheduled Derating and approximate time to restore the Facility to full operation.

c. PREPA shall consider and approve the draft Scheduled Maintenance Program in accordance with Section 6.3 (*Scheduled Maintenance*) of the Agreement. The Parties may amend the Scheduled Maintenance Program in accordance with Section 6.3 (*Scheduled Maintenance*) of the Agreement.

d. During any Scheduled Outage or Scheduled Derating:

d.1 If Resource Provider has reason to believe that the duration of the Scheduled Outage or Scheduled Derating will exceed the planned duration, Resource Provider will notify T&D Operator as soon as possible as to the cause of such delays and the additional time required to complete the Scheduled Outage or Scheduled Derating. In such event, Resource Provider will use reasonable efforts to return the Facility to operation in the shortest possible time following the end of the originally Scheduled Outage or Scheduled Derating period.

d.2 Resource Provider may notify T&D Operator if the work related to the Scheduled Outage or the Scheduled Derating requested by Resource Provider is completed before the expiry of the planned duration for such Scheduled Outage or Scheduled Derating. Upon receipt of such notice, T&D Operator will use commercially reasonable efforts to return the Facility to operation in the shortest possible time. For the purposes of

calculating the Permitted Outage Hours, the Scheduled Outage or Scheduled Derating, as applicable, will continue until the first to occur of: (i) the return by T&D Operator of the Facility to operation; and (ii) the expiry of the planned duration for such Scheduled Outage or Scheduled Derating.

4.3 Non-Scheduled Outages or Non-Scheduled Deratings

a. In accordance with Section 6.4 (*Non-Scheduled Outages & Deratings*) of the Agreement, Resource Provider shall use reasonable efforts to notify and coordinate all Non-Scheduled Outages or Non-Scheduled Deratings with T&D Operator's Operations Subdivision Head at least twenty-four (24) hours in advance of any such Outage or Derating. Such notifications shall be documented using the form attached as Appendix III.2 to this Procedure.

b. Resource Provider shall use reasonable efforts to coordinate Non-Scheduled Outages or Non-Scheduled Deratings to occur during times when the Facility is not projected to be dispatched or charging, during Scheduled Outages or Scheduled Deratings, or such other times as will minimize any adverse effect on the operation of the Grid System.

4.4 Spare Parts

In order to minimize the potential impact of any Non-Scheduled Outage or Non-Scheduled Derating, Resource Provider shall ensure that it maintains at the Site, or has access to in a near proximity to the Site, sufficient spare parts for the Facility in accordance with the manufacturer's recommendation or Prudent Utility Practices.

APPENDIX III.1 SCHEDULED OUTAGES OR SCHEDULED DERATINGS

a. At the times required in accordance with Section 6.3 (*Scheduled Maintenance*) of the Agreement, Resource Provider shall submit to the ECC (signed and submitted by Resource Provider's plant manager) a proposed Scheduled Maintenance Program setting out:

a.1 for each Scheduled Outage:

a.1.1 the date and time of the commencement of such Scheduled Outage – being the point in time when the Facility is desynchronized and is no longer available for discharging and/or charging;

a.1.2 the expected duration of such Scheduled Outage from the date and time of desynchronization of the Facility to the date and time the Facility is once again available for discharging and/or charging; and

a.1.3 details of the reasons for the Scheduled Outage and a reference to any supplementary information; and

a.2 for each Scheduled Derating:

a.2.1 the date and time of commencement of each Scheduled Derating – being the point in time when the Facility has reduced capacity to provide the Energy Storage Services;

a.2.2 the expected duration of such Scheduled Derating from the date and time when the Facility has reduced capacity to provide the Energy Storage Services until such time as the capacity of the Facility is fully restored; and

a.2.3 details of the reasons for the Scheduled Derating and a reference to any supplementary information.

b. T&D Operator shall procure that the ESSA Operational Administrator acknowledges receipt of the proposed Scheduled Maintenance Program by completing the following and returning it to Resource Provider:

Received by T&D Operator on [date].

This signature only indicates acknowledgement of the receipt of the proforma – it does not indicate acceptance of the proposed schedule for Scheduled Outages or Scheduled Deratings. T&D Operator will indicate its acceptance of all or any of the proposed dates and/or propose alternate dates in writing to Resource Provider in accordance with the Agreement and the procedures set out in Paragraph 4.2 of this Procedure.

c. If there is any delay in the completion of any Scheduled Outage or Scheduled Derating, Resource Provider shall notify T&D Operator of the delay, with such notice to include the following information.

c.1 Revised Scheduled Outage or Scheduled Derating completion date and time

c.2 Reference attached information outlining the cause / causes of the delay.

Date/Time Submitted _____

Submitted by Resource Provider _____

Received by T&D Operator _____

Date and Time of Reception of Completed Appendix III.1 by T&D Operator	Date and Time of Commencement of Scheduled Outage or Scheduled Derating	Scheduled Outage or Scheduled Derating Details	Expected Duration of Scheduled Outage or Scheduled Derating

APPENDIX III.2 NON-SCHEDULED OUTAGES OR NON-SCHEDULED DERATINGS

a. Resource Provider shall complete the following sections of the proforma and email it to T&D Operator's Operation Subdivision Head (submitted and signed by Resource Provider's plant manager or operations manager). Resource Provider shall use reasonable efforts to notify T&D Operator of any Non-Scheduled Outages or Non-Scheduled Deratings at least twenty-four (24) hours in advance:

a.1 In respect of a Non-Scheduled Outage:

a.1.1 the date and time of the commencement of the Non-Scheduled Outage, being the point in time when the Facility is desynchronized;

a.1.2 a summary of the cause of the Non-Scheduled Outage; and

a.1.3 the expected duration of the Non-Scheduled Outage in hours from the date and time of desynchronization to the date and time the Facility is once again available for discharging or charging.

a.2 In respect of a Non-Scheduled Derating:

a.2.1 the date and time of the commencement of the Non-Scheduled Derating, being the point in time when the Facility has reduced capacity for discharging and/or charging;

a.2.2 a summary of the cause of the Non-Scheduled Derating; and

a.2.3 the expected duration of the Non-Scheduled Derating in hours from the date and time of the reduction in capacity to the date and time the capacity of the Facility is restored.

a.3 Resource Provider shall revise the date and time notified in accordance with Paragraph a.1.3 or a.2.3 above as circumstances require through regular communication with T&D Operator.

Date/Time Submitted _____

Submitted by Resource Provider _____

Received by T&D Operator _____

Date and Time of Reception of Proforma by T&D Operator	Date and Time of Commencement of Non-Scheduled Outage or Non-Scheduled Derating	Non-Scheduled Outage or Non-Scheduled Derating Details[1]	Expected Duration of Non-Scheduled Outage or Non-Scheduled Derating

Notes:

1. Provide summary of reason for Non-Scheduled Outage or Non-Scheduled Derating and work to be done to address the cause of the Non-Scheduled Outage or Non-Scheduled Derating.

— End of Procedure III. Scheduled Outages, Non-Scheduled Outages, Scheduled Deratings and Non-Scheduled Deratings —

PROCEDURE IV. COMMUNICATIONS REGARDING THE GRID SYSTEM

1.0 Objective

This Operating Procedure is intended to facilitate communications between T&D Operator and Resource Provider regarding the Grid System.

2.0 Scope Of Procedure

This Procedure encompasses communications between T&D Operator and Resource Provider relating to the following:

- notifications for start-up and synchronization of the Facility;
- any Grid System Event;
- equipment maintenance and inspection and switching practices at the Interconnection Point;
- at risk situations;
- relay settings;
- certification of tests and inspections on electric and protection equipment; and
- infrared thermography inspections at the Interconnection Point.

3.0 Responsibilities

In accordance with Section 6 (*Operation of The Facility*) of the Agreement, the Parties agree that:

a. for the purpose of communications regarding the interface of the Facility and the Grid System, Resource Provider's personnel shall contact the following T&D Operator personnel:

a.1 for work orders and operations coordination:

Company	Title	Name	Phone	E-mail
T&D Operator	Generation Shift Engineer	On shift	787-521-5064	
T&D Operator	Transmission Operator North	On shift	787-521-5065 (115kv/230kv) or 787-521-5067 (38kv)	
T&D Operator	Transmission Operator South	On shift	787-521-3575 or 787-521-8714	

a.2 for outages or clearances relating to the Grid System:

Company	Title	Name	Phone	E-mail
T&D Operator	Supervisor Outage Planning	Gisell D. Acevedo	787-521-5628	giselld.acevedo@lumapr.com
T&D Operator	Director Supply-Side Contracts Administration	Brian Walshe	303-949-4646	brian.walshe@lumapr.com

a.3 for relay settings

Company	Title	Name	Phone	E-mail
T&D Operator	Protection Subdivision Head	[To be provided]		

b. for the purpose of communications regarding the Grid System, T&D Operator personnel will contact the following Resource Provider's personnel:

Company	Title	Name	Phone	E-mail
Resource Provider	Shift Supervisor			
Resource Provider	Plant Manager			
Resource Provider	Operation Manager			

4.0 Procedure

4.1 T&D Operator Notifications Required for Facility Start-up and Synchronization

a. Resource Provider's shift supervisor shall notify the ECC Shift Engineers when it will be in a position to synchronize the Facility.

b. T&D Operator will confirm to Resource Provider, with an order number, when the synchronization is to be completed.

c. The Parties will follow this procedure each time the Facility is disconnected.

4.2 Transmission System Outages

T&D Operator shall procure that the ESSA Operational Administrator immediately notifies Resource Provider of any planned Grid System outages that could directly affect the discharge or charging of Energy to or from the Facility, and, if applicable, how much Resource Provider's dispatching or charging activities should be limited, which shall in all cases be in accordance with Sections 6 (*Operation Of The Facility*) and 7 (*Dispatching & Charging Obligations*) of the Agreement.

4.3 Emergency Situations requiring a Reduction in Dispatching/Charing

a. T&D Operator Shift Engineers may take control of the Facility, or shall notify as soon as possible Resource Provider's shift supervisor of any potential line overloads or Emergencies that require a curtailment or disconnection of the Facility, and by how much dispatching or charging of the Facility should be reduced, which shall in all cases be in accordance with Sections 6 (*Operation Of The Facility*) and 7 (*Dispatching & Charging Obligations*) of the Agreement.

b. Resource Provider's personnel shall, as soon as possible, notify T&D Operator Shift Engineers of any Emergency situations at the Resource Provider site which may have a direct impact upon the dispatching or charging of the Facility. Resource Provider shall use all reasonable efforts to minimize the impact of any Emergency situation on the dispatching or charging of the Facility.

4.4 Equipment Maintenance and Inspection and Switching Practices at the Resource Provider Interconnection Facilities

Resource Provider shall not undertake any maintenance activity on any equipment located within the Resource Provider Interconnection Facilities which directly interface with the Grid System without first: (i) confirming with T&D Operator the required steps for the proposed switching activity; and (ii) obtaining an order from T&D Operator's ESO Coordination and Control Supervisor permitting each switching action to be executed at the Resource Provider Interconnection Facilities.

4.5 At-Risk Situations

Resource Provider shall coordinate and obtain a work order from T&D Operator Shift Engineers before commencing any work that interfaces with or affects the Interconnection Facilities.

4.6 Relay Settings

Resource Provider shall not change the relay settings of its protection systems that may have an impact on the Grid System without first coordinating with T&D Operator and obtaining a prior written authorization from T&D Operator's Protection Subdivision Head. T&D Operator shall procure that T&D Operator's Protection Subdivision Head shall provide such written authorization in a reasonable time upon receipt of a request from Resource Provider, provided that Resource Provider has submitted all the required documentation in a timely manner. Resource Provider shall bear all reasonable costs and expenses incurred by T&D Operator in relation to any change to the relay settings requested by Resource Provider, including the cost of any modifications to the Grid System involving replacement relays or upgrades.

