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COMMONWEALTH OF PUERTO RICO
PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

IN RE: REVIEW OF T&D OPERATOR'S SYSTEM OPERATION PRINCIPLES	**CASE NO.:** NEPR-MI-2021-0001 **SUBJECT:** Filing in Compliance with May 11th Order, Submitting Revised System Operation Principles and supporting information and documents.

MOTION IN COMPLIANCE WITH ORDER SUBMITTING REVISED SYSTEM OPERATION PRINCIPLES, PHASE 1 DRAFT PROCEDURES AND ADDITIONAL INFORMATION

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

COME NOW LUMA Energy, LLC ("ManagementCo"), and **LUMA Energy ServCo, LLC** ("ServCo"), (jointly referred to as the "Operator" or "LUMA"), and respectfully submit and pray:

I. Introduction and Procedural Background

On February 25, 2021, LUMA filed before this honorable Puerto Rico Energy Bureau ("Energy Bureau") a Petition for Approval of LUMA's System Operation Principles ("SOP Petition"), pursuant to LUMA's obligations under Section 4.1 (h) of the Puerto Rico Transmission and Distribution System Operation and Maintenance Agreement dated as of June 22, 2020, executed by and among LUMA, the Puerto Rico Electric Power Authority ("PREPA") and the Puerto Rico Public-Private Partnerships Authority ("P3 Authority") ("OMA").

PREPA and the P3 Authority entered into the OMA with LUMA to (i) provide management, operation, maintenance, repair, restoration and replacement, and other related services for the transmission and distribution system ("T&D System"), in each case that are customary and appropriate for a utility transmission and distribution system service provider, and (ii) establish policies, programs and procedures with respect thereto ((i) and (ii), collectively, the "O&M Services"). *See* OMA Section 5.1.[1] The O&M Services are to be provided in accordance with the "Contract Standards,"[2] requiring compliance with Applicable Law[3], Prudent Utility Practice[4], and other standards, terms, conditions and requirements specified in the OMA (for purposes of this Petition, "Contract and Policy Standards"). Contract and Policy Standards necessarily require acting consistently with policy mandates and directives in Act 57-2014, as amended, known as the "Puerto Rico Energy Transformation and RELIEF Act" ("Act 57-2014"), Act 120-2018, as amended, known as the Electric Power System Transformation Act ("Act 120-2018") and Act 17-2019, known as the "Puerto Rico Energy Public Policy Act" ("Act 17-2019"), among others.

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[1] The OMA further provides that, except for those rights and responsibilities reserved for PREPA and the P3 Authority or otherwise expressly provided in the OMA, LUMA "shall (A) be entitled to exercise all of the rights and perform the responsibilities of [PREPA] in providing the O&M Services, and (B) have the autonomy and responsibility to operate and maintain the T&D System and establish the related plans, policies, procedures and programs with respect thereto as provided in [the OMA]." *Id*. Moreover, the OMA provides that LUMA shall function as agent of [PREPA] and PREPA "irrevocably authorizes [LUMA] to (i) represent [PREPA] before PREB with respect to any matter related to the performance of any O&M Services provided by [LUMA] under [the OMA]" and "(ii) prepare all related filings and other submissions before PREB" among other functions. OMA, Section 5.6.

[2] The OMA specifically defines "Contract Standards" as "the terms, conditions, methods, techniques, practices and standards imposed or required by: (i) Applicable Law; (ii) Prudent Utility Practice; (iii) applicable equipment manufacturer's specifications and reasonable recommendations; (iv) applicable insurance requirements under any insurance procured pursuant to this Agreement; (v) the Procurement Manuals, as applicable, and (vi) any other standard, term, condition or requirement specifically contracted in this Agreement to be observed by [LUMA]." *Id.* Section 1.1 at page 9.

[3] This term includes "any foreign, national, federal, state, Commonwealth, municipal or local law, constitution, treaty, convention, statute, ordinance, code, rule, regulation, common law, case law or other similar requirement enacted, adopted, promulgated or applied by any [governmental body][…]" in each case applicable to the parties to the OMA. *Id.,* Section 1.1 at page 3.

[4] "Prudent Utility Practice" is defined, in pertinent part, as "…at any particular time, the practices, methods, techniques, conduct and acts that, at the time they are employed, are generally recognized and accepted by companies operating in the United States electric transmission and distribution business as such practices, methods, techniques, conduct and acts appropriate to the operation, maintenance, repair and replacement of assets, facilities and properties of the type covered by the [OMA] . . . ." *Id.* at page 26.

The O&M Services are to commence on a date referred to as the "Service Commencement Date," or the "Interim Period Service Commencement Date" if PREPA remains in Title III bankruptcy proceeding, and certain conditions precedent specified under the OMA are satisfied or waived (collectively, for purposes of this Petition, the "Commencement Date").[5] *See Id.*, Sections 4.5 and 4.7(b). Beginning on the Effective Date (that is, June 22, 2020) and until Commencement Date[6] (this period, the "Front-End Transition Period"), LUMA is required to provide "Front-End Transition Services"[7] which are "intended to ensure an orderly transition of the responsibility for the management, operation, maintenance, repairs, restoration and replacement of the T&D System to [LUMA] by the [. . .] [Commencement Date], without disruption of customer service and business continuity […]" *See Id.*, Sections 1.1 at page 15 and 4.1(a).

As part of the O&M Services, once LUMA reaches Commencement Date, LUMA will have the responsibility to, acting as agent for PREPA: "dispatch, schedule and coordinate Power and Electricity from available generation assets and provide related services[;]" and to "implement

[5] LUMA is assuming that PREPA will not exit the Title III Bankruptcy proceeding before June 1, 2021. Consistent with statements from the Executive Director of Financial Oversight and Management Board (FOMB) and PREPA Certified Fiscal Plan for FY2021, certified on June 29, 2020, the Initial Budgets assume that PREPA will exit Title III at December 31, 2021. *See e.g., "*Natalie Jaresko: "we are going to emerge from bankruptcy in 2021", PR Headline News, https://www.puertoricoheadlinenews.com/natalie-jaresko-we-are-going-to-emerge-from-bankruptcy-in-2021/ (last visited February 22, 2021). Consequently, LUMA anticipates providing the O&M Services during the Interim Period pursuant to the Supplemental Terms Agreement agreed between the OMA parties precisely for this contingency. If PREPA exits the Title III bankruptcy proceeding contemporaneously with all other conditions precedent to Service Commencement Date, then LUMA will begin providing O&M Services without the need for an "interim period." Mentions in this document (and in all other OMA required submittals to PREB), to "beginning of O&M Services," "start of operations," "start of operations and maintenance services," and other allusions of similar import, shall be understood to refer to the end of the Front-End Transition Period and LUMA's commencement of O&M Services regardless of whether it is in under an "interim period" or after full "Service Commencement Date."

[6] *See Id.*

[7] The Front-End Transition Services are defined in the OMA as services to "complete the transition and handover to [LUMA] of the operation, management and other rights and responsibilities with respect to the T&D System pursuant to [the OMA], including the services contemplated by the Front-End Transition Plan; <u>provided</u> that the Front-End Transition Services shall not be O&M Services." [7] OMA, Section 1.1 (Emphasis ours).

and apply, on a continuous basis on the relevant time basis applicable, the System Operation Principles in order to ensure and coordinate the delivery of Power and Electricity." *See* OMA Section 5.13 (a).

Under the OMA, LUMA's designation as the System Operator includes the obligation to operate the electricity supply system in a safe and reliable manner. *See Id*. Annex I, Section I(C) and Schedule 1. The System Operator must do so by the use of Economic Dispatch[8] principles and Prudent Utility Practice to operate the electricity supply system as economically as possible in consideration of the electricity supply system constraints and obligations under existing Power Purchase and Operating Agreements ("PPOAs"). *See Id*., Annex I, Schedule 1.

The contractually-mandated and intended scope of LUMA's System Operation Principles is to include "principles related to the dispatch of Power and Electricity […], which principles shall be generally consistent with those set forth in Schedule 1 (System Operation Principles) to Annex I (Scope of Services) [of the OMA]. . . ." *See* OMA Section 4.1(h).

Section I(C) of Annex I to the OMA provides the following on the services that LUMA will provide as Operator of the T&D System:

> System Operator Activities. Operator shall serve the role of T&D System operator, including (1) managing control center operations, including generation scheduling and economic/reliable T&D System dispatch; (2) balancing the supply and demand of electricity, including reacting to changes in demand in real time, adjusting generation dispatch to be in balance with demand and maintaining the T&D System at safe operating levels in accordance with Prudent Utility Practices and System Operation Principles; (3) conduct T&D System planning activities; (4) develop and implement reliability standards appropriate for the conditions in Puerto Rico; and (5) manage a transparent, equitable and open generator interconnection process.

See OMA at page I-2.

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[8] A term meaning "the distribution of available supply sources to meet the total electricity demand in consideration of total, average and marginal per-unit generation costs, generator capabilities and constraints, and the operational limits of the T&D System." OMA, Schedule 1 to Annex 1 at page I-17.

Per Schedule 1 to Annex I of the OMA, as Operator LUMA "will control the day-to-day dispatch and transmission of electricity throughout Puerto Rico and will be responsible for ensuring that the T&D System and all IPP-Owned Assets and Legacy Generation Assets operate in a reliable and economic fashion, and that sufficient generation capacity is available and maintained to meet resource adequacy goals." *Id.* at page I-1.

The System Operation Principles are meant to enable LUMA to "operate the electricity supply system in a safe and reliable manner . . . use Economic Dispatch principles and Prudent Utility Practices to operate the electricity supply system as economically as possible in consideration of the electricity supply system constraints and PPOA obligations . . . [,] "balance electricity supply from available generating facilities and coordinate and communicate with Generating Facility Operators in regards to the system planning and operations functions outlined [in Schedule 1 to Annex I of the OMA.]" *Id.* at page I-19.

Among other actions, during the Front-End Transition Period, LUMA was required to prepare and submit to the P3 Authority for review and approval the System Operation Principles which are "principles related to the dispatch of Power and Electricity […], which principles shall be generally consistent with those set forth in Schedule 1 (*System Operation Principles*) to Annex I (*Scope of Services*) [of the OMA]. . . ." *See* OMA Section 4.1(h). After the P3 Authority's review, comments and approval, LUMA was to submit the System Operation Principles to the Energy Bureau. Upon review of the System Operation Principles, the Energy Bureau may then "approve, deny or propose modifications to such proposed System Operation Principles." *Id.* The Energy Bureau's approval of the System Operation Principles is a condition precedent to Commencement Date under the OMA. *See* OMA Section 4.5 (l).

Consistent with these general mandates and the more detailed guidelines included in OMA Section 5.13 and in Schedule 1 to Annex I of the OMA, LUMA prepared the System Operation Principles[9] that were filed with the Energy Bureau on February 25, 2021.[10]

The System Operation Principles filed with this honorable Energy Bureau incorporate the aforementioned requirements of the OMA, serve as the blueprint for how LUMA will operate the Bulk Power System[11] and establish the framework for LUMA's planning role and with regards to future interconnection processes. The System Operation Principles outline the principles that LUMA will follow in the day-to day- dispatch and transmission of electricity in Puerto Rico. They include principles for management of the Bulk Power System but are not designed to include the detailed procedures and myriad mechanisms that LUMA as the Operator, per the OMA and in

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[9] As explained in the SOP Petition, in accordance with the procedural requirements of Section 4.1 (h) of the OMA, during the Front-End Transition Period LUMA, PREPA and the P3 Authority established a planning team for the development of the System Operation Principles, and with the input of this team, LUMA prepared proposed System Operation Principles. The System Operation Principles are the result of an iterative review process with the P3 Authority advisors during the months of December 2020 and January 2021, after which LUMA submitted a revised version of the System Operation Principles to the P3 Authority on February 4, 2021 for final review and comments. The comments and suggestions of the P3 Authority advisors and the P3 Authority were discussed and addressed in various meetings. That iterative process concluded with the P3 Authority's approval on February 23, 2021 of the System Operation Principles which are being submitted to the Energy Bureau on February 25, 2021.

[10] As detailed in the SOP Petition, on January 15, 2021, this honorable Energy Bureau issued a Resolution and Order ("SOP") wherein it established certain requirements to be met for the System Operation Principles prior to its filing with the Energy Bureau. Specifically, the Energy Bureau required that the proposed System Operation Principles fully align with: "(a) the public policy established in Act 57-2014 and Act 17-2019 and (ii) prudent utility practices." *See* SOP Order at page 3. In the SOP Order, the Energy Bureau also ordered LUMA and PREPA to attend a Pre-Filing Technical Conference to be held remotely on January 29, 2021, at 2:00 pm during which PREPA and LUMA would be able to clarify questions regarding the filing. Such Pre-Filing Technical Conference was held via video conference on the date and time specified in the SOP Order, and LUMA and PREPA attended as required. During the Pre-Filing Technical Conference, LUMA made a presentation outlining its approach to preparing the System Operation Principles and its contemplated content. LUMA also received input from the Energy Bureau regarding the filing and contents of the System Operation Principles. LUMA filed a copy of the presentation with the Energy Bureau on February 2, 2021 as per the PREB's verbal request during the Pre-Filing Technical Conference.

[11] Section 1.0 of the System Operation Principles defines the Bulk Power System as "[t]he collection of interconnected transmission, generation and control systems necessary to operate an integrated transmission system while maintaining reliability, which includes 230 kV, 115 kV and 38 kV voltages."

accordance with Prudent Utility Practice, will implement in the course of exercising its duties and obligations with regards to the different components of the T & D System. As the OMA and the System Operation Principles provide, the detailed procedures are to be adopted separately.

Also pursuant to the OMA, the System Operation Principles are subject to periodic reviews after LUMA's steps in into its role as Operator and the electric grid is transformed and modernized with the guidance and approvals of this Bureau and in accordance with Acts 57 and 17 and applicable public policy and regulations. *See* OMA Section 5.13 (c).