APPENDIX IV.1 RESOURCE PROVIDER'S SWITCHYARD EQUIPMENT LINE DIAGRAM

(Attach recent revision of switchyard equipment one line diagram)

— End of Procedure IV. Communications Regarding the Grid System —

PROCEDURE V. MONITORING AND ENFORCEMENT OF MTRS

1.0 Objective

The following Procedure is intended to facilitate the communications between T&D Operator and Resource Provider in relation to the management of the MTRs.

2.0 Scope of Procedure

The scope of the Procedure describes the following.

- information requirements;
- monitoring and non-compliance management relating to the MTRs; and
- penalties calculation and application relating to the MTRs.

3.0 Responsibilities

3.1 Management of the MTRs: Resource Provider Contact

In relation to the management of the MTRs, the Resource Provider personnel will contact the following T&D Operator personnel:

Company	Title	Name	Phone	E-mail
T&D Operator	Director Supply-Side Contracts Administration	Brian Walshe	303-949-4646	brian.walshe@lumapr.com
T&D Operator	Manager Energy Management	Salvador Serrano Menendez	787-521-5066	salvador.serrano@lumapr.com

3.2 Management of the MTRs: T&D Operator Contact

In relation to the management of the MTRs, T&D Operator personnel will contact the following Resource Provider personnel:

Company	Title	Name	Phone	E-mail
Resource Provider	Plant Manager			
Resource Provider	Operation Manager			

4.0 Procedure

4.1 Frequency Control and Regulation Requirement

4.1.1 The following frequency response and regulation requirements and protocols apply to the Facility:

Resource Provider shall be responsible to ensure that the Facility is designed, constructed, operated and maintained so that it is capable of complying with the following requirements relating to frequency response and regulation:

a. The Facility shall comply with the frequency response (FR) in accordance with the MTRs. The batteries and auxiliary systems shall be designed such that the frequency response function shall not be limited by the charging and discharging process

b. The Facility shall be able to simultaneously comply with both the frequency response and ramp up/down pre-selected configuration while the Facility is discharging or charging power to/from the grid.

c. The Facility will be utilized to support the system during downward and upward frequency events. The Facility will be used on a continuous basis for regulation against frequency deviations. The regulation function shall be active as long as there is Energy available. During periods of time where the amount of Stored Energy at the Facility is equal to the Maximum Stored Energy, such that the Facility cannot absorb more Energy, the Facility will be utilized to support the system during the upward frequency events.

d. The frequency response function shall be active at all times the Facility is discharging/charging energy considering the minimum charge value of the Facility, and the Facility shall respond to frequency deviations (movement) via frequency regulation as long as the frequency is beyond the deadband defined by T&D Operator and in accordance with the MTRs.

e. The Facility will provide measurement information as described in Paragraph 4.1.2 of this Procedure, including through the RTU, remaining equivalent energy of frequency function, and the State of Charge. The Energy charging process shall not affect the ramp rate limit requirement (configured by T&D Operator) or the frequency regulation of the grid and shall not create charging cycles oscillations.

4.1.2 The following frequency regulation and ramp rate configuration related measurement requirements apply to the Facility:

Resource Provider shall ensure that the Facility is capable of providing the following frequency regulation and ramp rate configuration related measurement signals to T&D Operator:

a. AC power output of the Facility at the Interconnection Point;

b. AC power output of the Facility at the Facility collector substation;

c. total AC power output of the BESS's inverters;

d. the Facility's frequency response storage MW participation;

e. the State of Charge management MW participation;

f. the frequency used for frequency response calculation;

g. the State of Charge of the Facility;

h. the BESS's enable status;

i. the BESS's limited status;

j. the State of Charge in the Facility for frequency regulation; and

k. any additional signal that may be requested by T&D Operator.

Resource Provider must ensure that these signals are provided by the Facility to T&D Operator's SCADA system with a sampling rate higher than two (2) seconds and so that such signals can be stored by T&D Operator's SCADA system, with a standard sampling rate of two (2) seconds. These signals shall also be available to the DSMs (please refer to the DSMs signal list) and will be used in the following sections to monitor the frequency response and ramp rate limit (configured by T&D Operator) requirements. More signals could be required depending in the specific Facility design, and the final electrical one line diagram of the Facility shall be provided as soon as it is available. For clarification, for purposes of compliance and monitoring of the technical requirements of the Facility (including relating to dispatching and charging of the Facility), all physical measurements will be made at the Facility and/or the Interconnection Point as necessary, which will be provided by measurement equipment.

4.1.3 Rapid Spinning Reserve and Fast Frequency Response:

T&D Operator shall monitor the rapid spinning reserve using data obtained from the DSM and SCADA. T&D Operator shall evaluate parameters, including accuracy, response time, overshoot, and active power contribution, based on parameters configurated by T&D Operator according to T&D Operator MTRs. If the Facility is in violation of the MTRs, the MTRs non-compliance management procedure will apply (see Paragraph 4.9 of this Procedure). In addition to regular monitoring, T&D Operator may require the Resource Provider to conduct periodic tests to demonstrate the Facility's compliance with specific voltage regulation system requirements.

4.2 Frequency Response/Regulation Requirement Compliance Monitoring

Frequency response will be monitored on a daily basis, by the following procedure:

a. The required response of the Facility to frequency deviations will be computed based on *the frequency bias formula, with a 5% droop characteristic or other specified droop characteristic between 1% and 5% in accordance with the MTRs:*

$$f_b = NCF / (Droop\% * f_{nom}) \ MW/Hz$$

Where:

f_b = Frequency bias in MW/Hz

NCF = D^{max} of the Facility in MW

$Droop\%$ = 5% in pu or other specified droop between 1% and 5%

f_{nom} = System nominal frequency = 60Hz

For example, for a Facility with a D^{max} of 20 MW:

$f_b = 20 / (.05*60) = 6.667$ MW/Hz

b. The frequency response of the Facility shall always be in opposition to the direction of the system frequency deviation.

f dev = absolute value (fsys – 60) in Hz

fsys = Actual system frequency in Hz

f dev = Frequency deviation from the nominal system frequency in Hz

c. The frequency bias will be applied to (multiplied by) the frequency deviation beyond the dead band. This result (FRF) establishes the increase or decrease in active power required from the Facility and measured at the Interconnection Point in response to the system frequency deviation.

FRF = (fb) (fdev – dband)

FRF = Frequency response of the Facility in MW (increase or decrease in active power required in response to the system frequency deviation)

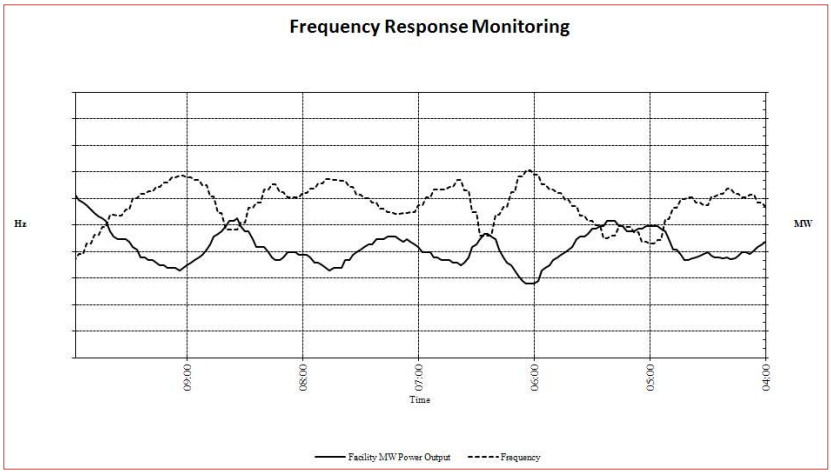
fdev = Frequency deviation from the system nominal frequency (in Hz) or the absolute value of the difference between the actual system frequency and 60 Hz

dband = Dead band in Hz

fb = Frequency bias in MW/Hz

d. For example, for a dead band of 0.01Hz and an increase in frequency deviation of 0.11Hz, the power output of a Facility with 20 MW D^{max} measured at the Interconnection Point is required to decrease by 0.667MW. On the other hand, if the frequency decreases with a frequency deviation of 0.31Hz, a 2 MW increase in active power output measured at the Interconnection Point is required.

The following chart illustrates graphically a representative performance of a Facility in the context of the frequency response and regulation requirement. The dotted graph represents the system frequency and the solid one represents the Facility's active power output as measured at the Interconnection Point in response to the corresponding system frequency deviations:



4.3 Configurable Ramp Rate Limit Requirement Compliance and Compliance Monitoring

T&D Operator will apply the following exceptions to the ramp rate limit:

a. the rates of change in active power, as measured at the Interconnection Point, caused by the need to meet frequency response requirements will not be considered as non-compliance with the ramp rate limit; and

b. the ramp rate limit will be monitored on a daily basis, independently of the frequency response, and any marginal non-compliance will be disregarded, in accordance with the following procedure:

The ramp in MW per scan of the Facility is defined as:

$$P_{sf} = P_s - P_f$$

$$R_s = |P_{sf} - P_{sf\text{-}1}|$$

Where:

Psf = present MW power output of the Facility measured at the Interconnection Point with the frequency response MW participation removed;

Ps = present MW power output of the Facility measured at the Interconnection Point;

Pf = frequency response MW participation;

Rs = absolute value of ramp in MW per scan; and

Psf-1 = MW power output of the Facility measured at the Interconnection Point, with the frequency response storage MW participation removed, one (1) scan before, which is two (2) seconds previous Psf.

The ramp rate for each scan will be calculated accordingly to the following formula, and expressed as a percentage of the D^{max} per minute (30 scans):

$$RR = \frac{Rs\ x\ 30}{P_F} x\ 100$$

Where:

RR= Ramp rate in % of D^{max} per minute

Rs = Ramp in MW per Scan

PF= D^{max} in MWAC

If the required ramp rate is ten percent (10%) (as an example), T&D Operator will apply an additional ten percent (10%) tolerance to exclude scans which are marginally in non-compliance.

If the Facility is non-compliant with the MTRs, the MTRs non-compliance management procedure (Paragraph 4.9 of this Procedure) will apply. T&D Operator will base the proposed curtailment in accordance with Paragraph 4.9 of this Procedure on the maximum insufficiency or worst scan during the non-compliance event period.

4.4 Voltage Ride Through (VRT) Requirement Compliance Monitoring

T&D Operator will monitor Voltage Ride Through (VRT) using parameters data obtained from the DSM and SCADA. After system events or disturbances such as voltage events or faults, T&D Operator will evaluate the performance of the Facility according to the MTRs. T&D Operator will use system and Facility parameters data from the DSM and SCADA for the compliance evaluation. If T&D Operator determines that the Facility is non-compliant, the MTRs non-compliance management procedures set out in Paragraph 4.9 of this Procedure will apply.

4.5 Voltage Regulation/Control and Fast Dynamic Reactive Power Reserve Requirement Compliance Monitoring

T&D Operator will monitor the Voltage Regulation System and Fast Dynamic Reactive Power Reserve using parameters data obtained from the DSM and SCADA. T&D Operator will evaluate parameters as voltage regulation accuracy, VRS response time, overshoot, and reactive power contribution based on voltage set point and voltage droop according to the MTRs. If T&D Operator determines that the Facility is in violation of the MTRs, the MTRs non-compliance management procedures set out in Paragraph 4.9 of this Procedure will apply. In addition to regular monitoring, T&D Operator may require Resource Provider to perform periodic tests to evaluate compliance with specific voltage regulation system requirements.

4.6 Reactive Power Capability and Minimum Power Factor Requirement Compliance Monitoring

T&D Operator will monitor the reactive power capability and minimum power factor requirement of the Facility using parameters data obtained from the DSM and SCADA. Resource Provider shall ensure that the reactive power capability of the Facility complies with the MTRs. If T&D Operator determines that the Facility is in violation of the MTRs, the MTRs non-compliance management procedures set out in Paragraph 4.9 of this Procedure will apply. In addition to regular monitoring, T&D Operator may require Resource Provider to perform periodic tests to evaluate compliance with the reactive power capability and minimum power factor requirement of the Facility.

4.7 Frequency Ride Through (FRT) Requirement Compliance Monitoring

T&D Operator will monitor frequency ride through (FRT) using parameters data obtained from the DSM and SCADA. T&D Operator will evaluate after system events or disturbances such as frequency events or faults according to the MTRs. If the Facility is in violation of the MTRs, the MTRs non-compliance management procedure set out in Paragraph 4.9 of this Procedure will apply.

4.8 Black Start Capability

T&D Operator will monitor and test the Black Start Capability of the Facility. T&D Operator will evaluate the performance of the Facility according to the MTRs. If T&D Operator determines that the Facility is in violation of the MTRs, the MTRs non-compliance management procedure set out in Paragraph 4.9 of this Procedure will apply.

4.9 MTRs Non-Compliance Management Procedure

a. In accordance with the Agreement, T&D Operator shall have no liability in connection with any disconnection or curtailment of the Facility by T&D Operator resulting from any non-compliance of the Facility with the MTRs (including any payment liability or liability in respect of waiting time).

b. T&D Operator will monitor the performance of the Facility to verify its compliance with the MTRs, in accordance with Paragraphs 4.1 to 4.8 of this Procedure.

c. If T&D Operator determines that the Facility is non-compliant with the MTRs, T&D Operator may curtail the Facility in such a scope and for such a duration as is consistent with Prudent Utility Practices (the "**Curtailment Level**").

d. For MTRs non-compliance events that do not depend on the Facility's power output and for which curtailment is not an effective remedy (such as, but not limited to, frequency response, voltage regulation, frequency ride through, voltage ride through or upward ramps, black start capability, rapid spinning reserve), T&D Operator may disconnect the Facility or curtail the Facility's active power output to zero (0) MW, in such a scope and for such a duration as is consistent with Prudent Utility Practices.

e. Scheduled Deratings and Non-Scheduled Deratings may affect how the Facility responds to the requirements specified in the MTRs. If a Scheduled Derating or a Non-Scheduled Derating may affect compliance with the MTRs, Resource Provider shall ensure that the auto-curtailment implementation of the Facility shall respond to this situation and Resource Provider will indicate the level of curtailment, if any, expected to keep the Facility in full compliance with the MTRs during the Scheduled Derating or the Non-Scheduled Derating in the proforma submitted as a part of the proposed Scheduled Maintenance Program (Procedure III, Appendix III.1) and the proforma submitted as a part of the notice of Non-Scheduled Derating. The curtailed level of capacity will replace the MCC for purposes of compliance monitoring calculations of this Procedure for the duration of the capacity limitation.

f. The following procedure will apply for capacity non-compliance events:

f.1 T&D Operator will provide to Resource Provider a written notification, via email, of the MTRs non-compliance event or events, including the corresponding events data and/or graphs, curtailment level, and non-compliance operational and/or test conditions as follows:

If the MTRs non-compliance event or events are severe, which means an event where the curtailment level is greater than ten percent (10%) of D^{max}, or events where curtailment level is less than or equal to ten percent (10%) of D^{max} but occur daily for two (2) consecutive days, then T&D Operator may apply a curtailment or disconnect the Facility prior to the written notification, and T&D Operator will provide the verbal notification as soon as practical.

Resource Provider will have forty-eighty (48) hours from receipt of T&D Operator's written notification to review the notification and provide a written report to T&D Operator via email that shall include the causes of the Facility non-compliance, proposed corrective actions, and approximate time it will take to bring the Facility back to a compliant state and submit the "**MTRs Non-compliance Report**". Should Resource Provider reasonably require additional time to prepare the MTRs Non-compliance Report, then Resource Provider shall notify T&D Operator within the initial forty-eighty (48) hours of the need for an extension and T&D Operator may provide an extension of up to ninety-six (96) additional hours to provide the written report. The Parties acknowledge that for MTRs non-compliance events (as described above) T&D Operator may apply a curtailment or disconnect the Facility prior to T&D Operator's written notice or Resource Provider's preparation of the MTRs Non-compliance Report.

f.2 If corrective actions are required, Resource Provider will perform the corrective actions, and when completed will provide to T&D Operator a written report "**MTRs Corrective Action Report**" indicating the corrective actions taken, including documentation reasonably required to demonstrate the corrective actions were completed. If no corrective actions are required, for example, due to an incorrect MTRs compliance calculation, Resource Provider will indicate as such in the MTRs Non-compliance Report including documentation reasonably required to support this position. If any curtailment or disconnection had been previously applied for the non-compliance event, T&D Operator shall fully lift the curtailment or disconnection as soon as practical, but in the case that no corrective action is required, in no event more than one hundred and twenty (120) hours from the receipt of the MTRs Corrective Action Report or the MTRs Non-compliance Report.

f.3 If corrective actions are taken, T&D Operator will monitor the Facility for a test period that shall be sufficient to allow the Facility to be exposed to the non-compliance test conditions after the corrective actions are completed. The test period will begin after T&D Operator receipt and evaluation of the MTRs Corrective Action Report and will end after the Facility is exposed to the non-compliance test conditions.

f.3.1 If the Facility fails to comply with the previously failed MTRs under the non-compliance test conditions, the Facility will be curtailed to the Curtailment Level or disconnected. Resource Provider shall provide to T&D Operator a further MTRs Non –compliance Report and procedures 4.9(f.2) through 4.9(f.3) shall be repeated.

f.3.2 If the Facility complies with the previously failed MTRs under the non-compliance test conditions, regular monitoring shall resume.

If, after additional corrective measures are taken, the Facility fails to comply with the previously failed MTRs under the non-compliance test conditions one (1) additional time consecutively (for a total of two (2) consecutive failures),

PREPA may file written notice of default pursuant to Section 16.1(f) (*Definition*) of the Agreement after the third (3rd) failure.

— End of Procedure V. Monitoring and Enforcement of MTRs —

PROCEDURE VI. EMERGENCY COMMUNICATIONS

1.0 Objective

The following Procedure is intended to facilitate the communications between T&D Operator and Resource Provider during Emergency situations.

2.0 Scope of Procedure

The scope of the Procedure describes the following.

- a T&D Operator declared Emergency;
- a Resource Provider declared Emergency;
- guidelines for recovery from a widespread electrical blackout;
- loss of primary and secondary pilot protection at the Interconnection Facilities; and
- disturbance analysis reporting.

3.0 Responsibilities

In accordance with Sections 6 (*Operation of the Facility)* and 7 (*Dispatching & Charging Obligations*) of the Agreement, the Parties agree, for the purposes of emergency communications, that:

a. Resource Provider's personnel will contact the following ECC personnel:

Company	Title	Name	Phone	E-mail
T&D Operator	Principal Shift Engineer	On shift	787-521-5066	
T&D Operator	Generation Shift Engineer	On shift	787-521-5064	

b. T&D Operator Dispatch Center will contact the following Resource Provider's personnel

Company	Title	Name	Phone	E-mail
Resource Provider (primary contact	Plant Manager			
Resource Provider (secondary contact	Operation Manager			

4.0 Procedure

4.1 T&D Operator Declared Emergency

a. Consistent with Section 6.5 (*Emergencies*) of the Agreement, if an Emergency is declared by T&D Operator, T&D Operator's Shift Engineers will take exclusive control of dispatching or charging the Facility for the duration of such Emergency and then shall notify Resource Provider's personnel. Without limiting the generality of the foregoing, T&D Operator's control centers may require Resource Provider's personnel to delay synchronization or raise or lower dispatch of electricity from the Facility to maintain safe and reliable load levels and voltages on the Grid System, which shall in all cases be in accordance with the Facility design, relevant Facility permits and Prudent Utility Practices.

b. T&D Operator will maintain the record for such an Emergency.

c. T&D Operator shall, as soon as practicable after the occurrence of the Emergency, submit to Resource Provider a report describing the causes for such action.

4.2 Resource Provider Declared Emergency

If, for the safeguarding of equipment, plant and/or personnel Resource Provider needs to take equipment and/or plant out of service immediately resulting in a reduction in the discharging or charging of the Facility or an Outage, Resource Provider shall notify the T&D Operator Shift Engineers as soon as possible (prior to the event if possible). Resource Provider shall use best efforts to maintain the net electrical output or charging capabilities of the Facility during such situations but in all cases shall keep T&D Operator informed as to the status of the Emergency. Resource Provider shall, as soon as practicable after the occurrence of the Emergency, submit to T&D Operator a report for the causes for such action.

4.3 Procedures for Recovery from a Local or Widespread Electrical Blackout

a. After a system blackout, which results in a disconnection of the Facility, T&D Operator shall inform Resource Provider with a work order when it can synchronize back to the Grid System, in the manner described in Procedure I.

b. After a system disturbance, resulting in a temporary outage at the Interconnection Point, T&D Operator shall inform Resource Provider with a work order when it can synchronize back to the Grid System, in the manner described in Procedure I.

4.4 Procedure for Recovery from Force Majeure

a. After an event or circumstance of Force Majeure, which results in a shutdown or disconnection of the Facility, T&D Operator may request Resource Provider to provide a technical assessment of the condition of the Facility to interconnect with the Grid System. Resource Provider must include in this technical assessment the findings of the visual inspections, damages, and their respective corrective actions, as well as the electrical testing of the Facility and its equipment as recommended by the manufacturers if requested by T&D Operator. Resource Provider shall submit all this information to T&D Operator for T&D Operator's

evaluation prior to any interconnection authorization of the Facility or notification of availability of the Facility to resuming discharging or charging activities.

b. As soon as practicable after receipt of the information provided by Resource Provider, T&D Operator will authorize the interconnection of the Facility, provided that it is reasonable and safe to do so in accordance with Prudent Utility Practices.

4.5 Interconnection Facilities Loss of Primary and Secondary Protection

Whenever Resource Provider or T&D Operator determines that both primary and secondary pilot protections between the Facility and the Interconnection Point are not operating, the Facility may be disconnected. Resource Provider and T&D Operator shall coordinate promptly and prudently to restore primary and secondary pilot protections in accordance with Prudent Utility Practices. When at least one (1) of either primary or secondary pilot protection has been restored, the Facility will be reconnected in the manner described in Procedure I. Resource Provider is responsible for both, primary and secondary pilot protections, therefore T&D Operator shall not have any liability for this disconnection of the Facility.

4.6 Disturbance Analysis Reporting

a. When an internal incident occurs inside the Facility, including its connection appurtenances, which results in any consequence or disturbance to the Grid System, Resource Provider will provide T&D Operator with verbal details, via phone, of the cause of the event determined from the relay panel (if applicable) within approximately two (2) hours of the start of the event. A disturbance analysis report shall be submitted, via email, by Resource Provider to T&D Operator within twenty-four (24) hours of the aforesaid incident, and if applicable, the report shall include a copy of the sequence of events report downloaded from the relays. Resource Provider shall submit the report using the form set out in Appendix VI.1 of this Procedure. During the next forty-eight (48) hours after the incident occurs, Resource Provider shall make all reasonable efforts to submit a final report including all details of such mentioned incident in a written letter to the T&D Operator Head of the Electric System Operation Division.

b. If the internal disturbance at the Facility results in a discharging loss deviating the grid system frequency by 0.3Hz or more, the requested report shall include the magnitude of the lost discharging, the mechanical or electronical consequences of the abnormal situation, the general findings and the corrective measures taken arising from the incident.

c. If the disturbance results in a forced disconnection of the Facility by T&D Operator from the Grid System, or an accident or any undesired or unexpected result is reflected in the Grid System, Resource Provider's personnel shall analyze the event and submit to T&D Operator a report in respect of such disturbance. The report shall include, but not be limited to, the sequence of the detected events, the interconnection devices operated, all the protections activated (correctly or not) and the consequences arising from the incident.