On April 6, 2021, this Energy Bureau issued a Resolution and Order where, among others, it directed LUMA to, within ten days, provide information and responses to requests included in Attachment A to the April 6th Order ("Requests for Information"). On April 27, 2021, LUMA filed its responses to the eleven requests for information that are included in Attachment A to the April 6th Order ("Responses to Requests for Information"). The Responses to Requests for Information were accompanied by several attachments. LUMA also included a *Request to Submit Portions of LUMA's Responses to Requests for Information Confidentially and Memorandum of Law in Support Thereof* ("Request for Confidential Treatment"). With the Responses to Requests for Information, LUMA submitted detailed information to support and explain the System Operation Principles.[12]

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[12] Particularly, LUMA provided the following:

i. Methodology for the development and management of load forecasts, see RFI-LUMA-MI-21-0001-21406-PREB-001, RFI-LUMA-MI-21-0001-21406-PREB-002, and RFI-LUMA-MI-21-0001-21406-PREB-003;
ii. LUMA's efforts and plans to establish a new distributed and utility scale generation interconnection agreement procedure and to support integration of distributed energy resources, RFI-LUMA-MI-21-0001-21406-PREB-004;
iii. The template of LUMA's Plant Level Agreement, RFI-LUMA-MI-21-0001-21406-PREB-006;
iv. Description and status of the system operations procedures that LUMA is developing and the aggressive timeline for completion of the procedures, RFI-LUMA-MI-21-0001-21406-PREB-007;
v. Additional explanation on existing gaps in PREPA's current operations, RFI-LUMA-MI-21-0001-

After a series of procedural events involving the Bureau's adjudication of LUMA's Request for Confidential Treatment, the Bureau issued a Resolution and Order dated April 27, 2021 with the Subject "Determination on [C]ompleteness and Preliminary Procedural Calendar ("April 27th Order deeming the SOP filing Complete")." At page 1 of the April 27th Order deeming SOP filing Complete, this honorable Bureau held that: "Upon review of the information filed by LUMA, the Energy Bureau DETERMINES that the SOP Petition, as clarified by the Compliance Motion is complete. The Energy Bureau can commence its evaluation of the SOP Petition." Based on the Bureau's finding that LUMA's SOP filing was complete, a technical conference was scheduled for May 10th and 11th, 2021 where LUMA representatives would participate to answer questions on all aspects of the SOP. *Id.* at page 2.

LUMA representatives appeared for the technical conference scheduled in this proceeding and provided extensive and detailed testimonies on May 10th and 11th, 2021. LUMA representatives offered and requested leave to file additional information or responses with regards to several topics and/or to provide written clarifications on specific matters. The Bureau issued bench orders granting LUMA leave to provide additional information or supplemental written responses to certain questions and/or to submit clarifications by May 14th 2021. LUMA filed those responses on May 14, 2021.

On May 11, 2021, the Bureau issued a Resolution and Order ("May 11th Order") with several specific requests for information, including that LUMA "[r]evise comprehensively the February 25 Petition to specifically show the principles that will govern LUMA's operation of the

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21406-PREB-008;

vi. The transmission planning standards, RFI-LUMA-MI-21-0001-21406-PREB-009;

vii. Detailed results of the inspections conducted by LUMA of transmission substations, RFI-LUMA-MI-21-0001-21406-PREB-010; and

viii. LUMA's Assessments of PREPA's generation plants, RFI-LUMA-MI-21-0001-21406-PREB-011.

electric system followed by a clear and specific discussion on how LUMA intends to implement and/or achieve the actions fostered or pursued by the corresponding principle (i.e., the mechanisms or measures LUMA will use for such implementation)." *See* May 11th Order at page 3 (item i). In footnote 8, the Bureau indicated that the "discussion does not need to reach the degree of specificity ordinarily encountered in operating procedures and or manuals." *See id* at page 3. The Bureau also requested revisions to Section 3.3 and Figure 3-1 of the System Operation Principles, and revisions to incorporate NERC Standard TPL-001-41 and any other standard that LUMA intends to use for the operation of the system. *Id.* (items ii and vii).

In the May 11th Order, the Energy Bureau also requested that LUMA provide the final versions or drafts of the operating procedures, a detailed timeline to complete de procedures, the final version and/or the preliminary draft of the template Plant Level Agreement ("PLA"), and a discussion of the process to execute a PLA with an independent power generator under contract for PREPA as it relates to the operation of the system, *see* May 11th Order at page 4 (items ii, iii, iv, vi, and ix). The Bureau granted LUMA three days, until May 14th 2021, to comply with the May 11th Order. On May 13, 2021, LUMA requested additional time to comply with the May 11th Order. In a Resolution and Order dated May 14, 2021, the Energy Bureau granted LUMA until May 19, 2021, to comply with the May 11th Order.

On May 14, 2021, LUMA submitted before the Energy Bureau, a revised Section 3.3 and Figure 3-1 of the System Operation principles on Plant Retirements. LUMA also filed additional information requested by the Energy Bureau and its consultants and offered by LUMA representatives during the technical conference held in this proceeding, including the following: (1) Customer Notification of Planned Outages; (2) Significant System Events; (3) System Redundancy; (4) System Restoration Capabilities; (5) Generation Unit Information; (6)

Interoperability; (7) Generator Reactive Testing; and (8) Interconnection. Also on May 14, 2021, LUMA filed the near final version of the Emergency Response Plan in compliance with the May 11th Order.

With this Motion, LUMA is submitting the pending responses to the May 11th Order, including a revised version of the System Operation Principles, drafts of several operating procedures ("Phase I Procedures") and "As-Is Documentation" on operating procedures developed by LUMA. *Exhibit 1*, RFI-LUMA-MI-21-0001-210511-PREB-001, Attachment 1, and RFI-LUMA-MI-21-0001-210511-PREB-009, Attachments 1 and 2.

LUMA respectfully requests that the Energy Bureau issue an order of approval of the System Operation Principles as revised and included as attachment 1 to RFI-LUMA-MI-21-0001-210511-PREB-001.

II. Energy Bureau's Authority

Act 57-2014, as amended, gives the Energy Bureau authority and regulatory oversight over electric services and electric service companies, such as PREPA and LUMA. *See* Act 57-2014, Sections 6.3 and 6.4. Among other powers, the Energy Bureau may establish public policy standards with respect to electric service companies, establish rates, regulate any transaction, action or omission in connection with the electric power grid and the electric power infrastructure, and exercise jurisdiction over certified electric power companies, persons connected to the grid or receiving energy services and persons that exercise control over the provision of electric power services. *See Id.* The Bureau may also determine the type of information it shall request electric service companies to provide regarding its dispatch center. *Id.,* Section 6.3 (t); *see also* Section 6.24 of Act 17-2014, as amended.

III. Coordinated Approach to FET Deliverables

Following is a discussion of LUMA's integrated and coordinated approach to preparing the System Operation Principles and other deliverables under Sections 4.1 and 4.2 of the OMA (for the purposes of this Petition, the "FET Deliverables"). A discussion will then follow on the System Operation Principles and their implementation, as required by the May 11th Order.

A. Assess, Analyze and Plan

As explained in the SOP Petition and further explained during the technical conferences in this proceeding, as well as in the technical conferences held to consider LUMA's Initial Budgets, Case No. NEPR-MI-2021-0004 and System Remediation Plan, NEPR-MI-2020-0019, as part of the Front-End Transition Period activities, LUMA followed a three-step approach to developing the FET Deliverables. This approach consists of: (1) assessing, (2) analyzing, and (3) planning.

In the assessment phase, LUMA conducted a broad, preliminary assessment (also referred to as "gap assessment") of the condition of the utility's physical assets and management practices, which included assessing PREPA's organizational health, asset condition, performance data, and systems operations. *See* Initial Budgets, Section 1.4.1 (filed before the Energy Bureau on February 24, 2021, in case NEPR-MI-2021-0004, as Exhibit 1 to the Petition for Approval of Initial Budgets and Related Terms of Service).

In the analysis phase, across all FET Deliverables, LUMA analyzed the information collected to compare it to industry standards, understood root causes and began developing potential solutions. *See Id.* Section 1.4.2. Initiatives were developed to meet one or more, as applicable, of the following objectives: (i) Remediate concerns identified through the gap assessment; (ii) carry out infrastructure recovery (repair, replacement, hardening) projects; (iii) achieve operational and customer satisfaction improvements; and (iv) meet regulatory imperatives (such as the Integrated Resources Plan) for transforming Puerto Rico's electricity system. *Id*. This process resulted in the development of over 600 initiatives. *Id*. These initiatives were consolidated into programs of similar, interdependent initiatives.

In the planning phase, LUMA used a comprehensive strategic framework for recovery and transformation (discussed in caption IV.B.) to prioritize and sequence the programs to enhance value to customers within annual budget constraints, consistent with the public interest and Contract and Policy Standards. *Id*., Section 1.4.3. LUMA's strategic planning process began by synthesizing policy objectives, stakeholder needs, regulatory requirements and other Contract and Policy Standards into a comprehensive strategic framework to guide planning and decision-making across all the FET Deliverables. The sources (policy objectives, plans, laws and regulation) reviewed by LUMA to develop these guiding principles included: Act 57-2014, and Act 17-2019; Case No. CEPR-AP-2015-0001 (dated March 31, 2017 and that came into effect on May 11, 2019) ("2017 Rate Order"); the Energy Bureau's final resolution and order on the Integrated Resources Plan in Case No. CEPR-AP-2018-0001;[13] the COR3 Grid Modernization Plan for Puerto Rico; US DOE's Energy Resilience Solutions for the Puerto Rico Grid; FEMA's Public Assistance Policy Guide; the FEMA National Disaster Recovery Framework; and a Survey of Puerto Rico utility customers commissioned by ATCO and Quanta Services, LUMA's owners. *Id*.

As a result of this strategic planning process, LUMA established a mission aligned with public policy to guide the preparation of all the FET Deliverables and set goals to achieve that mission. *See Id*., Figure 1-4. The established mission is to **recover and transform the T&D System to deliver customer-centric, reliable, resilient, safe, and sustainable electricity at reasonable prices**. *Id*., Figure 1-5. The resulting primary goals set to achieve this mission are to: (a) **Prioritize safety** by reforming utility activities to support a strong safety culture focused on employee safety and the safety of the people of Puerto Rico;

[13] Resolution and Order dated August 24, 2020 in Case No. CEPR-AP-2018-0001, *In re: Review of the Puerto Rico Electric Power Authority's Integrated Resource Plan.*

(b) **improve customer satisfaction** by transforming operations to deliver a positive customer experience and deliver reliable electricity **at reasonable prices**; (c) **rebuild and make the system more resilient**, by effectively deploying federal funding to restore the grid and improve the resiliency of vulnerable infrastructure; (d) introduce **operational excellence** by enabling employees to pursue it through new systems, processes and training; and (e) advance **sustainable energy transformation** by modernizing the grid and the utility to enable the sustainable energy transformation. *Id*.

B. Comprehensive Strategic Framework for Recovery and Transformation

LUMA used what has been denominated and referenced in the FET Deliverables as the "Recovery and Transformation Framework" to prioritize and sequence programs regardless of the FET Deliverable to which they pertain, to ensure that planning and budgeting was not undertaken separately and inconsistently for each FET Deliverable. *See Id.*, Section 1.4.3. LUMA deliberately designed the strategic goals of the framework to provide enhanced electric service to customers, as the utility service provider in Puerto Rico after Commencement Date and consistent with the public interest. LUMA developed a set of programs designed to deliver value to customers in accordance with Contract and Policy Standards and within annual budget constraints. *See Id*. These programs are organized in seven portfolios covering the areas of Customer Service, Transmission, Distribution, Substations, Control Center and Buildings, Enabling, and Support Services ("Improvement Portfolios"). LUMA also looked carefully at the scope, timing and resources needed for daily utility operations to support LUMA's obligations and serve customers. Several specific programs developed during the FET Period go hand-in-hand with the System Operation Principles and were developed with the principles in mind. The Control Center and Buildings Portfolio includes physical, software and technological upgrades to the dispatch Control Center and the development of new practices and strategies in accordance with the System Operation Principles and the OMA. (*see also* Exhibit

1 to Initial Budgets, Appendix D.5, pages 236-262, for the full contents of the Control Center and Building Portfolio, filed in case No. NEPR-MI-2021-0004).

Implementation of these programs—including those that focus on increasing the availability of system data and its use for improved decision-making—will enable control center professionals to put into practice the new protocols that form the core of System Operation Principles, and assure that they do not simply sit on a shelf gathering dust.

Overall, the System Operation Principles govern an integral part of LUMA's operations and are linked to LUMA's Initial Budgets, System Remediation Plan, and Performance Metrics which were submitted to the PREB, separately, for review and approval in cases NEPR-MI-2021-0004, NEPR-MI-2020-0025 and NEPR-MI-2020-0019.

IV. The System Operation Principles and Public Policy

The System Operation Principles were designed to meet the purposes and energy public policy mandates of Act 120-2018, that seek to advance the process of transforming the energy system in Puerto Rico to be "modern, sustainable, reliable, efficient, cost-effective, and resilient to the ravages of nature." Act 120-2018, Statement of Motives. LUMA also considered Act 17-2019's statement on the need for a "reliable and accessible" electric system that "promote[s] industrial, commercial and community development, improve[s] quality of life at [a] just and reasonable cost, and promotes economic development . . . ." Act 17-2019, Statement of Motives. The System Operation Principles also consider the duties and obligations to "provide and allow for the provision of reliable, clean, efficient, resilient, and affordable electric power, contributing to the general wellbeing and sustainable development of the people of Puerto Rico." Act 17-2019, Section 1.10.

In setting forth principles for how the Bulk Power System in Puerto Rico will be managed, the System Operation Principles advance the initial objectives under Act 17-2019, of facilitating interconnection of distributed generation to the electric power grid, *see* Act 17-2019, Section 1.6(8), and achieving:

> […] the fastest and most efficient reconstruction and modernization, and revamping of the transmission and distribution system for the purpose of developing a robust and flexible system that can integrate new technologies, distributed generation, renewable energy sources, and energy efficiency mechanisms as well as provide consumers with alternatives in the energy sector, thereby maximizing available state and federal resources.

Id., Section 1.6(1).