APPENDIX VI.1 DISTURBANCE ANALYSIS REPORT

The disturbance analysis report shall be used as the basis for reporting disturbances to the Grid System caused by an incident internal to Resource Provider's Facility, as outlined in Paragraph 4.6 of this Procedure.

Resource Provider will obtain and retain any additional data required to support the analysis of the system disturbance by Resource Provider for possible future discussions with T&D Operator.

Incident Reference Number _____

Date of Incident _____

Time of Incident _____

Plant Involved in Incident _____

Pre-Incident Details

System Frequency	System Voltage	Plant Load

Post-Incident Details

System Frequency	System Voltage	Plant Load

Details of Incident _____

_____

Relays Operated _____

_____

Alarms Initiated _____

_____

APPENDIX VI.1 DISTURBANCE ANALYSIS REPORT

Cause of Incident _____

_____

_____

_____

_____

_____

Consequences _____

_____

_____

_____

_____

_____

Corrective Measures _____

_____

_____

_____

_____

Report Submitted By _____

Report Submitted Date: _____ **Time** _____

Additional information to be attached to report as necessary.

— End of Procedure VI. Emergency Communications —

PROCEDURE VII. GENERAL COMMUNICATIONS

Date: MM/DD/YYYY
Rev: X

1.0 Objective

This procedure is intended to facilitate the communications between T&D Operator and Resource Provider pursuant to Section 20 (*Notices*) of the Agreement.

2.0 Method of Day-to-Day Communications

2.1 Written Communications

All written correspondence shall be sent by email or mail depending upon the urgency of the communication.

2.2 Oral Communications

Day-to-day communications will be mainly done by the use of land line phone or cell phone.

2.3 Meetings

Either party can request a meeting at any time considered necessary, to discuss any topic related, among others, to Resource Provider's operations, the Grid System, and accounting issues. Meeting dates, times, and places will be arranged by both Parties. The Party requesting the meeting should provide in advance an agenda of the proposed meeting, responsible for preparing and distributing the meeting notes, and keeping track of any action/open items resulting from the meeting.

— End of Procedure VII. General Communications —

APPENDIX M

TESTING PROTOCOL

I. GENERAL

This Testing Protocol sets out:

a. the testing requirements and acceptance criteria for carrying out the Performance Tests for the Facility;
b. the requirements for annual and return to service tests for the Facility; and
c. the requirements for factory acceptance tests.

Resource Provider shall (i) perform all tests in accordance with this Testing Protocol, utilizing plant personnel qualified to perform the required testing, (ii) review the results of the tests to confirm whether the Resource Provider Interconnection Facilities or remainder of the Facility, as applicable, pass(es) the applicable test, and (iii) provide the results to T&D Operator for review and acceptance.

Resource Provider shall ensure that all tests are performed in a grid-tied configuration and that the equipment configuration during testing is managed in the same way as is expected during commercial operations. Resource Provider shall monitor the Facility using internal instrument transformers, external instrument transformers, and metering functionalities to monitor and record voltages, currents, power disturbances, etc.

In the event of any conflict between the terms and conditions of this Testing Protocol and the Agreement, the terms and conditions of the Agreement shall prevail. Resource Provider acknowledges and agrees that (i) its compliance with this Testing Protocol does not relieve Resource Provider from any liability that it has under the Agreement, and (ii) PREPA shall not be liable to Resource Provider or any other Person by reason of its review or approval of this Testing Protocol and/or the Testing Plan (as defined in Paragraph 1.2 of this Testing Protocol).

II. PERFORMANCE TESTS

1.0 Objective and procedures

1.1 Objective

The objective of the Performance Tests is to verify that (i) the Facility can accept Charge Energy and deliver Discharge Energy and Ancillary Services at the Interconnection Point in accordance with the Operating Characteristics, (ii) the Facility meets the Performance Guarantees, and (iii) the Facility complies with each of the Other Minimum Acceptance Criteria.

1.2 Procedures

Resource Provider shall prepare and provide to T&D Operator a draft testing plan for the Performance Tests, including detailed test procedures and the methodology to meet the required testing, for T&D Operator's review no later than one hundred and eighty (180) Days prior to the Initial Synchronization Date. T&D Operator and Resource Provider shall mutually agree to any adjustments or additions to the draft testing plan for the Performance Tests taking into consideration Prudent Utility Practices and any applicable manufacturer's recommendations, and shall otherwise cooperate to finalize the testing plan for

the Performance Tests within ninety (90) Days after T&D Operator receives the draft performance testing plan from Resource Provider (such finalized testing plan being the "**Testing Plan**").

T&D Operator's approval of the Testing Plan shall not make T&D Operator responsible in any way for any damage to the Facility resulting from the performance by Resource Provider of any Performance Tests in accordance with the Testing Plan.

1.3 Timing for conduct of Performance Tests

1.3.1 Prior to the Commercial Operation Date

Resource Provider shall schedule and complete all required Performance Tests for the Facility. Resource Provider shall use commercially reasonable efforts to undertake such activities in sufficient time to achieve the Commercial Operation Date by the Guaranteed Commercial Operation Date and T&D Operator will reasonably cooperate with Resource Provider to meet such deadline.

Resource Provider shall provide T&D Operator reasonable prior notice (and, in any event, at least thirty (30) Days before) of Resource Provider's testing schedule to complete the Performance Tests and shall allow T&D Operator representatives to witness all Performance Tests. Resource Provider shall coordinate with T&D Operator to determine the desired start date for the Performance Tests and to ensure that the performance of the Performance Tests does not interfere with the Grid System. Resource Provider shall perform the Performance Tests under this Testing Protocol in accordance with the Testing Plan and shall demonstrate that the Facility meets the MTRs during such testing.

1.3.2 After the Commercial Operation Date

After the Commercial Operation Date:

a. during each Agreement Year of the Supply Period, PREPA may request Resource Provider to perform up to one (1) PREPA Performance Tests in accordance with Section 6.9(a) (*Supply Period Performance Tests*); and

b. Resource Provider may request to perform an additional Performance Test in accordance with Section 6.9(d) (*Supply Period Performance Tests*) of the Agreement.

1.4 Testing of the Interconnection Facilities

In respect of the commissioning and testing of the Interconnection Facilities:

a. T&D Operator shall test and commission the PREPA Interconnection Facilities in accordance with a separate testing and commissioning agreement to be entered into between T&D Operator and Resource Provider; and

b. Resource Provider shall test and commission the Resource Provider Interconnection Facilities in accordance with Paragraph 2 of this Testing Protocol.

2.0 Performance Tests

2.1 Overview

Prior to commencing any Performance Tests and prior to connection to the Interconnection Point, Resource Provider shall provide to T&D Operator a pre-inspection checklist that includes but is not limited to the following:

a. A requirement for all personnel to wear proper Personnel Protective Equipment (PPE) at all times during any testing or while on site at the Facility. The PPE requirements shall be based on the latest ARC flash study.

b. Verification that all protection equipment, controls, and relaying are loaded with proper settings.

c. Verification of proper stenciling of equipment as compared to IFC schematics and wiring diagrams.

d. Verification that safety grounds have been removed prior to energization.

e. Confirmation that a safety walkdown and job brief has been performed.

The Performance Tests include but are not limited to the following:

2.1.1 Voltage Regulation System (VRS) Tests

Resource Provider shall test and verify that the Facility complies with the VRS requirements in the MTRs as follows:

a. Resource Provider shall test the steady state voltage regulation accuracy of +/- 0.5% of the controlled voltage at the Interconnection Point at zero percent (0%) voltage droop and at twenty percent (20%) of the maximum AC active power capacity.

b. Resource Provider shall test the Facility VRS time response with an output power of one hundred percent (100%) or lower of the maximum AC active power capacity. Resource Provider shall calibrate the VRS such that a change in reactive power will achieve ninety-five percent (95%) of its final value no later than one (1) second following a step change in voltage. For the purposes of this test, the time response means the period from the time that the reference voltage set point is received at the plant controller until the reactive power generated by the Facility at the Interconnection Point reaches ninety-five percent (95%) of its final value. Resource Provider shall test the time response of the Facility VRS by changing the reference voltage at the plant controller. Resource Provider shall perform changes to the reference voltage at two (2) levels of generation, high (>85% of the AC contracted capacity measured at the Interconnection Point) and low (< 30% of the AC contracted capacity measured at the Interconnection Point). The reference voltage changes tested shall include at least:

b.1 1.05 pu to 0.95 pu

b.2 0.95 pu to 1.05 pu

b.3 Neutral Reactive Power Bus Voltage (NBV) to NBV + (0.5% or 1%)

b.4 Neutral Reactive Power Bus Voltage (NBV) to NBV – (0.5% or 1%)

The neutral reactive power bus voltage (NBV) is defined as the voltage at the Interconnection Point when the Facility is connected to the Grid System, energized, but not generating reactive power. Resource Provider shall define the voltage for each of the two (2) levels of generation described above and shall coordinated and agree on the proposed voltage with T&D Operator.

Resource Provider shall perform the abovementioned reference voltage changes with at least the following voltage droops and taking into account the two (2) generation levels (low and high): 0%, 1%, 2.5%, 5%, 7.5% and 10%.

c. The evaluation criteria for the VRS tests are:

c.1 Voltage error less than 0.5% of the *set point* at the Interconnection Point for voltage droop of 0%.

c.2 VRS time response less than or equal to 1 second for all cases.

c.3 Voltage overshoot lower than 1% of final voltage at the Interconnection Point for all cases.

c.4 VRS deadband does not exceed 0.1%.

VRS comparative droop results shall be presented as follows:

c.5 a comparative graph of the voltage at the Interconnection Point for all the droop cases versus the same reference voltage change; and

c.6 a comparative graph of the reactive power response at the Interconnection Point for all the droop cases versus the same reference voltage change.

2.1.2 Reactive Power Capability & Minimum Power Factor Requirements Tests

Resource Provider shall test and verify that the Facility complies with the Reactive Power Capability and Minimum Power Factor requirements in the MTRs. Resource Provider shall perform the Reactive Power Capability and Minimum Power Factor Requirement test at a power output of less than or equal to one hundred percent (100%). Resource Provider shall test the reactive power capability of the Facility to establish that the Facility complies with the reactive power capability curve described and required in the MTRs. The total power factor range shall be from 0.85 lagging to 0.85 leading at the Interconnection Point. The +/- 0.85 power factor range should be dynamic and continuous at the Interconnection Point and throughout the voltage regulation range. During the test, Resource Provider shall configure the Facility to import or export the required reactive power per the reactive power capability curve in the MTRs. The active power output range of the Facility for this test shall cover twenty percent (20%) to one hundred percent (100%) of the maximum AC active power capacity.

2.1.3 Frequency Response and Regulation Tests

Resource Provider shall demonstrate the capability of the Facility to comply with the MTRs for frequency response and regulation as follows.

a. Resource Provider shall evaluate the frequency response of the Facility at the Interconnection Point. Resource Provider shall perform part of the frequency response (FR) tests at twenty percent (20%) output power. These tests shall include at least two (2) frequency change rate

profiles, one (1) profile with a change rate of 10 Hz/min and the other of 1 Hz/min. Both profiles shall include a complete frequency scan that cover under and over frequencies from a minimum of 59.5 Hz to a maximum of 60.5 Hz. Resource Provider may obtain these profiles by simulating the grid frequency in the Facility's frequency control. Resource Provider shall ensure that the Facility's frequency control shall command the corresponding power output based in the configured frequency response droop and taking into account the frequency dead band. The frequency response of the Facility should start after the dead band. Resource Provider shall calculate the magnitude value of the frequency response based on Appendix L (*Operating Procedures*). Resource Provider shall not base the value of the response solely on the difference between 60 Hz and the frequency deviation, to avoid a jump or discontinuity in the response. If the full magnitude of the frequency response is required, the time response shall be less than one (1) second. The frequency response tests of the Facility must include two (2) plant active power output levels. The active power output levels must be above ninety percent (90%) and below twenty percent (20%) of the maximum AC active power capacity. Resource Provider shall perform these in the following stages: (1) ramp rate control activated; and (2) ramp rate control deactivated. Resource Provider shall demonstrate that the Facility can meet the frequency response requirement independently of the ramp rate control requirement (decoupled). Resource Provider shall conduct a complete test for a two (2) Days period where the frequency response of the Facility is evaluated due to actual grid frequency variations.

b. Resource Provider shall test the Facility to ensure that it is capable of frequency response with the specified three percent (3%) to five percent (5%) droop range, and the control is configurable from three percent (3%) to five percent (5%) in steps of zero point five percent (0.5%), over the operational range of ten percent (10%) to one hundred and ten percent (110%) of the maximum AC active power capacity.

c. Resource Provider shall demonstrate the capability of the Facility to assume responsibility for upward frequency events.

2.1.4 Ramp Rate Control Tests

Resource Provider shall demonstrate the functional capability of the Facility to comply with the MTRs with respect to ramp rate control (RRC) as follows:

a. Resource Provider shall demonstrate the Facility's capability to comply with the AC contracted capacity for at least one (1) minute.

b. Resource Provider shall demonstrate the Facility's capability to comply with the ramp rate control requirement while it is connected to the grid. This testing shall be for a period of four (4) Days if during this period of time at least five (5) ramp events result in a power drop greater than thirty percent (30%) of the maximum AC active power capacity in less than one (1) minute. During two (2) of these four (4) Days during the test period, Resource Provider shall enable the frequency response control to verify that the Facility can comply simultaneously with both requirements without any interference. Resource Provider shall decouple the Ramp Rate Control and the Frequency Response Control, continuously in operation and Resource Provider shall demonstrate that the Facility shall be able to comply simultaneously with both requirements. If during the four (4) Days test period the Facility required five (5) ramp events do not occur, the test will be extended for the number of Days necessary until all five (5) ramp events have occurred, provided that if the five (5) ramp events do not occur, but the evaluation during the testing period demonstrates that the Facility is in compliance with the ramp rate control requirement presented in the MTRs for a period of ten (10) consecutive Days, then the

Facility's compliance with the Ramp Rate Control requirement will be deemed to be achieved. Resource Provider shall perform this part of the Ramp Rate Control test with an output power of one hundred percent (100%), and shall also perform a two (2) Day period of similar tests with an output power of fifty percent (50%) of the of the maximum AC active power capacity.

2.1.5 Curtailment Test

Resource Provider shall perform active power curtailment tests demonstrating the capability of the Facility to respond to curtailment signals from T&D Operator in compliance with the MTRs and shall ensure that the Facility plant controller accepts external active power setpoints from T&D Operator. T&D Operator shall use two (2) types of curtailment commands, direct active power set value (MW) and percentage (%) value, and at least the following curtailment percentage values (and the analog MW direct values): 20%, 40%, 60% and 80%. Resource Provider shall coordinate with T&D Operator for the performance of this test. Resource Provider shall perform this test with an output power at or near one hundred percent (100%) of the maximum AC active power capacity.

2.1.6 Auto-Curtailment Test

Resource Provider shall submit a complete and detailed description of the auto-curtailment strategy to be implemented in the Facility to T&D Operator for evaluation at least one hundred and twenty (120) Days before the beginning of the test. Resource Provider shall test and verify the auto-curtailment strategy implemented in the Facility. As a minimum, the conditions to apply auto-curtailment specified in the MTRs shall be tested. The test results documentation shall be submitted by Resource Provider to T&D Operator for evaluation. Resource Provider shall perform the auto-curtailment tests in the Facility with output power of 100% of the maximum AC active power capacity.

2.1.7 Power Quality Test

Resource Provider shall test and analyze the power quality at the Interconnection Point. At a minimum, Resource Provider shall evaluate the parameters at the Interconnection Point according to the applicable standards as specified in the MTRs: total harmonic distortion (voltage and current measurements for each phase), total demand distortion (current and voltage measurements for each phase), individual harmonic distortion (voltage and current measurements), individual demand distortion (voltage and current measurements), voltage flicker in the short term, voltage flicker in the long term, and voltage and current unbalance (%). Resource Provider shall perform the power quality tests with an output power of one hundred percent (100%) of the maximum AC active power capacity.

2.1.8 Power Management Test

Resource Provider shall test the communication technology and the corresponding control equipment to comply with the power management requirements (ramp rate limits, output limits, curtailment) as established in the MTRs and to demonstrate that all components and sub-components are operating in harmony. Resource Provider shall verify the communication system is sending and receiving data with T&D Operator Operations Control Center as intended. Resource Provider shall evaluate the baseline measurements (voltage, current, temperature, frequency, energy storage capacity, charge time, discharge time) and power management requirements and check for anomalies. Resource Provider shall implement, verify and test any special protection schemes established by T&D Operator for power management.

2.1.9 System Startup Test

a. The objective of the system start-up test is to demonstrate the start sequence of all Power Units (PU).

b. Resource Provider shall perform the system start-up test on each individual PU until the overall BESS is started. A PU is a combination of a single Power Conversion System (PCS) with associated battery and control system. The PCS is a bi-directional grid connected power converter and includes the inverter and the step-up transformer.

c. To perform the system start-up test, Resource Provider shall:

c.1 verify on the Human Machine Interface (HMI) that all the PCS inverters' s AC output terminals are energized, and the voltage values are per the nameplate. (e.g. 480 V AC);

c.2 verify on the HMI that all the PCS inverter's DC input terminals are energized, and voltage values are per technical specifications (e.g. 845-1096 V DC) depending on battery State of Charge;

c.3 verify that all PCS Operational State are "Off", as read on the HMI;

c.4 from the central BESS control (site plant controller) or local PCS controller (as applicable), set zero (0) real / reactive power setpoints and send a "Start/Run" command to start each PCS and the overall site BESS; and

c.5 verify that all PCS's start with no errors as appropriately demonstrated on the HMI.

NOTE: A Human Machine Interface (HMI) is used to visualize the system performance, status and can be used as the Graphic User Interface (GUI) to send control commands.

2.1.10 System Shutdown Test

a. The objective of the system shutdown test is to demonstrate the shutdown sequence.

b. Resource Provider shall perform the system shut-down test on each individual PU and the overall BESS.

c. To perform the system shut-down test, Resource Provider shall:

c.1 verify all PUs are running as appropriately demonstrated on the HMI;

c.2 initiate the stop or shutdown function from the central BESS control (site plant controller) or local PCS controller (as applicable) and observe that all PU performs the shutdown with no errors; and

c.3 verify all PUs shall be in "Stop/Off/Offline" state on the HMI.

2.1.11 Emergency Shutdown and Restart Test

a. The objective of the emergency shutdown and restart test is to demonstrate the emergency shutdown and restart sequence.

b. Resource Provider shall perform the emergency shutdown and restart test on each individual PU and the overall BESS.

c. To perform the emergency shutdown and restart test, Resource Provider shall:

c.1 verify each PU is running as appropriately demonstrated on the HMI;

c.2 stop the PU by pushing the emergency stop button;

c.3 verify the PU stops immediately, and the PU main AC and DC contactors are opened, all PU are in a fault state as demonstrated on the HMI;

c.4 verify that the system has stopped;

c.5 manually reset stop button(s) and reset the system fault from the HMI;

c.6 start the PU and verify that that all PCS's start with no errors as appropriately demonstrated on the HMI; and

c.7 repeat the test for the overall BESS with an emergency stop command/button from the BESS control (site plant controller).

2.1.12 Battery Metering and Monitoring System Verification

a. The objective of the battery metering and monitoring system verification is to verify metering and monitoring system on BESS Graphical Web User Interface.

b. Resource Provider shall perform battery metering and monitoring system verification on each individual PU and the overall BESS.

c. To perform the battery metering and monitoring system verification, Resource Provider shall:

c.1 verify battery current readings are present and refreshing on the HMI; and

c.2 verify battery temperatures readings are present and refreshing on the HMI.

2.1.13 Battery Enclosure Unit Smoke Detection Test

a. Resource Provider shall demonstrate that the smoke detection circuit operates correctly and shuts down the PCS units when smoke is introduced in the enclosure. During this test, Resource Provider will ensure that if there is any fire suppression agent, it will not be activated during the test and will be temporarily disconnected from the firing pin assembly. After the test, Resource Provider will ensure that the fire suppression agent tank is reconnected for normal operations.

b. Resource Provider shall propose the detailed procedures for this test in the draft testing plan to be delivered in accordance with Paragraph 1.2 of this Testing Protocol.

2.1.14 Remote Power Setpoint Tracking

a. The objective of the remote power setpoint tracking test is to demonstrate the capability of the BESS to follow remote active and reactive power setpoints from the central BESS control (site plant controller).

b. Resource Provider shall perform the remote power setpoint tracking test for the overall BESS.

c. To perform the remote power setpoint tracking test, Resource Provider shall:

c.1 verify the BESS is running as demonstrated in the HMI with a "Run/On" status;

c.2 set the central control system state to manual mode via user interface;

c.3 send active power command values +/-100%, +/-50%, +/-25%, 0% of the nameplate MW to manual active power input;

c.4 write reactive power values -+/-100%, +/-50%, +/-25%, 0% of the nameplate MVAR to manual reactive power input; and

c.5 record power levels as measured by reference meter and displayed on the HMI.

2.1.15 Discharge Capacity Test

a. The objective of the discharge capacity test is to demonstrate the BESS discharge capacity.

b. Resource Provider shall perform the discharge capacity test for the overall BESS to demonstrate that the BESS is able to achieve positive fifty percent (50%) of the BESS's nameplate active power (e.g. +50 MW out of 100 MW) of positive output within one (1) second and hold for ten (10) minutes (this capability is representative of the maximum active power levels).

c. To perform the discharge capacity test, Resource Provider shall:

c.1 ensure that the BESS starting state shall be in the on-line state with each battery subsystem at approximately fifty percent (50%) usable SOC and at an initial active power level of zero (0) MW and reactive power level of zero (0) MVAR;

c.2 record the BESS active power level at the Interconnection Point;

c.3 command the BESS to follow a positive fifty percent (50%) of nameplate MW (e.g. +50 MW) SCADA signal and provide an active power profile;

c.4 record and store the BESS active power response, ensuring that all measurements are made at the same meter and by the BESS control system with a recording in the BESS historian (if applicable);

c.5 ensure that the BESS system end state shall be in the on-line state and at a commanded active power level of zero (0) MW; and

c.6 demonstrate that the difference between the BESS active power response and the commanded level is no less than ±3% as measured by the sum of values at the meter, the time to full output is one (1) second or less, and the hold period of such active power value is no less than ten (10) minutes as recorded in the BESS control system historian.

2.1.16 Maximum Capacity Test

a. The objective of the maximum capacity test is to demonstrate the maximum quantity of steady-state power capacity (in MW) that the BESS can continuously deliver.

b. Resource Provider shall perform the discharge capacity test for the overall BESS to demonstrate that the BESS can continuously deliver D^{max}.

c. Resource Provider shall perform the maximum capacity test as follow:

c.1 discharge the BESS at D^{max};

c.2 continue the discharge operation to reduce the State of Charge from one hundred percent (100%) to zero percent (0%); and

c.3 record the BESS active power level at the Interconnection Point for the duration of the maximum capacity test.

2.1.17 Design Discharge Duration Test

a. The objective of the Design Discharge Duration test is to demonstrate the period of time that the Facility can deliver Discharge Energy at D^{max}.

b. Resource Provider shall perform the Design Discharge Duration test to demonstrate that the period of time that the Facility can deliver Discharge Energy at D^{max} is equal to or greater than the Design Discharge Duration.

c. To perform the Design Discharge Duration test, Resource Provider shall record the period of time required by Resource Provider to reduce the State of Charge of the BESS from one hundred percent (100%) to zero percent (0%) when discharging at D^{max}.