The System Operation Principles also consider the mandated of Section 1.11 (c) of Act 17-2019, which provides that the operator of the T&D System shall establish from time to time, the level of reserves for planning, subject to review by the Energy Bureau and Section 1.8 (b) of Act 17-2019, that includes the operation of the Energy Control Center as one of the key activities to be contracted with a private operator via public-private partnership contracts pursuant to Act 120-2018 and Act 29-2009.

Finally, the System Operation Principles consider the applicable requirements of the Integrated Resource Plan and the Modified Action Plan ("IRP"), approved by Resolution and Order dated August 24, 2020 in Case No. CEPR-AP-2018-0001, *In re: Review of the Puerto Rico Electric Power Authority's Integrated Resource Plan*. Particularly, Section 3.0 of the System Operation Principles, the System Operation Principles considers IRP provisions on plant retirements, including, but not limited to,: (1) established schedule for retirements (*see e.g.,* IRP paragraphs 92 and 841 and Appendix C); (2) alignment with conversion of some units to synchronous condensing operation (*See e.g.* IRP paragraphs 58, 92, 605 and 841, 842 and item 7 at page 282); and (3) evaluation of threshold capacity at which retirement of unit is slated to commence (IRP paragraph 872).

V. System Operation Principles: Purposes and Framework

The System Operation Principles is a ground-breaking document for Puerto Rico and establish guidelines and protocols for the dispatch of power and electricity in Puerto Rico by a System Operator that does not own or operate generation facilities.

Separation of generation from the dispatch and planning for the transmission and distribution system was mandated by Act 120-2018 in order to facilitate increased investment in new generation resources and the operation of the overall electric system on a sounder technical basis. *See* Act 120, Statement of Motives and Section 8(g) and (h). They provide a comprehensive guide for operations that will enable LUMA to operate the T&D System in accordance with Prudent Utility Practice and as economically as possible in consideration of available electricity supply, system constraints, and according to obligations under existing PPOAs, executed by PREPA with independent power producers.

The main policy objectives of the System Operation Principles are safety and reliability, data driven decision making, cost-effective operations, non-discriminatory behavior, transparency and performance. Exhibit 1, Sections 2.1 and 2.2. The written principles and their implementation through written operational procedures will work to enhance the utility's credibility with customers and stakeholders and, importantly, do away with perceptions of arbitrary or unfair practices in dispatch and system operations. *Id*., Section 2.5.[14] The application of clear rules in a consistent manner, separated from any interest to favor specific facilities, is also critical to attract greater investment in generation.

[14] The System Operation Principles address the following components of the T&D System's operations: System Planning and coordination (*Id.,* Section 3.0); data accuracy and data security (*Id.,* Section 4.0); security constrained economic dispatch of resources that meets system demands (*Id.,* Section 5.0); adoption of detailed rules on operating parameters (*Id.,* Section 6.0); implementation of a new energy management system (*Id.,* Section 7.0); planned generation and transmission outages to be coordinated and approved through LUMA as System Operator (*Id.,* Section 8.0); high-level emergency preparedness in accordance with Prudent Utility Practice (*Id.,* Section 9.0); and development of procedures and schedules to balance frequency and system impacts (*Id.,* Section 10.0).

The operating procedures component of the System Operation Principles framework define how the System Operation Principles will be implemented on a consistent basis and allow LUMA to assess potential improvements. *Id.*, Section 2.1, Table 2-1. Also included are requirements that there will be generating plant level agreements that document technical and communication protocols between the plants and the dispatch center to aid in coordinated operation of the Bulk Electric Power System. *Id.*

LUMA will coordinate short-term and long-term system planning processes across the following areas: load forecasting, integrated resource planning, Resource Adequacy[15] to maintain target adequate generation capacity, and others that may be identified to support the provision of O&M Services or address needs identified for the Bulk Power System. *Id.* Sections 3.1 and 9.4. The results of these plans will be reviewed periodically, presented to the Energy Bureau and shared with stakeholders. *Id.,* Section 9.4.

As stated in Section 3.2, the System Operation Principles include provisions that, subject to existing PPOAs, all generators comply with the System Operation Principles and applicable procedures to support maintenance of system technical parameters (including frequency and voltage). *Id.* The System Operation Principles also include general rules for interconnection of new generators and potential retirements, consistent with the Integrated Resource Plan and applicable energy policy. *Id.,* Section 3.3 and 3.4

In compliance with public policy mandates to protect the trust of customers and stakeholders in how the grid is handled and managed, **LUMA will operate the T&D System in a non-discriminatory manner** to avoid the perception of arbitrary behavior in the dispatch of generation resources decision processes. Asset ownership will not be a factor. *Id.* Section 5.3. In accordance with Act 120-2018, LUMA cannot own or operate electric generation facilities. *See* Act 120, Section 8(g). With this framework, the

[15] Resource Adequacy is "the regulatory construct that is used to ensure that there are sufficient resources available to satisfy electrical demand under all but the most severe conditions." Exhibit 1, Section 1.0 at page 6. In terms of operating procedures, it "describes the process and procedure for establishing the amount of generation capacity required to supply load with sufficient reserve for reliable service." Exhibit 1, A.2 at pages 28.

System Operation Principles comply with the legislative mandate of Section 4B of Act 83 of May 2, 1941, as amended, which mandates the autonomous operation of the Energy Control Center "to protect the reliability in the management of the electric power grid, prevent discrimination against electric power companies interconnected to the electric power grid, and ensure greater independence in the operations of the electric power grid .…" 22 LPRA § 195A.

Overall, LUMA's independent and technically sound management of the Bulk Electric Power System in accordance with the System Operation Principles, links directly to the attainment of the public policy energy goals established in Act 17-2019, other laws and regulations, and, ultimately, to serving the public interest.

VI. Implementation of the System Operation Principles

As explained in RFI-LUMA-MI-21-0001-210511-PREB-001, LUMA's implementation of the System Operation Principles will consist of: (a) implementation of procedures over time; (b) operator training; (c) recording of data and findings as required by procedures; (d) development of additional procedures, as necessary; and (e) review procedures for improvements and updates.

With this Motion, LUMA is submitting under seal of confidentiality, drafts of the fourteen (14) Phase I operating procedures that will be completed in advance of June 1st, 2021 and will be implemented soon after Commencement Date. *See* RFI-LUMA-MI-21-0001-210511-PREB-009, Attachment 1. The Revised Appendix A-1 to the System Operation Principles document that is being submitted today with RFI-LUMA-MI-21-0001-210511-PREB-001, Attachment 1, itemizes and identifies the procedures by which LUMA will implement with reference to each of the seven System Operation Principles: (1) planning; (2) standards; (3) management of reserves; (4) contingency planning; (5) dispatch operations; (6) outage management; and (7) emergency response. As will be discussed below, the operating procedures provide the details on how LUMA will implement each of the aforementioned System Operation Principles.

A. System and Resource Planning Principle (“Planning Principle”)

The Planning Principle involves planning on load forecasting, integrating resources and resource adequacy.

The Planning Principle will be implemented, among others, through the Phase I procedure on Resource Adequacy Assessments to ensure that the electrical system has the resources available to balance supply and demand, considering uncertainties like unexpected generator outages, fluctuating load and changes in the weather. *See also* Section 9.4 of the System Operation Principles. Resource Adequacy Assessment involves the following analysis: (1) near term: defined as the next seven days to the next six months planning horizon; (2) mid-term: defined as the next six months through the next five years, with primary focus on three to five years planning horizon; and (3) long-term: defined as the next 10-20 years planning horizon. The draft Resource Adequacy procedure is focused on the near-term adequacy of resources to meet load.

The Planning System Operation Principle will also be implemented through the Phase I New Generation Interconnection procedure that establishes the procedure to apply for electrical interconnection to the electric grid. The management staff of transmission and generation operations is responsible for implementing this procedure.

Load forecasting will be done in accordance with the Phase II procedure that will describe data input requirements, processing and data reporting to enable load forecast data reporting requirements. *See also* Section 3.1 of the System Operation Principles.

Finally, resource planning on plant retirements, will be done in accordance with the IRP, as set forth in Section 3.3 of the System Operation Principles, and pursuant to the Phase II procedure on Retirements that is under development. Implementation of plant retirement plans will consider, among others, the following: (1) established schedule for retirements (*see e.g.,* IRP paragraphs 92 and 841 and Appendix C); (2) alignment with conversion of some units to synchronous condensing operation (*See e.g.*

IRP paragraphs 58, 92, 605 and 841, 842 and item 7 at page 282); and (3) evaluation of threshold capacity at which retirement of unit is slated to commence (IRP paragraph 872).

B. System Operation Standards

Implementation of the System Operation Standards Principle encompasses several Phase I procedures: (1) Legacy T&G Demarcation; (2) Generation Capabilities; (3) Black Start; and (4) Public Reporting.

The Legacy T&G Demarcation procedure sets the demarcation plan for PREPA Legacy Transmission and Generation units and specifies the delivery point where the care and custody of the electrical output of the Interconnected Facility is metered and conveyed to the system.

The Generation Capabilities Phase I procedure will be implemented by the Transmission System Operator (TSO). It requires the interconnected facilities to communicate its specific performance and capabilities on a regular basis as outlined in the procedure. The communication of this data will help LUMA prioritize the dispatching of generating assets based on multiple priorities.

The Black Start Phase I procedure addresses the restoration plan for the Transmission System, including the procedures, documentation, training, and testing for the Generation Facility Operator (GFO) and market participants to ensure reliable system restoration following a major or total blackout due to a weather event resulting in a transmission system blackout or a generation event (voltage, frequency, insufficiency) causing a transmission system blackout or segmentation. *See also* Section 9.3 of the System Operation Principles. It describes the requirements for each unit's capability for a Black Start, including items such as ramp rate, time to be online, fuel capacity, available run time and other critical items for a successful Black Start.

The Public Reporting Phase I procedure provides guidance regarding communication requirements to the regulator and public stakeholders. It provides recommended metrics such as Estimated Time of

Restoration to be reported and frequency for reporting. This procedure will help ensure compliance with regulatory requirements concerning the management of the electric power grid and the operations of electric power transmission and distribution system.

The following Phase II procedures will be adopted and implemented to establish standards with regards to key elements of System Operations: (1) Telemetry Standards (describes all the telemetry needed for generation, substations and transmission; also addresses needed fiber, back-up capabilities, testing requirements); (2) Data & Cybersecurity Standards (describes data submittal and maintenance rules and requirements for all interconnected Generators and commercial and industrial loads to maintain safe, secured and accurate data, which allow the Participant to continue in good standing with the System Operator and in accordance with all data requirements), *see* Section 4.0 of the System Operation Principles; (3) Root-Cause Analysis & Lessons Learned (describes how to properly perform a root-cause analysis when an event occurs on equipment or personnel. Provides a detailed and thorough investigation into an event and how to properly communicate all lessons learned throughout the organization), *see* Section 8.4 of the System Operation Principles; (4) Performance Reporting (provides guidance regarding appropriate metrics including but not limited to safety, reliability, status of equipment, corrective and preventative maintenance and budgetary reporting.); and (5) Stakeholder Management (provides guidance on the stakeholder process including an issues resolution process and process to develop and evaluate enhancements and other changes that impact multiple stakeholders).

C. Management of Reserves

Management of Reserves is a key principle for operating the T&D System. The System Operation Principles document discusses this principle in Section 6.0 on Operating Parameters.

The Phase I procedure in Policy on Reserves includes an overview of Electrical Generation reserves and explain why reserves are important. It names and defines the types of reserves, defines the Legacy

Reserve Policy, and includes procedures for the System Operator to utilize reserves effectively when changing or unexpected generation supply conditions potentially impact the Electrical System. The Phase II procedure on Reducing Risk Exposure to Contingencies, provides guidance, rules and procedures that establish how to proactively monitor and react to contingencies and be able to analyze and react to system issues to prevent contingencies.

Further content on the System Operation Principle on management of reserves is found in Sections 6.1 and 6.2 of the System Operation Principles.

D. Contingency Planning

The Contingency Planning Operating Principle falls within the proposed operating parameters discussed in Section 6.0 of the System Operation Principles. Implementation of the Contingency Planning System Operation Principle includes two Phase I Procedures: (1) Critical Loads and (2) Contingency & System Operating Limits, and one Phase II procedure: Load Shedding. *See also* Sections 6.3 and 6.4 of the System Operation Principles.

The Critical Loads procedure provides an overview of critical loads and explains why they are important. It identifies key operations that must be kept running during a main power supply failure and describes procedures to restore or maintain critical loads safely, efficiently, and with minimal service interruptions.

The Contingency & System Operating Limits procedure provides a systematic approach for maintaining continuity of service when adverse events such as the following occur: switching operations, customer load increases and decreases, generation planned/unplanned outages, transmission line or element outages, equipment damage, and other emergencies that change transmission load flows.

The Phase II Load Shedding procedure provides guidance regarding under-frequency conditions, sets specific limits and timeframes for deviation from these limits, and defines the procedures for load shedding or bus isolation. It also defines frequency limits and the ability to properly shed load in a safe and controlled manager.

E. Dispatch Operations

The System Operation Principle on Dispatch Operations involves the core function of operating the system by balancing and allocating system resources. This principle is discussed in Section 5.0 of the System Operation Principles. It will be implemented through the following Phase I procedures: (1) Energy Dispatch, Scheduling & Merit Order; (2) Plant-Level Agreements; and (3) Balancing Frequency & Voltage. *See* Section 5.0 of the System Operation Principles.

The Energy Dispatch, Scheduling & Merit Order procedure involves the operation of the Energy Control Center (ECC) and encompasses many activities that are performed by different operating and technical personnel. It focuses on the real-time operations of the ECC and describes how ECC Operators dispatch, control generation resources, monitor the transmission of energy flow and respond to fluctuations throughout the shift. It also describes best practices for preparing and the scheduling of resources for each shift as well as guidance for utilizing and maintaining a merit order dispatch sequence.

The Plant Level Agreement Phase I procedure defines the methods of communication, data transfer and emergency management activities related to the electrical generation products and services between Interconnected Facilities and the System Operator. It will be used to develop a separate Plant Level Agreement for all facilities in the Commonwealth of Puerto Rico that are interconnected to the bulk electric system, in order to allow LUMA as System Operator to develop appropriate real-time dispatch, schedule, and merit order decisions along with allowing LUMA to properly ensure resource adequacy.