2.1.18 Discharge Energy Test

a. The objective of the Discharge Energy test is to demonstrate the quantity (expressed in MWh) of Discharge Energy that the Facility discharges when discharging at D^{max} over the Design D^{max} Duration following charging starting at zero percent (0%) State of Charge.

b. Resource Provider shall perform the Discharge Energy test to demonstrate that the Tested Duration Energy is equal to or exceeds the Degraded Duration Energy.

c. To perform the Discharge Energy test, Resource Provider shall:

c.1 command the BESS to charge from zero percent (0%) State of Charge to one hundred percent (100%) State of Charge over the Design Charge Duration;

c.2 command the BESS to discharge Discharge Energy at D^{max} for the Design Discharge Duration until the BESS reaches zero percent (0%) State of Charge; and

c.3 record the quantity (expressed in MWh) of Discharge Energy that the BESS makes available when discharging at D^{max} over the Design Discharge Duration following charging from zero percent (0%) State of Charge to one hundred percent (100%) State of Charge.

2.1.19 Charge Capacity Test

a. The objective of the charge capacity test is to demonstrate the BESS charge capacity.

b. Resource Provider shall perform the charge capacity test to demonstrate that the Facility is able achieve negative fifty percent (50%) of the BESS's nameplate active power (e.g. -50 MW out of 100 MW) of output within one (1) second and hold for ten (10) minutes (this capability is representative of the maximum active power levels).

c. To perform the charge capacity test, Resource Provider shall:

c.1 ensure that the BESS system starting state shall be in the on-line state with each battery subsystem at approximately fifty (50%) usable SOC and at an initial active power level of zero (0) MW and reactive power level of zero (0) MVAR;

c.2 record the BESS active power level at the Interconnection Point;

c.3 command the BESS to follow a negative fifty (50%) of nameplate MW (e.g. -50 MW) SCADA signal and provide an active power profile;

c.4 record and store the BESS active power response, ensuring that measurements are made at the same meter and by the BESS control system with a recording in the BESS historian (if applicable);

c.5 ensure that the BESS system end state shall be in the on-line state and at a commanded active power level of zero (0) MW;

c.6 demonstrate that the difference between the BESS active power response and the commanded level is no less than ±3% as measured at the meter, the time to full output is one (1) second or less, and the hold period of such active power value is no less than ten (10) minutes as recorded in the BESS control system historian.

2.1.20 Charge Duration Test

a. The objective of the Charge Duration test is to demonstrate the period of time required by Resource Provider to increase the State of Charge of the BESS from zero percent (0%) to one hundred percent (100%) when charging at C^{max}.

b. Resource Provider shall perform the Charge Duration test to demonstrate that the period of time required by Resource Provider to increase the State of Charge of the BESS from zero percent (0%) to one hundred percent (100%) when charging at C^{max} is equal to or less than the Design Charge Duration.

c. To perform the Charge Duration test, Resource Provider shall:

c.1 command the BESS to charge from zero percent (0%) State of Charge to one hundred percent (100%) State of Charge; and

c.2 record the period of time required to increase the State of Charge of the BESS from zero percent (0%) to one hundred percent (100%) when charging at the maximum charging capacity of the Facility.

2.1.21 Reactive Power Test

a. The objective of the reactive power test is to demonstrate the BESS reactive power production capability at the system starting state and to document the status at the end state.

b. Resource Provider shall perform the reactive power test.

c. To perform the reactive power test, Resource Provider shall:

c.1 ensure that the BESS starting state shall be in the on-line state with each battery system at approximately fifty percent (50%) usable SOC and at an initial active power level of zero (0) MW and reactive power level of zero (0) MVAR;

c.2 ensure that the BESS control system is configured to follow a predefined reactive power profile as indicated in (c) though (f) below;

c.3 command the BESS to follow >20% MVAR absorbing for ten (10) minutes;

c.4 command the BESS to follow >20% MVAR injecting for ten (10) minutes;

c.5 record and store the BESS reactive power response, ensuring that measurements are made at the same meter and by the BESS control system with recording in the BESS historian;

c.6 demonstrate that the BESS reactive power response and the commanded level is within ±3% as measured by the sum of values at the meter, the time to full output is one (1) second or less, and the hold period of such reactive power value is no less than ten (10) minutes as recorded in the BESS control system historian;

c.7 ensure that the BESS end state shall be in the on-line state and at a commanded reactive power level of zero (0) MVAR; and

c.8 record the BESS reactive power level at the Interconnection Point.

2.1.22 Round-Trip Efficiency and Energy Test

a. The objective of the round trip efficiency and energy test is to demonstrate the BESS installed energy and installed round-trip efficiency.

b. Resource Provider shall perform the round trip efficiency and energy test.

c. Resource Provider shall operate the BESS in both the charge and discharge directions in the following order:

c.1 Set each battery subsystem to three percent (3%) SOC.

c.2 Allow each battery subsystem to enter background cell balancing mode by maintaining a SOC of three percent (3%) for twenty (20) minutes. After the background cell balancing mode begins the system can be operated as normal. Allow the cell balancing function to operate in the background for at least twenty-four (24) hours to allow the automatic cell balancing procedure to reach completion. This time may be reduced based on the suppliers' recommendations.

c.3 Discharge each battery subsystem to zero percent (0%) SOC.

c.4 Immediately perform the round-trip efficiency and capacity test set forth below.

c.5 To be valid, the test must be started within twenty-four (24) hours of the end of the period (greater than four (4) Days) during which cell balancing was completed. For the duration of the test, Resource Provider shall configure the control system to have the power limiting mechanisms disabled and shall configure each battery subsystem to follow the charge and discharge current limits specified by their respective Battery Management System (BMS).

d. To perform the round trip efficiency and energy test, Resource Provider shall:

d.1 ensure that the BESS is in the on-line state with each battery Subsystem at zero percent (0%) SOC;

d.2 verify that in the previous twenty-four (24) hour period, each battery subsystem completed the cell balancing procedure allowing full cell balancing to occur, as described item C above;

d.3 verify that ambient temperature measurements at all battery subsystems are between the recommended temperatures by the supplier throughout this test (e.g. 18 °C and 28 °C);

d.4 record initial values of each battery subsystem SOC;

d.5 command a real power charge that results in an AC power of the BESS's minimum operating level and continue the charge until the power is 2% different than the minimum operating level;

d.6 record and store the AC energy charged to the system as measured at the Interconnection Point, ensuring that measurements are made by the meter with recording in the BESS historian;

d.7 within five (5) minutes of fully charging the BESS, command a real power discharge that results in an AC power output of the BESS's maximum operating level.

d.8 maintain the discharging state until the power is two percent (2%) different than the maximum operating level; and

d.9 record and store the AC energy discharged as measured at the meter. Measurements will be made by the meter with recording in the BESS historian.

e. The resulting round-trip efficiency is the total discharged energy divided by the total charged energy at the Interconnection Point.

f. The energy capacity is the sum of the total discharged energy at the Interconnection Point.

g. Resource Provider shall demonstrate that:

g.1 the measured round-trip efficiency is equal to or greater than the round-trip efficiency guaranteed by Resource Provider; and

g.2 the energy capacity is equal to or greater than the energy capacity guaranteed by Resource Provider.

2.1.23 Automatic Generation Control (AGC) Test

a. The objective of the automatic generation control AGC test is to demonstrate the capability of the Facility to achieve the BESS's maximum operating level within one (1) second, which is representative of the maximum active power levels for T&D Operator Energy Control Center (ECC) services.

b. T&D Operator and Resource Provider shall coordinate to conduct the AGC test, and T&D Operator will initiate the AGC test from the ECC.

c. To perform the AGC test, Resource Provider shall:

c.1 ensure that the BESS is in the on-line state with each battery subsystem at fifty percent (50%) usable SOC and at an initial active power level of zero (0) MW and reactive power level of zero (0) MVAR and the control system is configured to follow a predefined active power profile as described below;

c.2 record the BESS active power level at the Interconnection Point;

c.3 command the BESS to follow a simulated ECC signal of +50% of the nameplate capacity (e.g. +50 MW of 100 MW) for ten (10) minutes;

c.4 command the BESS to follow a simulated ECC signal of -50% of the nameplate capacity (e.g. -50 MW of 100 MW) for ten (10) minutes;

c.5 record and store the BESS active power response. Measurements will be made at the same meter and by the control system with recording in the BESS historian;

c.6 the BESS end state shall be in the on-line state and at a commanded active power level of zero (0) MW; and

c.7 ensure that the BESS active power response and the commanded level (e.g. +50 MW) is within ±2% as measured by the sum of values at the meter, the time to full output is one (1) second or less, and the hold period of such active power value shall be no less than ten (10) minutes as recorded in the BESS control system historian.

2.1.24 Internal Tests

a. The internal tests are the tests that Resource Provider is required to perform in coordination with T&D Operator to demonstrate the adequate performance of the Facility based on the design and the requirements in the MTRs. The internal tests include equipment initial energization, the Original Equipment Manufacturer (OEM) onsite testing and commissioning of the Facility equipment (batteries, inverters, PCS, communication, protection, SCADA, etc.), protection system tests, internal and external communication tests, control system tests, SCADA system and signal verification tests, and the MTRs tests. The OEM tests shall include visual inspection, standard tests of the electrical infrastructure and inspection of BESS, switchgear, transformer, and SCADA. Resource Provider shall provide the corresponding documentation of the internal tests to T&D Operator.

b. Resource Provider shall test the communication to T&D Operator's SCADA system and its corresponding signals prior to the synchronization of the Facility to the grid. Resource Provider shall install, commission and set-up a Dynamic System Monitor (DSM) with all the required signals available before performing any internal test that requires power output.

c. In addition, for the internal tests, Resource Provider shall develop a test plan with detailed procedures for the pre-commissioning, functional, energization and operational testing, which shall include the mechanical and electrical tests by NETA for the following non-inclusive list of equipment:

c.1 complete BESS per OEM recommendations and checklists;

c.2 High Voltage and Medium Voltage Equipment (disconnect switches, circuit breakers, reclosers, switchgear, transformers, cable, etc.): insulation and contact resistant, continuity, very low frequency testing, relaying, wiring, trip checks, turns ratio, voltage, phase rotation and operation;

c.3 Low Voltage Equipment (switchgear, distribution panels, switches, ATS, motors, battery chargers, controllers, transformers, control/power wires, etc.): insulation and contact resistant, continuity, very low frequency testing, relaying, wiring, trip checks, turns ratio, voltage, winding resistance, full load current, settings, and operation; and

c.4 grounding systems (BESS, substation, collector system): fall of potential, resistance, and continuity.

2.1.25 BESS Fire and Safety Tests

a. Resource Provider shall test the BESS compliance to the local fire and safety codes related to batteries in enclosures. Resource Provider shall provide site specific documentation if required by T&D Operator. Resource Provider shall ensure that testing and certification at the equipment manufacturing facilities is also completed or, if such tests cannot be done at the equipment manufacturing facilities, Resource Provider may be required to have the BESS field certified at the project site.

b. Resource Provider shall test the BESS to ensure proper functioning of the fire detection, fire protection or fire prevention mechanisms, shutdown mechanisms, smoke detection, safety functions, annunciation, emergency egress, physical enclosure security, and cyber security functions.

c. Resource Provider shall ensure that UL 9540A testing and certification shall be conducted to the 4th Edition of the standard and shall include tests of the proposed battery at the cell, module, and rack or system level. Resource Provider shall provide the full test report to T&D Operator for review, including the UL 9540A gas analysis report.

d. T&D Operator reserves the right to perform a third-party test at Resource Provider's expense to validate the OEM or Supplier's testing data. If any discrepancies in the testing data arise, T&D Operator's testing data shall supersede all other testing data used in the BESS project design.