The Balancing Frequency & Voltage Phase I procedure describes how to manage capacity resources, monitor transmission and provide services. *See also* Section 10.0 of the System Operation Principles. It focuses on the high voltage operating system, which is 38kV and above, with the equipment, limits and corrective action steps described all residing within the same high voltage operating system. It provides action steps to maintain frequency and voltage balance and to correct frequency and voltage imbalance without impairing system safety, stability and reliability.

Dispatch Operations will also be conducted pursuant to three Phase II procedures: (1) Transmission Operations (involves transmission operations, including switching, communications and reporting describes all activities involved with the transmission system, including operations, maintenance and planning); (2) Demand-Side Resources (NWAs) (System Operator will outline the demand-side response rules, including non-wire alternatives, that will help the System Operator provide reliable power during high demand or unstable periods); and (3) Shift System Operator Training Requirements (Addresses the training programs for transmission and generation operators and continuing training requirements for all System Operators).

F. Outage Management

This System Operation Principle is discussed in Sections 8.0 through 8.3 of the System Operation Principles. Among others, it will be implemented through the Phase I procedure on Forced Outage Response. This procedure is designed to provide guidance when responding to an unplanned or forced outage on a generating unit or a transmission element that impacts the operation of the T&D System and provides detailed steps for responding to the event, including communications and restoration. It is written to aid both the generation and system operations to properly respond to outages while maintaining the system reliability and safety of the system. The procedure is divided into two parts: generation unplanned or forced outages and transmission outages.

LUMA will also implement the Outage Management System Operation Principle through two Phase II procedures: (1) Scheduling Planned T&G Outages (Provides operating philosophies and operating parameters with respect to outage planning and scheduling and addresses the reporting, analyzing and approval of generation and transmission outages); and (2) Outage Execution & Closeout (Describes process and procedure for executing work during outages, all reporting to be done and proper recovery and closeout of an outage).

G. Emergency Response

This System Operation Principle will enable LUMA as System Operator to implement and maintain a high level of emergency preparedness. *See* Section 9.0 of the System Operation Principles. LUMA will achieve said implementation, among others, through the Emergency Response Plan that was filed with this Energy Bureau on May 14, 2021, in almost final form, and through two additional operational procedures: (1) Emergency Response Execution; and (2) Emergency Drills.

The Phase I procedure on Emergency Response Execution procedure is designed to provide guidance when responding to an emergency on the T&D System and provides detailed steps for responding to all types of emergencies that would adversely affect the operation of the Puerto Rican electrical system, and would be classified as either a Type 2, 3 or 4 Operating Condition. It was written as an additional aid and will be part of the LUMA Emergency Response Plan. The Emergency Response Execution procedure is divided into two parts: the first deals with the various types of emergencies including adverse weather conditions, system instabilities, earthquakes and other emergency situations that typically result in electrical system damage and the loss of load; and the second involves the response to a terrorist or sabotage event on the transmission system.

Secondly, the Phase II Emergency Drills procedure includes the procedure to periodically drill the opening of emergency response facilities, all emergency response team members and the emergency response procedure.

H. As-Is Process Documentation

With this Motion, LUMA is also submitting to the Energy Bureau the "As-Is Process Documentation" with a description of "As-Is" processes to document how the grid is managed today. The As-Is Process Documentation provides further content on how LUMA will safely and efficiently operate the grid. RFI-LUMA-MI-21-0001-210511-PREB-009, Attachment 1. It includes LUMA's assessments on the gaps in current processes and provides further context on LUMA's proposed and revised System Operation Principles, the decision to develop written procedures, and the justifications and need to employ a phased approach with regards to developing and implementing the written operating procedures. The As-Is Process Documentation submitted today covers the following key areas of operations that, as discussed in this Section IV, *supra*, are elements of LUMA's System Operation Principles: (1) resource adequacy, (2) generation-transmission demarcation & metering requirements; (3) black start; (4) public reporting; (5) policy on reserves; (6) critical loads; (7) contingencies & system operating limits; (8) plant level agreements; (9) energy dispatch, scheduling and merit order; (10) balancing frequency and voltage; (11) forced outage response; and (12) emergency response execution.

The Revised System Operation Principles document, in conjunction with the draft operating procedures and the As-Is Process Documentation, show how LUMA will implement the aforementioned seven System Operation Principles that will govern LUMA's operation of the electric system.

VII. Submission of Information in Support of the System Operation Principles

With this Motion LUMA is submitting the documents and information requested in the May 11th Order. The table below identifies the documents and information that are being submitted today in compliance with the May 11th Order and identifies those that contain confidential information and that are being submitted today under seal of confidentiality. Under separate cover and expediently, within the next ten days, as allowed by Section A.2 of the Energy Bureau's Policy on Management of Confidential

Information," CEPR-MI-2016-0009, of August 31, 2016 as amended by the Resolution dated September 16, 2016, LUMA will be submitting a separate memorandum of law in support of its requests to file some of the aforementioned documents under seal of confidentiality.

#	Response	Subject	Pages in which Confidential Information is Found, if applicable	Summary of Legal Basis for Confidentiality Protection, if applicable
1	TC-RFI-LUMA-MI-21-0001-210510-PREB-001	Response to Request for Revised February 25th Petition and System Operation Principles	N/A	
1.1	TC-RFI-LUMA-MI-21-0001-210510-PREB-001 Attachment 1	System Operation Principles – Revised as of May 19, 2021	N/A	
2	TC-RFI-LUMA-MI-21-0001-210510-PREB-002	Revised Section 3.3 & Figure 3.3	N/A	
3	TC-RFI-LUMA-MI-21-0001-210510-PREB-003	Plant Level Agreements (PLA)	N/A	
4	TC-RFI-LUMA-MI-21-0001-210510-PREB-004	Discussion on Plant Level Agreements (PLA)	N/A	
5	TC-RFI-LUMA-MI-21-0001-210510-PREB-005	Emergency Response Plan (ERP)	N/A	

#	Response	Subject	Pages in which Confidential Information is Found, if applicable	Summary of Legal Basis for Confidentiality Protection, if applicable
6	TC-RFI-LUMA-MI-21-0001-210510-PREB-006	Draft Operational Procedures	Full text of the 14 draft operational procedures and portions of several appendices, *see* row 9.1 *infra*.	*See* Row 9.2, *infra*.
7	TC-RFI-LUMA-MI-21-0001-210510-PREB-007	Incorporation of the NERC Standard TPL-001-4	N/A	
8	TC-RFI-LUMA-MI-21-0001-210510-PREB-008	Timeline of SOP Procedures	N/A	
8.1	TC-RFI-LUMA-MI-21-0001-210510-PREB-008 Attachment 1	Procedure Development Team Status Tracking	N/A	
9	TC-RFI-LUMA-MI-21-0001-210510-PREB-009	Response on SOP Procedures		
9.1	TC-RFI-LUMA-MI-21-0001-210510-PREB-009 Attachment 1	As Is Documentation	Full text of the "As-Is Process Documentation"	Critical Energy Infrastructure Information 18 C.F.R. §388.113; 6 U.S.C. §§ 671-674. Sensitive Commercial Information and Trade Secrets protected under

#	Response	Subject	Pages in which Confidential Information is Found, if applicable	Summary of Legal Basis for Confidentiality Protection, if applicable
				Act 80-2011 and Act 122-2019.
9.2	TC-RFI-LUMA-MI-21-0001-210510-PREB-009 Attachment 2	SOP Procedures	Full text of the 14 draft operational procedures	Sensitive Commercial Information and Trade Secrets under Act 80-2011 and commercial trade secrets of third parties. These documents are confidential because they are working documents that LUMA has not disclosed to the public as they are still under consideration and undergoing revisions. These are confidential drafts and works in progress that have not been disclosed.

#	Response	Subject	Pages in which Confidential Information is Found, if applicable	Summary of Legal Basis for Confidentiality Protection, if applicable
			Appendix F to Legacy T&G Demarcation Procedure and Appendices A through G, H-1 and H-2, J-1 and J-2, L through V and X)(Demarcation of PREPA Generation Assets from the T&D System; Appendix B to Generator Capabilities Procedure; Appendix D to Policy on Reserves Procedure; Appendix C and D to Critical Loads Procedure; Appendix H to Energy Dispatch, Scheduling and Merit Order Procedure.	Critical Energy Infrastructure Information 18 C.F.R. §388.113; 6 U.S.C. §§ 671-674 ; and Confidential Information and proprietary and trade secrets of third parties protected under Act 80-2011 and Act 122-2019.

#	Response	Subject	Pages in which Confidential Information is Found, if applicable	Summary of Legal Basis for Confidentiality Protection, if applicable
1	TC-RFI-LUMA-MI-21-0001-210510-PREB-001	Response to Request for Revised February 25th Petition and System Operation Principles	N/A	
1.1	TC-RFI-LUMA-MI-21-0001-210510-PREB-001 Attachment 1	System Operation Principles – Revised as of May 19, 2021	N/A	
2	TC-RFI-LUMA-MI-21-0001-210510-PREB-002	Revised Section 3.3 & Figure 3.3	N/A	
3	TC-RFI-LUMA-MI-21-0001-210510-PREB-003	Plant Level Agreements (PLA)	N/A	
4	TC-RFI-LUMA-MI-21-0001-210510-PREB-004	Discussion on Plant Level Agreements (PLA)	N/A	
5	TC-RFI-LUMA-MI-21-0001-210510-PREB-005	Emergency Response Plan (ERP)	N/A	
6	TC-RFI-LUMA-MI-21-0001-210510-PREB-006	Draft Operational Procedures	Full text of the 14 draft operational procedures and portions of several	*See* Row 9.2, *infra.*

#	Response	Subject	Pages in which Confidential Information is Found, if applicable	Summary of Legal Basis for Confidentiality Protection, if applicable
			appendices, *see* row 9.1 *infra*.	
7	TC-RFI-LUMA-MI-21-0001-210510-PREB-007	Incorporation of the NERC Standard TPL-001-4	N/A	
8	TC-RFI-LUMA-MI-21-0001-210510-PREB-008	Timeline of SOP Procedures	N/A	
8.1	TC-RFI-LUMA-MI-21-0001-210510-PREB-008 Attachment 1	Procedure Development Team Status Tracking	N/A	
9	TC-RFI-LUMA-MI-21-0001-210510-PREB-009	Response on SOP Procedures		
9.1	TC-RFI-LUMA-MI-21-0001-210510-PREB-009 Attachment 1	As Is Documentation	Full text of the "As-Is Process Documentation"	Critical Energy Infrastructure Information 18 C.F.R. §388.113; 6 U.S.C. §§ 671-674. Sensitive Commercial Information and Trade Secrets protected under Act 80-2011 and Act 122-2019.

#	Response	Subject	Pages in which Confidential Information is Found, if applicable	Summary of Legal Basis for Confidentiality Protection, if applicable
9.2	TC-RFI-LUMA-MI-21-0001-210510-PREB-009 Attachment 2	SOP Procedures	Full text of the 14 draft operational procedures	Sensitive Commercial Information and Trade Secrets under Act 80-2011 and commercial trade secrets of third parties. These documents are confidential because they are working documents that LUMA has not disclosed to the public as they are still under consideration and undergoing revisions. These are confidential drafts and works in progress that have not been disclosed.
			Appendix F to Legacy T&G Demarcation Procedure and Appendices A through G, H-1 and H-2, J-1 and J-2, L through V and X)(Demarcation of PREPA Generation Assets from the T&D System;	Critical Energy Infrastructure Information 18 C.F.R. §388.113; 6 U.S.C. §§ 671-674 ; and Confidential Information and proprietary and trade secrets of third parties protected under

#	Response	Subject	Pages in which Confidential Information is Found, if applicable	Summary of Legal Basis for Confidentiality Protection, if applicable
			Appendix B to Generator Capabilities Procedure; Appendix D to Policy on Reserves Procedure; Appendix C and D to Critical Loads Procedure; Appendix H to Energy Dispatch, Scheduling and Merit Order Procedure.	Act 80-2011 and Act 122-2019.

WHEREFORE, LUMA respectfully requests that this Bureau **take notice** of the aforementioned, **accept** the revised System Operation Principles document, **accept** the information and documents submitted with this Motion, and **deem** that LUMA complied with May 11th Order. Finally, LUMA requests that the Energy Bureau approve the revised System Operation Principles.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 19th day of May 2021.

I hereby certify that I filed this Petition using the electronic filing system of this Energy Bureau and that I will send an electronic copy of this Petition to the attorneys for PREPA, Joannely Marrero-Cruz, jmarrero@diazvaz.law; and Katiuska Bolaños-Lugo, kbolanos@diazvaz.law.

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Exhibit 1

NEPR-MI-2021-0001

System Operations Principles Responses to May 11, 2021

Request for Further Information

List of Response Attachments

Response ID	Attachment Name	Description
RFI-LUMA-MI-21-0001-210511-PREB-001	Attachment 1	Revised SOP
RFI-LUMA-MI-21-0001-210511-PREB-008	Attachment 1*	Phase I & Phase II Procedure Timelines
RFI-LUMA-MI-21-0001-210511-PREB-009	Attachment 1	As-Is Process Documentation
RFI-LUMA-MI-21-0001-210511-PREB-009	Attachment 2	LUMA Procedures

*Note: * Denotes attachments that have been provided in Microsoft Excel format.*

Request Naming Convention

Please note that LUMA proposes to use the following naming convention to categorize and reference any requests made in this process and future processes, related to technical sessions, conferences or hearings.

Example:

RFI-LUMA -MI-21-0001-210511-PREB-001

Recipient of Request

Compressed Docket Number

RFI Receipt Date

Request Number

Request for Information

Initiator of Request

System Operations Principles
Docket ID: NEPR-MI-2021-0001

Information Response to PREB Resolution & Order

Reference: RFI-LUMA-MI-21-0001-210511-PREB-001

Subject: Revise February 25th Petition

Clarification:

Revise comprehensively the February 25 Petition to specifically show the principles that will govern LUMA's operation of the electric system followed by a clear and specific discussion on how LUMA intends to implement and/or achieve the actions fostered or pursued by the corresponding principle (i.e., the mechanisms or measures LUMA will use for such implementation).