III. ANNUAL & RETURN TO SERVICE TESTS

1.0 Overview

The objective of the annual tests is to verify, on an annual basis, the Facility's capability to comply with the MTRs. Resource Provider shall perform the tests within thirty (30) Days of the established annual testing date and provide a report to T&D Operator with the test results and reasonable supporting documentation within forty-five (45) Days of the conduct of the test.

The purpose of the return to service tests is to ensure the proper functioning of the Facility after any repair or modification of the Facility that may affect its compliance with the MTRs or the Agreement. If Resource Provider repairs or modifies the Facility in any way that might affect its compliance with the MTRs or the Agreement, Resource Provider shall perform the appropriate annual tests as soon as the new equipment is installed or any repair/improvements are completed and prior to returning the Facility to service.

Resource Provider will identify and analyze critical parameters over time to assess the system and equipment performance, degradation, and overall health of the Facility. If performance of the Facility deviates from acceptable norms or does not meet the acceptance criteria, prompt preventive and/or corrective actions shall be planned and conducted to repair or service the system, equipment, or structures and, where trend data shows, degrading performance or condition, Resource Provider will take actions to prevent failures that can potentially result in Non-Scheduled Outages or Non-Scheduled Deratings.

2.0 Annual & Return to service Tests

Prior to commencement of the annual tests, Resource Provider shall provide a pre-inspection checklist to T&D Operator that includes but is not limited to the following:

a. A requirement for all personnel to wear proper Personnel Protective Equipment (PPE) at all times during any testing or while on site at the Facility. The PPE requirements shall be based on the latest ARC flash study.

b. Verification that all protection equipment, controls, and relaying are loaded with proper settings.

c. Verification of proper stenciling of equipment as compared to IFC schematics and wiring diagrams.

d. Verification that safety grounds have been removed prior to energization.

e. Confirmation that a safety walkdown and job brief has been performed.

Resource Provider shall perform the following tests annually and as required prior to returning the Facility to service:

a. Voltage Regulation System (VRS) Test – Resource Provider shall test and verify the Facility's compliance with the VRS requirements in the MTRs. Details of the expected tests are set out in Paragraph 2.1.2 of this Testing Protocol.

b. Reactive Power Capability Test – Resource Provider shall test and verify the Facility's compliance with the Reactive Power Capability requirements in the MTRs. Details of the

expected tests are set out in Paragraph 2.1.3 of Testing Protocol. If the required active power output range of the Facility for this test is not reached, Resource Provider shall repeat the test, and T&D Operator shall curtail the Facility output to the active power tested.

c. Frequency Response and Regulation Test – Resource Provider shall test and verify the Facility's compliance with the Frequency Response requirements in the MTRs. Resource Provider shall demonstrate the capability of the Facility to comply with the MTRs for frequency response and regulation. Details of the expected tests are set out in Paragraph 2.1.4 of this Testing Protocol.

d. Ramp Rate Control Tests – Resource Provider shall test and verify the Facility's compliance with the Ramp Rate Control requirements in the MTRs. Resource Provider shall demonstrate the capability of the Facility to comply with the MTRs for Ramp Rate Control. Details of the expected tests are set out in Paragraph 2.1.5 of this Testing Protocol.

e. Power Quality – Resource Provider shall test and verify the Facility's compliance with the power management requirements in the MTRs. Details of the expected tests are set out in Paragraph 2.1.8 of this Testing Protocol.

f. Round Trip Efficiency – Resource Provider shall test and verify the qualified/available energy and qualified round trip efficiency of the Facility. Details of the expected tests are set out in Paragraph 2.1.22 of this Testing Protocol.

g. Charge and Discharge Capacity Tests – Resource Provider shall perform both charge and discharge tests to measure the available discharge and charge capacity and discharge and charge duration. Details of the expected tests are set out in Paragraphs 2.1.15, 2.1.16, 2.1.17, 2.1.18, 2.1.19 and 2.1.20 of this Testing Protocol.

h. Infrared thermography inspections of the Interconnection Facilities – Resource Provider shall perform an infrared thermography preventive inspection of the Interconnection Facilities and related equipment and structures.

3.0 Periodic Testing

In accordance with Section 6 (Operation of the Facility) of the Agreement, at T&D Operator's request, Resource Provider shall provide certifications of tests and inspections of the electric and protection equipment, which may impact the Grid System. T&D Operator shall have the right to visit and visually monitor Resource Provider's site during operation and testing.

IV. FACTORY ACCEPTANCE TESTS

Resource Provider shall provide to T&D Operator the major equipment manufacturer's formal test result report and official documentation of the Factory Acceptance Test (FAT) to demonstrate equipment performance, including to the MTRs, ESSA tests, design or type tests and factory routine tests. The major equipment includes BESS, MV/LV cable, inverters, switchgear, transformers, circuit breakers, disconnect switches, BESS, reactive power compensation equipment.

Resource Provider may satisfy design capability tests which comply with industry standards (IEEE 1547, IEEE P2800, UL 1741, UL 1642, UL 9540A, UL 1973, NFPA 855) by submission of the proper certification conforming to Section 6.9(b) (Supply Period Performance Tests) of the Agreement. This is applicable to U/O VRT, FR, anti-islanding, single-phasing, and three-phase

testing. However, T&D Operator reserves the right to require Resource Provider to test on-site the anti-islanding, single-phasing, and three-phase trip capabilities of the Facility.

Resource Provider shall submit to T&D Operator the test results report and official documentation at least ninety (90) Days prior to the Facility commissioning test.

T&D Operator reserves the right to witness virtually or in person the FAT of any of the major equipment at the manufacturers' facilities. Resource Provider and T&D Operator shall coordinate the schedule to witness an FAT ahead of its execution. Resource Provider shall submit to T&D Operator the tentative dates for the FAT at the start of project development.

Additionally, Resource Provider shall provide documentation (including the corresponding manufacture's official test reports per Section 6.9(b) (Supply Period Performance Tests) of the Agreement)) from the battery and power conversion equipment manufacturers that demonstrates or certifies the batteries, power conversion equipment's and overall BESS compliance with low voltage ride-through (LVRT), over voltage ride-through (OVRT), and frequency ride through (FRT) specifications of the MTRs in Appendix K (Minimum Technical Requirements) of the Agreement and consistent with the Operating Procedures in Appendix L (Operating Procedures) of the Agreement. Resource Provider shall demonstrate compliance with the LVRT curve and the OVRT curve described in the MTRs during the commissioning tests. The LVRT tests shall include the verification and compliance testing of the reactive current injection mode during a fault. Resource Provider shall demonstrate that the disconnection times satisfy the frequency thresholds defined in the MTRs during the frequency ride through tests and frequency ride through testing on one (1) BESS to be specifically installed at the Facility. If a BESS is used in tandem to comply with the MTRs, Resource Provider shall procure that the BESS power conversion equipment manufacturer and the BESS manufacturer determine the parameters and assumptions for the manufacturer testing. Resource Provider shall procure that the equipment manufacturers utilize loss assumptions consistent with the expected conditions at the Facility.

APPENDIX N

TECHNICAL SPECIFICATIONS FOR THE DYNAMIC SYSTEM MONITOR

I. Introduction

The following specification defines the minimum requirements for an instrument used in the monitoring and registration of dynamic disturbances on electric power systems and the supervision of source performance according to Grid Codes.

II. Hardware

a. Inputs:

1. The equipment shall have at least 32 analog inputs with the capacity to increase them to a minimum of 96 inputs depending on the application required analog signals. The minimum resolution for the A/D converter shall be 16 bit. The sampling rate shall be programmable up to a minimum of 250 samples per cycle (15000 samples per second). The analog inputs shall permit at least the following types of signals:

   i. PT voltage (150 V rms minimum, Accuracy better or equal to 0.3%);

   ii. CT currents (5 A rms minimum, Accuracy better or equal to 0.3%);

   iii. DC voltages of at least 800 V (Accuracy better or equal to 0.3%);

   iv. Small Analog Signals (Accuracy better or equal to 0.3%);

      A. Current: 4 – 20 mA; and

      B. Voltage: 0 – 200 mV, 1V, 10 V;

2. The equipment shall have at least 16 digital inputs with the capacity to increase them to a minimum of 48 inputs depending on the application required digital signals. The minimum input voltage range of the digital inputs should be 0 – 150 V. The digital inputs should be included as a user defined software triggering input.

3. The equipment shall be able to record power system frequency with a resolution of at least 0.001Hz.

b. The equipment shall have a built-in microprocessing unit with color monitor, keyboard and mouse from which all commands, controls and setup parameters may be entered. All setup parameters shall be store in a non-volatile medium, to prevent loss of setup data if power is interrupted. This microprocessing unit shall be of industrial grade to insure long life in a typical substation or generation plant environment.

c. Memory and storage capacity:

The equipment shall have a nonvolatile solid state memory (ex. SSD, flash, *etc*.) with the required capacity to stores at least one (1) Year of continuous data based in typical recording periods and typical recording rates. Also, the memory shall have a minimum

storage capacity of 1,000 RMS trigger events and 1,000 Instantaneous trigger events based in typical recording rates and recording periods. Typical recording periods and recording rates are:

i. RMS Trigger Recording Function (Recording rate of 1 sample per cycle on all the signals)

A. Pre-Trigger: 60 seconds

B. Post –trigger: 300 seconds

ii. Instantaneous Values Trigger Recording Function (recording rate of 250 samples per cycle on all instantaneous signals)

A. Pre-Trigger: 1 second

B. Post-Trigger: 2 seconds

iii. Continuous Recording Function - The recording rate is one (1) sample per second on all the signals. This recording function is continuous, but saved in twenty-four (24) hour periods.

All the recording functions mentioned above shall work simultaneously. The equipment shall maintain the date and time in an internal battery-backed clock.

d. Communication:

The equipment shall have at least two Ethernet 10/100/1000 Mbps port (LAN interface, TCP/IP Protocol) for local and remote network communication.

e. Power Source:

The equipment shall have a redundant power supply. Two separate inputs (one AC and one DC) 100 – 240 VAC, 60 Hz and 100 – 150 DC. Some applications could require DC supply of 48 VDC + 10%, verify before the equipment acquisition.

f. Measurement accuracy:

1. Voltage measurement error shall be less than + 0.3% of reading.

2. Current measurement error shall be less than + 0.3% of reading.

III. Software

a. The software platform of the equipment shall be compatible with the latest version of Microsoft Windows operating system.

b. The equipment remote communication shall be thru TCP/IP network connectivity (LAN). The remote communication should permit at least the set up and data retrieval of the equipment. The equipment should have the capability to perform at least the following functions remotely:

1. Modification of the configuration;

2. Retrieval of captured events; and

3. Remote event triggering.

c. The equipment shall have the capacity of time synchronization with GPS system. A GPS receiver and GPS antenna shall be included.

d. Triggers:

1. The equipment shall support user defined programmable triggers. Triggering shall be initiated based upon primary quantities (voltage, current, and frequency), calculated quantities (watts, Var, power factor, apparent power, *etc*.), digital signals or small analog signals.

2. The trigger thresholds shall be based on limits, gradients, equations and status. Examples of trigger conditions that shall be available are:

i. Level threshold (high level, low level, in-band, out-band, *etc*.);

ii. Rate of change (ex. frequency variation (df/dt));

iii. Manual input (keyboard trigger);

iv. Request from remote computer; and

v. Event input status (digital signal status).