Response:

Please refer to RFI-LUMA-MI-21-0001-210511-PREB-001 Attachment 1 for a revised version of the February 25 Petition inclusive of the below response:

As part of LUMA's Front-End Transition deliverables and as a Condition Precedent to Service Commencement, LUMA was required to 'prepare principles related to the dispatch of Power and Electricity' *OMA, Section 4.1(h)* (called the System Operation Principles) that are 'generally consistent with those set forth in Schedule 1 to Annex I'.

During O&M Services, LUMA will provide generation related power supply dispatch and management services in accordance with Section 5.13 of the OMA and the System Operation Principles, including:

- Dispatch, schedule and coordinate Power and Electricity from available generation assets and power related services
- Coordinate the scheduling of load requirements and Power and Electricity with IPPs pursuant to their respective contracts
- Implement and apply on a continuous basis on the relevant time basis applicable the System Operation Principles in order to ensure and coordinate the delivery of Power and Electricity
- Develop load and energy forecasts, scheduling requirements and capacity requirements taking into consideration unit outages
- Request and consider information with respect to operational constrains
- Perform other services related to dispatch, scheduling or coordination of Power and Electricity from existing and future available generation assets

This includes periodic review of System Operation Principles and submit revised System Operation Principles to this Bureau.

Implementing the System Operation Principles will consist of:

- Implementation of procedures over time

- Operator training
- Recording of data and findings as required by procedures
- Development of additional procedures, as necessary
- Review procedures for improvements and updates

LUMA discovered through the Gap Assessment that PREPA currently operates the system without written procedures and with minimal documentation, below industry standards. The development of procedures was not contemplated during the Front-End Transition. Rather than verifying, modifying and adding to an existing set of procedures, LUMA has undertaken the challenge of developing a large number of procedures from scratch for the Puerto Rico bulk electric system. LUMA recognized the benefit of accelerating the development of the higher priority procedures and began developing the procedures after submitting the System Operation Principles to the Energy Bureau.

In support of the operationalization of the System Operation Principles, Phase I procedures, listed and described below, will be completed in advance of June 1st, 2021 and will begin implementation soon after commencement. Phase II procedures will be completed in advance of December 31, 2021 and will begin implementation soon after January 1, 2022. Draft Phase I procedures are presented to the Bureau within RFI-LUMA-MI-21-0001-210511-PREB-009.

The following table lists each major principle and the corresponding procedures LUMA intends to utilize to implement that principle.

Principle	Procedure	Procedure Description
Planning	Load Forecasting - Phase II	Describes data input requirements, processing and data reporting to enable load forecast data reporting requirements.
	New Generation Interconnections - Phase I	Provides guidance to a new Generator through the application and agreement process including specific requirements and rights.
	Resource Adequacy Assessments - Phase I	Describes the process and procedure for establishing the amount of generating capacity required to supply load with sufficient reserve for reliable service.
	Retirements - Phase II	Describes the process for submitting a notification/requests for retirement of a unit to System Operator. The process will include reason for retirement, timing of the retirement and system impact study.
Standards	G&T Demarcation & Metering - Phase I	Describes the demarcation point between generation and transmission and the process and requirements necessary to properly provide for the demarcation point.
	Generator Capabilities - Phase I	Provides specific requirements and rules to Generators who operate on the Puerto Rico bulk system.
	Black Start - Phase I	Describes all the requirements for each unit's capability for a Black Start, including items such as ramp rate, time to be online, fuel capacity, available run time and other critical items for a successful Black Start.

Principle	Procedure	Procedure Description
	Telemetry - Phase II	Describes all the telemetry needed for generation, substations and transmission; also addresses needed fiber, back-up capabilities, testing requirements.
	Data / Cybersecurity - Phase II	Describes data submittal and maintenance rules and requirements for all interconnected Generators and commercial and industrial loads to maintain safe, secured and accurate data, which allow the Participant to continue in good standing with the System Operator and in accordance with all data requirements. Cybersecurity standards establish best practices that comply with LUMA requirements. These cybersecurity standards with also comply with all governmental and regulatory requirements.
	Root Cause & Lessons Learned - Phase II	Describes how to properly perform a root-cause analysis when an event occurs on equipment or personnel. Provides a detailed and thorough investigation into an event. Also describes how to properly communicate all lessons learned throughout the organization.
	Public Reporting - Phase I	Provides guidance regarding communication requirements to the regulator and public stakeholders. Also provides recommended metrics such as Estimated Time of Restoration to be reported and frequency for reporting.
	Performance Reporting - Phase II	Provides guidance regarding appropriate metrics including but not limited to safety, reliability, status of equipment, corrective and preventative maintenance and budgetary reporting.
	Stakeholder Management - Phase II	Provides guidance on the stakeholder process including an issues resolution process and process to develop and evaluate enhancements and other changes that impact multiple stakeholders.
Management of Reserves	Policy on Reserves - Phase I	Describes the rules, procedures and requirements for adequate availability of necessary resources that can be called upon to support reliability.
	Reducing Risk Exposure to Contingencies - Phase II	Provides guidance, rules and procedures that establish how to proactively monitor and react to contingencies and be able to analyze and react to system issues to prevent contingencies.
Contingency Planning	Critical Loads - Phase I	Identifies steps to maintain critical loads online, prevent load shedding and other switching steps to mitigate interruption of service to critical loads and critical-care customers. Overall policy to be developed by

Principle	Procedure	Procedure Description
		other groups outside System Operations, including Utility Transformation and Customer Service.
	Load Shedding - Phase II	Provides guidance regarding under-frequency conditions and sets limits and timeframes for deviation from these limits; defines procedures for load shedding or bus isolation, frequency limits and the steps to shed load in a safe and controlled manner.
	Contingency & System Operating Limits - Phase I	Describes contingencies and establishes operating limits with corrective actions and timeline for proper response.
Dispatch Operations	Energy Dispatch, Scheduling & Merit Order - Phase I	Procedure for the On Shift Operators to maintain adequate regulation, and system frequency and voltage within tolerances. Also describes responsibilities for switching and blocking and other daily shift responsibilities.
	Transmission Operations - Phase II	Transmission operations, including switching, communications and reporting describes all activities involved with the transmission system, including operations, maintenance, and planning.
	Plant-Level Agreements - Phase I	Template for all plant-specific technical and communication protocols for Generator interfaces with System Operator.
	Balancing Frequency & Voltage - Phase I	Describes how to manage capacity resources, monitor transmission and provide services within the Puerto Rico service territory.
	Demand-Side Resources (NWAs) - Phase II	Outlines the demand-side response rules, including non-wire alternatives, that could support reliability during high demand or unstable periods.
	Shift System Operator Training Requirements - Phase II	Addresses initial and ongoing training programs for On Shift Operators.
Outage Management	Scheduling Planned T&G Outages - Phase II	Provides operating philosophies and operating parameters with respect to outage planning and scheduling. Also addresses the reporting, analyzing and approval of scheduled generation and transmission outages.
	Forced Outage Response - Phase I	Describes actions to be taken in response to a forced outage to either generation or transmission. Includes communications responsibilities regarding cause of outage, outage duration and other steps to recover in a timely manner.
	Outage Execution & Closeout - Phase II	Describes process for executing work during outages, reporting t and steps for recovery and closeout of an outage.

Principle	Procedure	Procedure Description
Emergency Response	Emergency Response Execution - Phase I	Provides guidance for emergency response, including roles and responsibilities, system operating conditions, system restoration and blackout restoration.
	Emergency Drills - Phase II	Provides guidance on periodic drills of emergency response procedure.

LUMA

System Operation Principles

May 19, 2021

Executive Summary

This System Operation Principles (SOP) document, which LUMA is submitting to the Puerto Rico Energy Bureau (PREB), defines how the Bulk Power System in Puerto Rico will be managed upon LUMA's commencement of operations as per the terms of the Transmission and Distribution System Operation and Maintenance Agreement (OMA). The implementation of the SOP is an integral part of LUMA's plan to provide the operation and maintenance (O&M) services detailed in the OMA and to operate the transmission and distirbution (T&D) system. Key elements of the SOP are linked to activities proposed in LUMA's Initial Budgets and System Remediation Plan, and will support the improved service results targeted in the Performance Metrics.

The LUMA team reviewed publicly available manuals and procedures from several North American control areas and operators and spoke with their key personnel to develop best practices applicable to Puerto Rico, given the size of the Bulk Power System, generation portfolio and other characteristics. LUMA also visited all major operating plants and transmission centers and spoke with operators to develop an understanding of the existing system.

This SOP establishes rules and protocols to operate the system in accordance with Prudent Utility Practice and as economically as possible in consideration of available electricity supply, other system constraints and Power Purchase and Operations Agreement (PPOA) obligations. LUMA's role as the System Operator and the SOP are consistent with the legal structure and applicable regulatory requirements for the interaction between generation and the rest of the electrical system. LUMA's independence from ownership and operation of generation, and the System Operator's non-discriminatory dispatch of generation to satisfy reliability and economic objectives, will result in tangible customer benefits in the short and long terms.

LUMA will emphasize four key success factors for the operation and management of the Bulk Power System: safety, data-driven decision making, transparency and performance.

The SOP is organized to address the following functions.

SYSTEM & RESOURCE PLANNING

LUMA, the System Operator, will coordinate planning across the following areas: load forecasting, integrated resource planning, transmission planning, resource adequacy and other planning activities, including additions of renewable energy and storage to comply with Puerto Rico's Renewable Portfolio Standards (RPS) and Integrated Resource Plan (IRP) Modified Action Plan.

All new Generators will be required to comply with the SOP to enable the coordinated addition of new resources and reliable operations.

DATA MANAGEMENT

LUMA will develop procedures that stress the importance of data accuracy and data security so that the decisions made are informed, accurate and timely. LUMA will also define and stress adherence to strict protocols related to security and data management.

In response to the immediate and growing threats to computer systems and internet-connected devices, LUMA will develop a comprehensive strategy on cybersecurity for operations that conform with LUMA's overall cybersecurity program requirements.

System Operation Principles

ENERGY DISPATCH

LUMA will operate within security-constrained economic dispatch principles to dispatch sufficient resources. These resources could include generation, storage or other non-wire alternatives to control constraints and system impacts within clearly defined system limits while meeting system demand.

LUMA will define appropriate communication protocols for each situational need. Automation and control procedures will be used to increase each legacy generation plant's reliability and resilience, as well as the overall transmission system. The System Operator will implement defined rules for load-shed events.

OPERATING PARAMETERS

LUMA will define detailed rules and procedures for operating reserves with the goal of being able to operate even while losing the largest block of power being generated by any one facility at any point in time or losing a key transmission line without impairing system safety, stability and reliability.

Based on an understanding of the factors that could threaten or disrupt service, LUMA will define procedures for controlling steady-state power system stability, minimize disruptions caused by contingencies and establish transmission operating limits.

ENERGY MANAGEMENT SYSTEM

LUMA will implement a new energy management system to provide comprehensive, integrated visibility for the entire generation, transmission and distribution system so that the on-shift Operator can be prepared to react to an adverse event using real-time data.

OUTAGE SCHEDULING & REPORTING

All planned generation and transmission outages will be coordinated and approved through LUMA as System Operator. To ensure that outages are conducted in a controlled and orderly manner, LUMA will define a procedure for requesting and approving all scheduled generation and transmission outages on a rolling two-year basis.

EMERGENCY RESPONSE

Every power system experiences emergencies, and the Puerto Rico system has proven to be extremely vulnerable to weather– and infrastructure-related events. LUMA will implement and maintain a high level of emergency preparedness in accordance with Prudent Utility Practice, which includes defined plans and procedures and regular practice drills for all reasonably expected potential emergency scenarios.

Responsive System Operations are among the most critical elements of effective emergency response to natural disasters and other major events that threaten overall system stability and lives. As part of its Front-End Transition Services, LUMA is developing an Emergency Response Plan (ERP) that includes system operation activities during emergency events. LUMA will also establish a program to drill emergency procedures, including coordination with government agencies, other utilities and key stakeholders as defined in the LUMA Emergency Response Plan.

BALANCING FREQUENCY & SYSTEM IMPACTS

LUMA will develop procedures and schedules to enable the collection of secure, accurate and timely data so that responses to sub-optimal voltage and/or frequency situations are coordinated and timely. This enables the maintenance of system level voltages within established limits, thus preventing voltage collapse and system instability.

Contents

Tables & Figures

1.0 Defined Terms

Black Start: Black Start service enables the System Operator to designate specific generators, called Black Start Units, whose location and capabilities are required to re-energize the transmission system following a system-wide blackout.

Bulk Power System: The collection of interconnected transmission, generation and control systems necessary to operate an integrated transmission system while maintaining reliability, which includes 230 kV, 115 kV and 38 kV voltages.

Emergency Response Plan: LUMA's plan to respond to emergency events, including the definition of different levels of emergency, structure of command organization and other requirements.

Generator: For purposes of this SOP when used as a defined term, the entity that operates generating facilities and performs the functions of supplying energy to the Bulk Power System.

Incident Commander: The individual designated to have overall responsibility for LUMA's response during an Emergency Event.

Load Relief Warning: A tool used to warn the System Operator in advance of a contingency to coordinate future load shedding.

Load Shed Event: A system condition where end-use electrical consumption must be switched off to certain customer loads in order to bring the electrical system into balance.

Non-Discriminatory Treatment: The standard of care the System Operator must follow to make decisions that are not preferential or to the detriment of an asset because of the ownership of that asset and in accordance with the public policy pursued by Act No. 83 of May 2, 1941, as amended. While some decisions and scenarios may favor one asset to the detriment of another, if the decision was based upon the operational conditions and benefits to the system, it is considered non-discriminatory.

Operation and Maintenance Agreement (OMA): The Transmission and Distribution System Operation and Maintenance Agreement executed by the Puerto Rico Electric and Power Authority, the Puerto Rico Public-Private Partnerships Authority, LUMA Energy LLC and its subsidiary LUMA Energy ServCo, LLC, with an effective date of June 22, 2020.

Participant: For purposes of this SOP, an entity that is involved in either the transmission, generation or consumption of electricity, or otherwise has a commercial or business interest in some aspect of System Operation.

Planned Outage: The scheduled removal from service, in whole or in part, of a generating unit for inspection, maintenance or repair with approval of the System Operator.

Plant-Level Agreement (PLA): An agreement entered into between each Generator and System Operations that defines the technical and communication protocols that will exist between that plant and System Operations. A generic Plant-Level Agreement template is used as the starting basis, and then adjusted for any unique plant attribute or exception. The document is signed by both parties.

Power Purchase and Operations Agreement (PPOA): A contract executed between two parties, one who generates electricity (the seller) and one who purchases electricity (the buyer).

System Operation Principles

Prudent Utility Practice: At any particular time, the practices, methods, techniques, conduct and acts that, at the time they are employed, are generally recognized and accepted by companies operating in the United States electric transmission and distribution business as such practices, methods, techniques, conduct and acts appropriate to the operation, maintenance, repair and replacement of utility assets, facilities and properties. The full definition of Prudent Utility Practice is in the OMA.

Reliability Must Run (RMR): A generating unit that is slated to be retired by its owners but is needed to be available for reasons of reliability. Typically, it is requested to remain operational beyond its proposed retirement date until additional resources or other system upgrades are completed.

Resource Adequacy: The regulatory construct that is used to ensure that there are sufficient resources available to satisfy electrical demand under all but the most severe conditions.

System Operations: Refers to the LUMA organizational department responsible for the interaction and management of all aspects of the Bulk Power System to ensure safe and reliable electricity to supply the end-user customers.

System Operator: The entity that is responsible for the safe and reliable operations of the Bulk Power System and the decision making associated with use of existing equipment to generate, transmit and deliver energy. The OMA designates LUMA as the System Operator for Puerto Rico.

2.0 Introduction & Purpose

LUMA is submitting the System Operation Principles (SOP) to the Puerto Rico Energy Bureau (PREB) in accordance with the Transmission and Distribution System Operation and Maintenance Agreement (OMA) executed by the Puerto Rico Electric and Power Authority (PREPA), the Puerto Rico Public-Private Partnerships Authority (P3A), LUMA Energy and its subsidiary LUMA Energy ServCo, LLC (LUMA ServCo) (LUMA Energy and LUMA Servco, together LUMA).

This SOP document defines how the Bulk Power System in Puerto Rico will be managed upon LUMA's commencement of operations as per the terms of the OMA, and in the future to enable the System Operator to safely, reliably and efficiently operate the electrical system. The System Operator plays a critical role in the reliable and cost-effective operation of the electric grid. As the System Operator, LUMA will manage the real-time operation of the Bulk Power System including dispatch of power plants and flow of power over the electric system to maintain supply and demand in balance. LUMA will also carry out short– and long-term system planning and will manage the system under emergency conditions.

This SOP establishes rules and protocols to operate the system in accordance with Prudent Utility Practice and as economically as possible in consideration of available electricity supply, other system constraints and PPOA obligations.

2.1 Overall Framework for the System Operation Principles

The System Operations Principles describe how the Bulk Power System will operate. These Principles must also be consistent with a broader framework that includes contracts, procedures and agreements. The SOP must also conform with the laws of Puerto Rico, regulatory orders from PREB and permit requirements issued by various government agencies.

The key elements of the overall framework to implement the SOP are illustrated in table below.

Table 2-1. Elements of SOP Framework

Elements of Framework	Objectives

System Operation Principles	▪ Document that reflects Policy and Objectives including:
	  ▪ Safety and Reliability
	  ▪ Cost Effective Operations
	  ▪ Non-Discriminatory Behavior

Operating Procedures	▪ Define how SOP are implemented to ensure consistency across System ▪ Provide basis for to assess potential process improvements, and after-event lessons learned
Plant Level Agreements	▪ Document technical and communications requirements between each plant and Dispatch Center and notes any exceptions ▪ Ensures consistent operations by defining exactly what each plant is required to do

The SOP itself is reviewed and approved by PREB. P3A, as Administrator, and LUMA may from time to time propose changes to the SOP. LUMA shall submit these proposed changes to PREB for their review and approval. PREB has the right to approve, deny or propose modifications to the revised SOP.

2.2 Objectives of the System Operation Principles

The OMA designates LUMA as the System Operator and tasks LUMA with preparing the SOP related to the dispatch of power and electricity (OMA, Section 4.1 (d)) during the Front-End Transition Period. LUMA did so with input from PREPA and P3A. The SOP defines how the System Operator will operate the Bulk Power System in a safe and reliable manner. The System Operator will use Prudent Utility Practice to operate the electricity delivery system as economically as possible in consideration of the electricity supply system and PPOA obligations. (OMA, Annex I, Schedule 1, Introduction). This operational principle is also known as security-constrained economic dispatch.

As required in the OMA, the SOP are subject to the review and approval of first P3A and subsequently PREB. (OMA, Section 4.1 (h)). After LUMA commences operations, and from time to time, the SOP shall be subject to further review and update by LUMA and P3A based on "Applicable Law, load and energy forecasts, long and short-term system plans, proposed annual operating and maintenance plan[s], any limitation criteria, and the condition of the entire electric system." These proposed updates shall be submitted to PREB, which has the right to approve, deny or propose modifications to such revisions (OMA, Section 5.13(c)).

To achieve the defined objectives of the SOP, LUMA will emphasize four key success factors: safety, data driven decision making, transparency and performance. These are described in Table 2-2.

Table 2-2. Key Success Factors

Safety First	The health and safety of our employees and members of the public are our top priority
Data-Driven Decision Making	LUMA will use best practices to collect, validate and review data. System Operations decisions will use data to drive decisions, assess risk and report results In accordance with public policy mandates, LUMA will employ non-discriminatory treatment of all Generators and operate the Bulk Power System based on data available, Prudent Utility Practice, seeking the combined system objectives of reliability, resiliency and cost to customers
Transparency	LUMA will consider customer impacts and engage with stakeholders to ensure accountability LUMA will provide information to Bulk Power System Participants, stakeholders and the public to enable them to better understand the operation of the system
Performance	LUMA will apply technical and managerial expertise to develop solutions LUMA's Performance Metrics and System Remediation Plan have defined milestones to track performance and report on progress toward achievement of reliable and efficient System Operations

2.3 How the System Operation Principles Were Prepared

As required in the OMA, during the Front-End Transition Period LUMA reviewed relevant information and worked collaboratively to develop the SOP. Subject-matter experts (SMEs) brought to bear relevant professional experience in and technical knowledge of the following control areas and/or System Operators: AESO, ATCO, Hydro-Quebec, PJM, MAIN, PECO, Commonwealth Edison and NIPSCo. This information was combined with specific data and operating knowledge from PREPA's dispatch control center, System Operations and generation operations.

The LUMA team reviewed publicly available manuals and procedures from several North American control areas and System Operators to develop best practices applicable to Puerto Rico, given the size of the Bulk Power System, generation portfolio and other characteristics. LUMA also visited all major operating plants and transmission centers, reviewed generation and operations information and spoke with operators to develop an understanding of how the existing system is being operated and maintained, as well as reviewing current operational and other constraints. Several calls were held with personnel in operating North American transmission systems, who generously provided feedback to discuss interpretation of specific sections and rules, how these might be applied in Puerto Rico and the relative importance of those rules in their particular systems and applicability to Puerto Rico.

In preparing the SOP, LUMA SMEs followed the outline in Schedule 1 to Annex 1 of the OMA, which describes major areas of the SOP. LUMA based its work on information from PREPA (in particular the System Operations function and its dispatch of generation) and industry practice and principles employed in Bulk Power Systems in North America, including NERC guidelines such as NERC Standard TPL-001-4. LUMA carried out other diligence activities, including interviews and workshops with PREPA's generation and System Operations personnel, site visits to PREPA's major generation stations, review of historical and current data on generation and transmission dispatch, availability, outages and other information relevant to the Bulk Power System.

2.4 Assessment of Current System Operations

Management challenges, natural disasters and a lack of financial resources have contributed to an unreliable PREPA generation fleet and T&D system that have resulted in PREPA's inability to operate its generation and System Operations in accordance with Prudent Utility Practice. Key observations include:

- Inadequate safety practices resulting in operations that are often unsafe for employees and the public
- Inadequate operating reserves
- Poor situational awareness and integrated communications capability (e.g., AGC, telemetry, RTUs)
- An inflexible PREPA generation fleet with low availability and high forced outage rates and
- Generation units often operating outside of efficient output rates, consuming more fuel than would be the case for operations within the recommended range of output.

The main priority facing the System Operator is to bring the existing system to minimum industry standards as quickly as possible while supporting compliance with the Integrated Resource Plan (IRP) Modified Action Plan, which includes shifting from a fossil-based generation fleet to one made up predominantly (and eventually exclusively) of renewables and storage. Achieving this transformation while maintaining reliability, resiliency and reasonable costs requires:

- Significant upgrades to transmission and distribution equipment to bring the system up to an acceptable industry standard
- Implementation of new written policies and procedures along with training programs to prepare the System Operations group for a more robust system with a more diverse power generation portfolio and
- An assessment of how the more robust system will allow for the addition of renewable resources and how to effectively operate these new sources initially alongside the current fossil fleet and eventually without it, after the retirement of the legacy generation units.

The implementation of the SOP is an integral part of LUMA's plan to operate the System. Key elements of the SOP are linked to activities proposed in LUMA's Initial Budgets and the System Remediation Plan. Implementation of the SOP will support the improved service results targeted in the Performance Metrics. Some the programs aimed at the most effective improvements in System Operations include:

- Construction or refurbishment of buildings to house the main and back-up control centers and all ancillary support services
- Critical energy management system upgrades and the addition of relevant technology to operate the electric system safely and reliably
- Development of new strategies and mechanisms for energy balancing and operating reserves as well as new technology to efficiently integrate renewable energy, battery storage and demand response into the system and
- Other new procedures and strategies to operate the system reliably and efficiently.

These programs that address higher-impact deficiencies identified during LUMA's gap assessment are included in the System Remediation Plan. All costs for LUMA's System Operations described in this SOP, including improvement initiatives aimed at physical and IT upgrades for the first three years, are included in LUMA's Initial Budgets. As LUMA executes new investments and other programs focused on System Operations we will improve safety for employees and the public, increase reliability and resiliency, while providing stakeholders with greater transparency. These actions directly enable the modernization of the electric grid targeted in the IRP. In particular, implementation of a modern EMS is required in order to effectively integrate new renewable utility-scale energy sources and energy storage systems as required under the Modified Action Plan of the approved IRP and the RPS requiring 100% renewable energy supply. Overall, the implementation of this SOP will result in better service to customers and an electric grid that supports economic growth and improved quality of life in Puerto Rico.

2.5 System Operation Principles Will Support the Later Development of Procedures

There currently are no written procedures at PREPA that operators use to manage the Bulk Power System. What few documents exist are many years old and rarely, if ever, used. This lack of principles and procedures creates daily operational challenges and limits the ability to improve System Operations. This absence of documentation also damages the utility's credibility with the public and all Participants. Lacking a consistent understanding of what is supposed to happen, the public, customers and Participants in the Bulk Power System form the opinion that operations are generally arbitrary and often unfair.

These System Operation Principles provide a comprehensive guide for operations in Puerto Rico. In addition to these System Operation Principles, LUMA will develop as-is documentation of existing control center practices prior to the start of operations. LUMA has identified 12 critical operating procedures, which will be revised and re-written prior to commencement, and another 13 non-critical operating procedures that will be revised and re-written within 6 months of commencement. The remaining four operating procedures will be completed within 12 months after commencement. Operating procedures will be available in both English and Spanish.

The entire list of expected procedures is identified in Appendix A. LUMA has divided the development of specific procedures into three phases, which are illustrated below.

Figure 2-1. Procedure Development Plan

2.6 Building a Foundation for the Future

Puerto Rico has enacted legislation to move the electrical production currently derived from fossil fuels toward greener resources, and primarily to solar. As the production of electricity shifts from primarily using fossil-fired units to using primarily renewable resources, LUMA will develop processes to integrate additional variable and intermittent generation resources like solar and wind into the integrated system. Given these fundamental changes, the electrical power system in Puerto Rico will require specific strategies for adding generation and storage resources, retiring older generation units and managing a changing electrical system while maintaining reliability and resiliency at a reasonable cost. LUMA, as System Operator, will maintain and update procedures as several significant changes are expected over coming years. Any new PPOAs will need to be reviewed for consistency with these SOP.

Operating conditions on the Bulk Power System will evolve as LUMA implements the investment plan. Changes to the system will result from T&D line and substation improvements, new generation and storage resources being added from new competitive solicitations, and as regulatory policy drivers evolve. When these circumstances change, it is expected that the SOP will be reviewed and potentially revised in order to address a new context. LUMA will work with P3A and submit any revised SOP to PREB for its review and approval. (OMA Section 5.13 (c)). LUMA will communicate any revised SOP to Generators and stakeholders. LUMA will also update all related procedures and implement any new required training.

1 As-Is documentation of existing approach for daily management of grid
2 Critical operating procedures ready at start of LUMA operations; cover responses for key events and key decision-making processes
3 Non-critical operating procedures ready six months after operations start involves other departments or processes that will be changing from PREPA's current practices
4 Process/support procedures ready 12 months after operations start support process definition or documentation requirements, but do not deal with real-time decision-making and require extensive involvement of other departments
5 QA/configuration management coordinates updates to procedure and reviews other related procedures

3.0 System & Resource Planning

The planning function will cover both short-term and long-term planning horizons. Short-term planning functions will include load forecasting and other tools as may be developed from time to time. Long-term planning will include Resource Adequacy and Integrated Resource Planning.

3.1 Components of System & Resource Planning

LUMA will coordinate planning across the following areas.

LOAD FORECASTING

A single load forecast will be prepared for Puerto Rico, which will be carried out and coordinated by LUMA. The load forecast will be updated at least annually and shall form the basis of all related planning studies and financial projections. Additional econometric scenario analysis may be performed and will be coordinated internally and/or with other stakeholders by LUMA, as applicable. LUMA will also develop near-term load forecasts on a rolling weekly or monthly basis.