3. A re-trigger function shall be available which permits the equipment to generate a new event register if a second disturbance is detected while the recording of the first disturbance is still in process. This process should continue if more disturbances occur in the new registers.

e. The acquisition software shall include a user defined pre-trigger interval option as well as a user defined post trigger interval for the information captured in the case of triggered events. The minimum range of the pre-trigger interval should be from 0 to 60 seconds and the minimum range for the post trigger interval should be 0 to 300 seconds. In addition, the date, time, and type of trigger that initiated the event shall be included as part of the disturbance record.

f. The acquisition software shall have the following capabilities:

1. Time displays (ex. Oscilloscope);

2. Digital Status display (ex. High/Low, 1/0);

3. Multiple displays and multiple signals in displays in real time and off-line;

4. Display resizing;

5. Programmable conversion of range and units of signals; and

6. Independent range for signals.

g. The acquired data shall be available in a format directly compatible with Siemens Power Technologies International (Siemens PTI) PSS/E plotting software.

h. The software shall support data export in ASCII, CSV and PSS/E formats.

i. The software shall support image export in JPG, BMP or WMF formats.

j. The software shall have the following analysis capabilities for the data and signals (primary and calculated):

1. Fast Fourier Transform (FFT);

2. Peak analysis;

3. Filter functions; and

4. Series and scalar mathematic (square root, inversion, square, sum, gain, offset, *etc*.).

k. The software shall perform the following power engineering calculations (on-line and off-line) and measurements:

1. Three phase and single phase power (real, reactive, apparent);

2. Power Factor;

3. Power angle;

4. rms line and phase voltage;

5. rms current;

6. Power system frequency;

7. DC voltage and currents; and

8. AC voltage and currents.

IV. General

a. Environmental Conditions:

1. Operating temperature: 0° C to 50° C; and

2. Operating humidity: 95%, non-condensing.

b. Equipment cabinet and corresponding accessories:

1. The cabinet should have test switches at the front of the panel for the three phase voltages and currents. The test switches should have a minimum rating of 600 V

rms and 30 A rms; semi flush mounted, rear connected, equal or similar to ABB FT-1, style no. 129A514G01. The test switches should be assembled horizontally in groups of three FT-1 switches per row, mounted on a 19 inches wide, three-rack unit (3RU) high panel suitable for rack mounting, similar to ABB FR3J014014014.

2. The signals (analog and digital) should terminate on terminal blocks inside the cabinet, before the connection to the Dynamic System Monitor. The AC, DC, digital, exciter voltage and exciter current signals should be in different terminal blocks. The terminal blocks should have a minimum rating of 600 V rms and 30 A rms (except the exciter voltages signals, see below). Examples of terminal blocks are: GE CR151B2 and Marathon 1512 STD. The current signals should terminate on shorting type heavy duty terminal blocks equal or similar to Marathon, catalog number 1506SC. The terminal blocks used for the excitation voltage of the generators must have a nominal voltage capacity greater than 800 V DC. A switch or breaker for isolation purposes is also required for the excitation voltage and current signals.

c. Documentation:

1. The equipment shall include a documentation package that contains the user, operation and maintenance manuals and the mechanical and electrical equipment drawings. The documentation should be in hard copy and in digital format.

2. The equipment documentation shall include a copy of the software.

d. Spare parts recommended by the equipment manufacturer shall be included in the dynamic system monitor purchase order.

e. Warranty:

1. The equipment warranty shall include part and service for a period not less than sixty (60) Months from the delivery day.

2. Equipment Training, Installation Support and Commissioning:

i. An on-site equipment operation and configuration training should be included; and

ii. The dynamic system monitor manufacturer shall perform the equipment commissioning and offer installation support.

APPENDIX O

TECHNICAL REQUIREMENTS FOR OPERATION, PROTECTION, & CONTROL

1. Resource Provider shall provide general protection practices, which comply with PREPA's written protection system practices and DCDs, in all the electrical equipment related to the Interconnection Facilities according to the standards and PREPA requirements in order to ensure personnel safety and secure operation and interconnection with PREPA's systems. Resource Provider has responsibility for the design, accurate relay settings (in accordance with the Approved Design) and testing of the protection that shall contain the evaluated Resource Provider Interconnection Facilities' settings. PREPA will evaluate and approve only the protection design, settings, and tests of the Resource Provider Interconnection Facilities related to PREPA's system stability, security, and optimal performance. Those protection designs, settings and tests of the Resource Provider Interconnection Facilities not related to PREPA's system stability, security and optimal performance will not be evaluated by PREPA.

2. As further defined in Article 3 (*Pre-Operation Period*) and Appendix H (*Interconnection Description and Specifications*), Resource Provider shall have responsibility for any protection related equipment, relays, scheme design, coordination and short circuit studies, and relay settings of all the protection equipment within PREPA's installation and remote terminals necessary to safely synchronize the Interconnection Facilities according to the latest technology and standards. For the avoidance of doubt, this includes the protection from (a) the PREPA Interconnection Facilities breaker to the Resource Provider Interconnection Facilities and (b) the differential protection relay from the Resource Provider Interconnection Facilities to the PREPA Interconnection Facilities.

3. Resource Provider shall submit a complete Resource Provider Interconnection Facilities protection report with all relay settings, including all calculations and considerations for the relay settings in addition to coordination and short circuit studies. In addition to the foregoing, the report shall also provide, including the following:

a. The approved Resource Provider Interconnection Facilities design single line drawings shall have all the equipment information and all the relay's input and output descriptions;

b. The Resource Provider Interconnection Facilities relay settings shall include the logic, inputs, and outputs according to the Approved Design;

c. The backup overcurrent protection units of the Resource Provider Interconnection Facilities relay shall be set so that PREPA does not provide short circuit current for more than one second;

d. The transformer from the Resource Provider Interconnection Facilities to PREPA shall have Delta – WYE configuration to avoid zero sequence current contribution from the Facility during faults at the electrical system;

e. The Resource Provider Interconnection Facilities transformer protection shall be set so that the Resource Provider Interconnection Facilities does not provide short circuit current to PREPA or disconnects instantly;

f. The Resource Provider Interconnection Facilities transformer protection shall provide an overvoltage protection unit on the delta side of the transformer to disconnect the Resource

Provider Interconnection Facilities during ground faults on the delta side of the transformer; and

g. Resource Provider shall provide all the equipment data of the Resource Provider Interconnection Facilities for PREPA's protection studies such as capacity, transformer and line impedances, current and voltage transformer ratios and information and short circuit duty, among others.

For the avoidance of doubt, PREPA does not assume, calculate or interpret any required item from manuals, graphs, or relay curves, and Resource Provider shall ensure that it includes all the required data in the report upon first submittal.

APPENDIX P

PERFORMANCE GUARANTEE

1. Facility Availability

a. Threshold Availability

Resource Provider guarantees the Facility will be available for use by PREPA for at least seventy percent (70%) of the hours in each Billing Period during the Supply Period ("**Threshold Availability**"). For each Billing Period, Facility Availability shall be calculated in accordance with paragraph (b) of Section 4 (*Facility Availability*) of Appendix F (*Compensation*).

b. Availability Liquidated Damages

If the Facility Availability falls below the Threshold Availability during any Billing Period of an Agreement Year, then Resource Provider shall pay PREPA liquidated damages for each hour of such Billing Period (the "A**vailability Liquidated Damages**") equal to:

$$\text{ALD} = (\text{TA} - \text{FA}) \times \text{DDE} \times \left(\text{RER} - \frac{\text{CPP}}{(30.33 \frac{\text{Days}}{\text{Month}} \times 24 \frac{\text{hours}}{\text{Day}})} \right)$$

where:

ALD = Availability Liquidated Damages for such hour, expressed in $;

TA = Threshold Availability, expressed as a percentage;

FA = Facility Availability for such Billing Period, expressed as a percentage;

DDE = Degraded Duration Energy applicable to such Agreement Year, expressed in MWh;

RER = replacement Energy rate of $170/MWh; and

CPP = Capability Payment Price applicable to such Agreement Year, expressed in $/MW-Month.

2. Capability

a. Guaranteed Capability

Resource Provider guarantees that the Facility will maintain an Adjusted Duration Energy not less than the Degraded Duration Energy ("**Guaranteed Capability**") for the Supply Period, as measured by the Performance Tests conducted in accordance with Section 6.9 (*Supply Period Performance Tests*).

b. Capability Liquidated Damages

If a Performance Test shows the Adjusted Duration Energy below the Guaranteed Capability, then Resource Provider shall pay PREPA, for each Day from the Day on which such Performance Test occurred until the Day on which Resource Provider demonstrates a Tested Duration Energy equal to or greater than the Degraded Duration Energy, liquidated damages ("**Capability Liquidated Damages**") equal to:

$$\mathrm{CLD} = (\mathrm{GC} - \mathrm{TDE}) \times \left(\mathrm{RER} - \frac{\mathrm{CPP}}{(30.33 \frac{\mathrm{Days}}{\mathrm{Month}} \times 24 \frac{\mathrm{hours}}{\mathrm{Day}})} \right)$$

where:

CLD = Capability Liquidated Damages, expressed in $;

GC = Guaranteed Capability, expressed in MWh;

TDE = Tested Duration Energy, expressed in MWh;

RER = replacement Energy rate of $170/MWh; and

CPP = Capability Payment Price applicable to such Agreement Year, expressed in $/MW-Month.

3. Efficiency

a. Guaranteed Efficiency

Resource Provider guarantees that the Facility will maintain Actual Efficiency for each Billing Period during the Supply Period not less than Guaranteed Efficiency. The Parties shall calculate Actual Efficiency in accordance with paragraph (b) of this Section 3 of this Appendix P.

b. Calculation of Actual Efficiency

Resource Provider shall calculate the actual efficiency of the Facility for each Billing Period "n" as a percentage measurement using the formula set forth below ("**Actual Efficiency**"):

$$\text{Actual Efficiency}_n = \frac{(DE_n + (AE_{end} - AE_{beg}))}{CE_n}$$

DE_n = the total Discharge Energy for Billing Period "n", as measured for such period in accordance with Section 8.4 (*Meter Reading*);

CE_n = the total Charge Energy for Billing Period "n", as measured for such period in accordance with Section 8.4 (*Meter Reading*);

AE_{end} = Stored Energy Level at 23:59 on the last Day of Billing Period "n";

AE_{beg} = Stored Energy Level at 23:59 on the last Day of the Billing Period preceding the current Billing Period "n"; and

n = relevant Billing Period "n" for which Actual Efficiency is calculated.

c. Efficiency Liquidated Damages

If the Actual Efficiency for a Billing Period "n" in an Agreement Year falls below the Guaranteed Efficiency, then Resource Provider shall pay PREPA liquidated damages for such Billing Period (the "**Efficiency Liquidated Damages**") equal to:

$$\mathrm{ELD} = \left(\mathrm{RER} - \frac{\mathrm{CPP}}{(30.33 \frac{\mathrm{Days}}{\mathrm{Month}} \times 24 \frac{\mathrm{hours}}{\mathrm{Day}})} \right) \times ((\mathrm{CE} \times \mathrm{GE}) - \mathrm{DE})$$

where:

ELD = Efficiency Liquidated Damages for such hour, expressed in $;

RER = replacement Energy rate of $170/MWh;

CPP = Capability Payment Price applicable to such Agreement Year, expressed in $/MW-Month;

CE = the total Charge Energy for Billing Period "n", as measured for such period in accordance with Section 8.4 (*Meter Reading*);

GE = Guaranteed Efficiency, expressed as its decimal equivalent; and

DE = the total Discharge Energy for Billing Period "n", as measured for such period in accordance with Section 8.4 (*Meter Reading*).

4. Ramp Rate

a. Guaranteed Ramp Rate

Resource Provider guarantees a minimum response rate of [ten percent (10%)] of the Facility's Degraded Duration Energy per minute ("**Guaranteed Ramp Rate**").

b. Non-Scheduled Outage

The Ramp Rate will be measured in accordance with Section 6.9 (*Supply Period Performance Tests*). If the Facility is unable to demonstrate the Guaranteed Ramp Rate, Resource Provider shall place the Facility into a Non-Scheduled Outage immediately and resolve any issues so that the Facility can achieve the Guaranteed Ramp Rate.