INTEGRATED RESOURCE PLANNING

The IRP is the reference for all long-term planning and resource projections. The IRP will be prepared by LUMA and is reviewed and approved by the PREB. LUMA will use operational data and assumptions derived from System Operations for forecasts, scenarios and analysis related to the IRP. A long-term capacity expansion plan will be a key output of the IRP process and will describe the long-term vision of how supply– and demand-side plans are to be integrated.

RESOURCE ADEQUACY

Resource Adequacy refers to maintaining adequate generating capacity (i.e., the capability to produce electric energy) to serve all system load. LUMA will coordinate a Resource Adequacy assessment at least annually. The assessment will focus on the Resource Adequacy of the system, considering Puerto Rico’s environment and other specific constraints, including potential investments in PREPA’s legacy generation fleet and prospective timing for retirement of some of these units. The assessment will analyze the current situation and a near-term planning horizon of approximately three to five years. This assessment will define gaps in Resource Adequacy levels compared to Prudent Utility Practice and applicable industry guidelines as appropriate for Puerto Rico. LUMA may also analyze near-term alternatives to address existing Resource Adequacy deficiencies and present options to PREB for review. As part of its work during the Front-End Transition, LUMA evaluated the effective availability of generation to meet demand. Overall, the system currently often has inadequate resources available to meet peak demand. This can be addressed by improvements to existing units and by adding additional resources, or a combination of both. LUMA’s evaluation on this matter is further discussed in Figure 5-1 of the Initial Budgets report.

OTHER PLANNING TASKS

Additional planning activities may be identified to support the provision of O&M Services or address needs identified for the Bulk Power System. Such activities may include transmission planning and the consideration of storage and non-wire alternatives.

3.2 Requirements for Interconnected Generation Resources

The System Operator will require all newly connected Generators to comply with the SOP and applicable procedures to maintain generator capability and controls related to generator frequency and voltage-support devices that are used for transmission support. The intent of this requirement is to standardize the rules by which interconnected facilities interact with the grid to ensure safe and reliable operations. This includes the ability to provide primary frequency response. For generators installed in a generator-plus-storage configuration (e.g., solar + storage), the ability to provide primary frequency response may be satisfied through the storage portion of the facility. In the case of Generators with existing PPOAs, these capabilities generally already exist. In the case of existing legacy PREPA generating plants, these capabilities will have to be installed on a timeline still to be discussed and resolved by PREB in order to support the requirements to unbundle generation. It is contemplated that discussions with these existing thermal assets may be required to agree on a reasonable accommodation. Key requirements which will need to be discussed with the operator of PREPA's generation units are listed below.

- Generators will need to maintain and calibrate all generator control systems to ensure that data used to control the electrical system and support short-term and long-term resource planning is accurate, secure and timely.
- Generators will need to agree to rules governing interconnected generation resources frequency and voltage system maintenance, specifically Automatic Voltage Regulators (AVR), governor controls, Automatic Generator Control (AGC) and other legacy controls and telemetry devices that support electrical system stability and/or provide valid data to the System Operator.
- Annual testing and verification of all interconnected generator control systems shall be carried out and evidenced.
- While PREPA's generation units do not currently meet the above requirements, PREPA, or the new operator of PREPA's generation assets, will have to work with LUMA to implement these measures or agree to other solutions that meet the defined objectives. Installation or implementation of solutions such as AGC for legacy plants will be subject to cost-benefit analysis that considers anticipated costs of investment and benefits to reliability, stability and other system impacts.

Each Generator will be required to provide regular reporting to the System Operator to comply with the SOP. Each Generator will be required to execute a Plant Level Agreement (PLA) with the System Operator which will itemize requirements and exceptions to the PLA template for their specific plant. The signed PLA will provide each plant with a clear identification of relevant technical and communication requirements of that plant. The PLA will not contain commercial or pricing information and will not be relied upon for any dispute resolution purposes. All commercial terms and conditions will be based upon the signed PPOA. The System Operator will execute all System Operations and control actions in accordance with signed PPOAs and the PLA. Existing PPOAs, or new agreements with a new generation operator for the legacy PREPA thermal plants, may need to be reviewed for consistency with the SOP, and will be handled on a case-by-case basis.

3.3 System Operator Will Coordinate All Generation Retirement Requests

When a generation owner or operator has determined it plans to retire a generation unit, a request will be sent to the System Operator. To ensure that this process conforms with a uniform procedure, the System Operator will define rules related to how that retirement request must be presented. Any such retirement decision shall be evaluated by the System operator and presented to the PREB for regulatory approval. In accordance with IRP reporting requirements to the Bureau, LUMA would provide quarterly updates and compliance reports associated with the plans for retirement of steam units, with specific reporting and compliance information requirements and dates as described in the Modified Action Plan. These regular updates and compliance reports would include all information on the status of conversion to synchronous condensing where applicable.

All retirement evaluations shall be carried out consistent with the approved IRP and The Modified Action Plan, and in accordance with required approvals. Topics in retirement evaluation include:

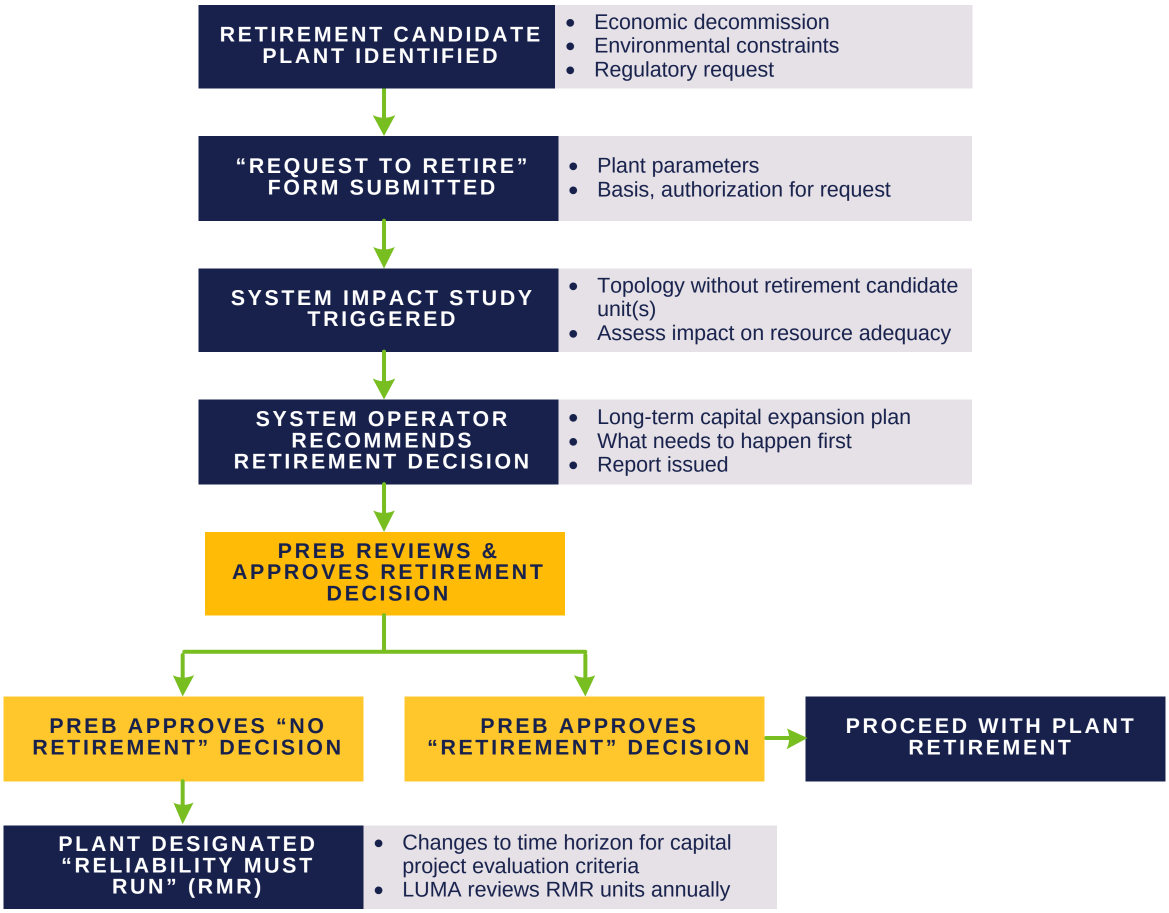
- Established schedule for retirement.
- Whether it should be aligned with conversion of some units to synchronous condensing operation.
- Whether applicable reliability milestones have been reached.
- Load reduction, new capacity and existing capacity reliability.
- Threshold capacity at which retirement of unit was slated to commence.

LUMA will consider the following associated issues in its analysis of retirement scenarios:

- Completed information and forms required to both carry out analysis of the requested retirement and to process the request,
- Date of requested retirement and findings from required system impact studies to determine overall system impact and any recommendation or requests regarding timing of retirement, and
- Whether the unit should be designated to be Reliability Must Run (RMR), as described below.

Figure 3-1 below describes the general process to retire a generating unit.

Figure 3-1. General Process to Retire a Unit



Note: "Reliability Must Run" can also be used at times to designate facilities that are necessary during certain operating conditions to maintain the security of the power system.

3.4 System Operator Will Coordinate Requests for New Generation & Transmission Interconnecting to the Transmission System

Any new Generator must submit a request to LUMA to connect a new generation unit to the integrated system. The new Generator will be required to follow the System Operator's new interconnection procedure. To ensure that this process conforms with a uniform procedure, the System Operator will define the procedures for how all new interconnection requests must be presented, studied and approved by LUMA. LUMA will follow the same process for interconnection of new transmission to the Bulk Power System. The System Operator will consider the following topics for new interconnection requests:

- Completed documentation and forms required for the interconnection request with all necessary signatures and approvals
- Results from system impact studies including any necessary upgrades or modifications to support the new generation or transmission asset
- Identification of which parties are responsible for all payments and the timing of such payments, including for system upgrade costs

- Timeline of expected milestones including requested in-service dates and possible coordination with any other known projects occurring in the same timeframe
- Electrical, controls, AGC, telemetry, performance and metering requirements

Interconnection procedures will be consistent with the IRP and other applicable energy policy — including the transition from fossil generation to renewables and utility-scale battery storage — while promoting the safe, reliable and cost-effective operation of the system.

4.0 Data Management

Data management and data security are critical to making informed decisions. The System Operator will develop procedures that stress the importance of data accuracy and data security so that decisions made are informed, accurate and timely. The System Operator will also define and stress adherence to strict protocols related to data security and data management.

4.1 System Procedures Will Reflect a Structured Mechanism to Coordinate Data-Related Issues

Data management is a vital component of stable and efficient operations. To proactively coordinate and manage data-related factors, system procedures will define roles and responsibilities, governance and reporting requirements.

Data management coordination will ensure that all personnel are trained on data management protocols. To adhere with industry practices, LUMA will prioritize accurate, complete and credible data, as well as comprehensive data validation. It will also establish data retention policies that allow critical data to be readily accessed to facilitate the timely investigation of incidents.

LUMA will develop a data redundancy standard and set requirements for proper data storage in multiple secure locations, as well as redundancy of the software operating system to maximize uptime and minimize disruptions to operation of the Bulk Power System.

Data and communication protocols and requirements of all parties will be managed for both secured and unsecured data transfer.

Administrative controls will be implemented related to future changes or industry standards:

- Information requirements for each Generator
- Telemetry specifically related to generation, transmission and distribution interconnected devices used in the management of the electrical system and other data capture requirements (SCADA)
- Infrastructure requirements to capture and communicate the data (RTUs)
- Maintaining alignment with evolving industry standards

4.2 System Operator Will Maintain Programs & Rules for Cybersecurity

In response to the immediate and growing threat of cyberterrorism and external hacking of systems and internet connected devices, the System Operator will develop a comprehensive strategy on cybersecurity.

System Operations will conform with LUMA's overall cybersecurity program requirements. The System Operator will define cyber-related requirements for assets and Participants on the system, which will reflect the type of Participant, the information system it has access to and the impact on LUMA's cybersecurity program.

The System Operator's cybersecurity program and rules will form part of LUMA's overall Cybersecurity Plan whose implementation will be managed by LUMA's IT department to ensure compliance with any Puerto Rico-specific standards as well as other applicable standards, including federal government agencies such as the Department of Homeland Security, the Department of Energy, the FBI and the Department of Defense.

To ensure that the cybersecurity programs and rules are properly developed and implemented, the System Operator will establish a cybersecurity management team. The cybersecurity management team will work closely with LUMA's IT department and will identify threats and develop the organization's strategy to manage cybersecurity risk with the goal of protecting and fortifying LUMA's systems by detecting events through 24/7 monitoring and responding quickly using well-defined plans.

In addition to preventing cybersecurity breaches, the LUMA team will establish processes than enable systems to recover quickly from such events, using multiple contingency plans to minimize impact and bring critical systems back online rapidly and safely.

5.0 Energy Dispatch

One core function of operating the system is energy dispatch, the process of balancing and allocating system resources based on customer load, economic operation, system reliability and stability and safety.

5.1 System Operator Will Dispatch Resources to Maximize System Reliability

System reliability depends on the collection of secure, accurate and timely data to allow the System Operator to efficiently and effectively allocate resources. The System Operator will operate within security-constrained economic dispatch principles to dispatch sufficient resources; these resources could include generation, storage or other non-wire alternatives to control constraints and system impacts within clearly defined system limits while meeting system demand.

The System Operator will define the appropriate communication protocols for each situational need. Automation and control procedures will be used to increase each plant's reliability and resilience as well as the overall transmission system. These include but are not limited to procedures for:

- Automatic Generation Control (AGC) on all generation units, as specified according to size
- Automatic Voltage Regulators (AVR) at all plants (if applicable)
- Transmission line loading and requested clearances
- Communications between the System Operator, generation and T&D personnel

A transmission-related constraint may require the reprioritization of resources. In such an event, the System Operator will either contact the specific generation units that are not available (if known) or send an automated call to all generation entities (e.g., blast call) requesting operational response. Such responses could include regulation, voltage or increased generation production. The System Operator may also manually re-dispatch generation, if necessary.

5.2 System Operator Will Define Dispatch Order

LUMA will require multiple dispatch scenarios for economic and reliability reasons. Generation dispatch will be prioritized in a sequence that considers both economics and reliability in order to provide for the lowest feasible cost, taking into consideration system security. To dispatch generation efficiently, the System Operator must have accurate and timely data on marginal costs and forecast marginal costs by generating unit.

The primary objective is to reliably operate the system, although economics and reliability must be weighed together by the System Operator when dispatching generation and managing contingencies throughout the system. Based on its determination for the sequence of dispatch and stability requirements, the System Operator will define criteria to guide how dispatch is sequenced.

Generator units will be committed and dispatched in economic merit order taking into account the security constraints of the system. However, while economic dispatch represents the goal, it may not always be feasible. System stability and reliability will drive real time daily dispatch decisions and may require changes to the initial dispatch sequence as the Operators manage dynamic changes to their loads and resources.

Any changes to the initial dispatch sequence shall be done in a way to minimize total cost where possible. Emergency situations can also justify other non-economic decisions on an as-needed basis.

Procedure compliance, improved system visibility and increased data availability will allow the on-shift Operator to dispatch system resources and assets in a way that trends towards lower costs as Resource Adequacy improves.

5.3 System Operator Will Operate the System in a Non-Discriminatory Manner to Achieve System Objectives Consistent with Individual PPOAs

In accordance with public policy mandates of protecting the trust of customers and stakeholders in the management and handling of the grid, to avoid arbitrary discrimination in the dispatch of energy and to pursue independence in the dispatch decision process, all system resources will be treated in a non-discriminatory manner that does not consider asset ownership in the decision-making process. The primary decision criteria will be to produce a more reliable system and lower costs to consumers, subject to security constraints on the system. Dispatch sequences will be defined to optimize overall production and PREPA's legacy plants will not receive preferential status over other independent power projects on the system.

When some operating dispatch decisions could achieve the same system benefit, the System Operator will select the option that is least costly to consumers when possible, considering both reliability and system security.

The System Operator will dispatch all plants consistent with the terms of their PPOAs and shall record and tabulate all production data required to support monthly costs invoiced by the Generator under its PPOA. LUMA will use production data to validate the invoice and payment requirements under the commercial terms of PPOAs.

LUMA plans to increase the level of involvement and dialogue with Generators and other Participants in the system compared with current practice to promote industry best practices:

- LUMA will prepare a written report on the progress of transformation of the systems operation function and will communicate this progress to Generators interconnected to the system
- LUMA will provide increased information to the public to enable energy developers to better understand the operation and constraints of the existing system and to encourage greater deployment of renewables, non-wire alternatives and emerging technology solutions
- LUMA will place information on its website to better communicate various aspects of System Operations that could provide developers with additional information, which could inform their development projects.

5.4 System Operator Will Define Actions to Address Insufficient Generation Supply & Transmission Resources

The System Operator will analyze and evaluate the overall resource inventory of the system and determine a course of action that will maintain system integrity. Specific areas to be considered include limiting thermal overloads and ensuring network operating frequency and voltage levels.

If there are insufficient generation and/or transmission resources available to control constraints within established procedures, the System Operator will implement a defined response plan to impacted areas across the system and issue a Load Relief Warning, which will be communicated to all Generators and demand-side resources.

The System Operator will implement defined rules for Load-Shed Events to minimize threats to employee and public safety, equipment damage and customer impact. LUMA will identify which critical loads will remain online when possible in coordination with the LUMA critical loads policy and LUMA's Emergency Response Plan (ERP).

The System Operator can manually dispatch generation to minimize or mitigate resource shortfalls during Emergency Conditions if there are insufficient resources as defined in established procedures. Voltage reduction and other strategies may be used in accordance with procedures and current operating conditions.

6.0 Operating Parameters

The following section outlines high-level policies related to the operation of the system. The objective of these policies is to ensure stable, safe operations and actions to be taken including defining resources to be used when operations fall outside of these ranges.

6.1 System Operator Will Establish Policies on Reserves & Line Loading

The System Operator will define detailed rules and procedures on reserves. Operating reserves are electricity supplies that are not currently being used but that can be made available in a timely manner in the event of an unexpected loss of generation or a transmission event. The goal of having adequate reserves is to be able to operate the system during a G-1 or a T-1 event, meaning that losing the largest generating unit or losing a key transmission line does not impair system safety, stability and reliability.

These policies will include specifications to be applied to existing generators, storage and other non-wire alternatives and the mechanism to calculate reserves.

The System Operator will manage all contingencies on the system to mitigate or reduce system interruptions. A contingency is defined as an event, usually involving the loss of one or more elements in generation or transmission, that affects the power system's ability to serve load. The System Operator will define appropriate contingency reserve requirements to address smaller load and generation imbalances by using regulation connected devices such as reactors and capacitors.

The System Operator will define appropriate operating reserves requirements to address larger load and generation imbalances. Spinning reserves should be used to stabilize the system immediately following a disturbance and to provide coverage of the largest unit on the system. Non-spinning, fast start reserves should be used to return the frequency and voltage to prescribed limits after spinning reserves are used.

The reserve policies will also consider the timeliness of receiving reserves. The System Operator will define appropriate reserve requirements to restore the spinning reserves after the disturbance, once the system has been restored to pre-contingency levels.

6.2 System Operator Will Define Procedures to Control Steady-State Power System Stability to Avoid a Puerto Rico-Wide Blackout Condition

The System Operator will define procedures for controlling and preserving steady state power system stability based on an understanding of the factors that could threaten or disrupt service. Power system stability is the ability of an electric power system to regain a state of operating equilibrium after being subjected to a physical disturbance for a given initial operating condition. Steady-state power system stability entails most of the system variables being bounded within certain bandwidths such that the system remains intact after a disturbance. Factors that can affect steady-state stability include:

- Unbalanced loads
- System disturbances including loss of a transmission line or lines
- Loss of one or more generation units
- Loss of major equipment
- System faults
- Low voltage operation
- Frequency regulations malfunction
- Automatic Load-Shed Event recovery

6.3 System Operator Will Develop Action Plans to Reduce Risk Exposure to Contingencies

To minimize disruptions to the system caused by contingencies, the System Operator will establish a baseline of consistent service based on dispatch instructions and provide guidance when generating units have deviated from those instructions. Many of these parameters already exist for plants under existing PPOAs but may need to be developed for legacy thermal units. Development of these Plant-Level Agreements for legacy plants will need to balance the need to mitigate risks against the cost required for such risk mitigation.

The System Operator will develop local load-relief procedures that minimize the impact of Load-Shed Events. These procedures will require operators to maintain accurate reporting of generation and transmission capabilities and set system operating limits (SOL) including generating and thermal transmission limits.

The procedures will also establish a requirement for contingency planning to assist the on-shift Operator in switching transmission lines, dispatching generation units or a combination of actions to mitigate or minimize overall system impact.

6.4 System Operator Will Develop a Set of Transmission Operating Limits

In order to keep the power system operating within safe, stable and reliable levels of energy flow, the System Operator will define transmission operating limits that reflect the appropriate facility rating, voltage stability and transient stability.

The System Operator must be aware when line flows approach a limit on both an actual and a contingency basis, and perform the following:

- Analyze the situation or contingency
- Develop a plan to mitigate or minimize the impact of the situation/contingency
- Implement the plan
- Check to see desired effects have been achieved

To avoid a cascading series of events, the System Operator must evaluate and prioritize multiple simultaneous problems and contingencies and prioritize the order in which to address them. The System Operator will implement controlling actions in the order necessary to avoid other violations.

7.0 Energy Management System

A robust energy management system is critical to optimizing the efficient, safe and reliable operation of the Bulk Power System. One of the fundamental elements of Prudent Utility Practice is a fully functioning energy management system (EMS). PREPA's EMS is no longer supported by the vendor and does not have the functionality to adequately manage and control a modern grid with a large portion of renewable resources. The System Operator will implement a new EMS to provide comprehensive, integrated visibility into the entire generation, transmission and distribution system so that the on-shift Operator can be better prepared to react to an adverse event using real-time data. Implementation of the new EMS is described as part of LUMA's System Remediation Plan.

The EMS will provide operators with situational awareness to enable appropriate decisions in response to system events. The EMS also allows development of prescribed actions to assist in mitigating outages or minimizing outage durations.

The EMS will enable the System Operator to verify that system operation contingency definitions are correct. Telemetry errors from generation and transmission will be identified and logged, and a resolution will be coordinated. The System Operator will also investigate situational issues to resolve potential contingencies.

By coordinating generation and transmission data, the System Operator can model and determine the most conservative solution to emergent issues and minimize impact on both generation and transmission. On-shift Operators can then implement these action plans to resolve discrepancies. LUMA will implement processes to confirm that the on-shift Operator resolves discrepancies within prescribed operational and time limits.

8.0 Outage Scheduling & Reporting

System outages occur for a variety of reasons, both planned and unplanned. The System Operator will prepare for each possible outage and perform an analysis of each event after it occurs.

8.1 System Operator Will Manage All Generation & Transmission Planned Outages

All planned generation and transmission outages must be coordinated and approved through the System Operator. To ensure that outages are conducted in a controlled and orderly manner, the System Operator will define a procedure for requesting and approving all scheduled generation and transmission outages on a rolling two-year basis.

8.2 System Operator Will Develop Planned Outage Requirements

The procedure will include:

- Request forms
- Requirements regarding timing for submittal
- System impact study
- Outage duration
- Restoration plans
- Communication and coordination plan between generation and transmission

Outage scheduling will be done with a minimum of two years for all Planned Outages of all major generation units.

The System Operator will review all requests for transmission or equipment outages to determine system impact on other Generators, transmission lines and/or equipment. The System Operator will manage generation and equipment outages to maintain proper system configuration, maximize system resilience and resolve all out-of-service conditions in a timely manner. LUMA processes will prescribe coordination between field activities and System Operations to plan for outages required for capital projects and maintenance activities.

8.3 System Operator Will Develop Unplanned & Forced Outage Management Procedures

The System Operator will have command and control authority over forced outage responses consistent with existing PPOAs and will lead the implementation of immediate response and corrective actions regarding critical loads. In addition, the System Operator will define rules for reporting and updating dispatch sequence during forced outages, determine estimated outage duration and implement restoration plans.

To minimize the impact and disruption of forced outages, the System Operator will develop procedures that define the appropriate course of action in each area of operation. These procedures will provide guidance to generation and transmission operators on their responses to forced outages.

8.4 Prudent Utility Practice Requires Processes & Procedures to Address Analyzing & Learning from System Events

The System Operator will develop a process to investigate and analyze system events in generation and transmission and subsequently perform a root-cause analysis (RCA) of significant system events to identify causal and contributing factors.

By performing a thorough analysis of systems, human performance, work processes, materials, procedural compliance, environmental conditions and physical plant and management systems, the System Operator can identify the factors, both individually and collectively, that contributed to the event. The RCA will focus on the lessons learned from the event and on improving the reliability of the system and should not be viewed as a punitive exercise. Generators (and/or customers as appropriate) will be required to share their data and analysis on system events as requested by the System Operator.

The System Operator will share all lessons learned across the organization and create communication standards to ensure that the learning messages are well understood and that corrective actions are taken. Subject to system conditions and constraints, the System Operator will implement the corrective actions in a timely fashion to improve overall system reliability.

9.0 Emergency Response

Every power system experiences emergencies and the Puerto Rico system has proven extremely vulnerable to weather and other emergency events. The System Operator will implement and maintain a high level of emergency preparedness in accordance with Prudent Utility Practices.

9.1 System Operator Will Implement an Emergency Response Plan

Responsive System Operations are among the most critical elements of effective emergency response to natural disasters and other major events that threaten overall system stability and could potentially result in prolonged outages leading to possible life-threatening events in communities. As part of its Front-End Transition Services, LUMA is developing an Emergency Response Plan (ERP) that includes system operation activities during emergency events. (OMA, Section 4.2 (g)). The ERP will include:

- Classification of events and emergencies
- Appropriate response based on classification
- Emergency command center (ECC) to be manned during an event
- Incident commander and roles and responsibilities for an emergency response organization consistent with FEMA guidelines
- Procedures that define proper responses to events and emergencies and after-action reviews

LUMA will establish a program to drill emergency procedures, including coordination with government agencies, other utilities and key stakeholders. LUMA's Performance Metrics include metrics that will be used during major outage events to track LUMA's performance during emergencies, provide key data and allow for continuous improvement of emergency procedures and activities.

9.2 System Operator Will Develop a Prioritized List of Actions to Take in Emergency Situations

The System Operator will prepare a list of actions to be followed during significant system events and disturbances to the electric system. The list will include preventive and corrective actions that can be taken to mitigate outages and/or restore the system in situations such as:

- Storms and hurricanes
- Earthquakes
- Tsunamis
- Equipment malfunctions
- Operating errors

The list will include other major system disturbances which could result in cascading events, such as:

- Electrical islanding
- Load shedding
- Trip of generation
- Full or partial blackout

The risk mitigation plan should reflect the degree of advance warning or expected severity of the approaching event. LUMA will use industry best practices including the development of a damage prediction model and timely post-event damage assessment to support restoration activities. The list of events above is illustrative and not intended to be exhaustive.

9.3 System Operator Will Develop & Implement Black Start & System Restoration Procedures

When part or all of the system has experienced a loss of power and a blackout condition has been declared by the System Operator, the System Operator will be required to follow Black Start procedures to restore service. The System Operator will create and maintain a defined set of procedures that dictate actions to restore the system from blackout condition.

These procedures will identify generation equipment that is able to start without an outside electrical supply, as well as the proper steps to energize defined portions of the transmission system. The System Operator will create a desktop procedure for on-shift Operators to select which units to restore first in order to restore the system safely.

At all times, the System Operator should be in control of start and dispatch of all generation units connected to the system. Emergency operating conditions shall be at the sole discretion of the on-shift Operator.

During a blackout, the System Operator will follow its Black Start procedures to get the first generation unit restored. Upon restoring that first generation unit, the System Operator will commence actions to safely energize portions of the transmission system in coordination with the restart of other generation resources.

System restoration will be drilled annually. As part of its regular planning, the System Operator will give special attention to the fragility of the system during a system restoration. The process should carefully manage frequency control, voltage control and ramping time, along with avoiding overcurrent conditions and cold load pickup situations.

9.4 LUMA Will Determine How to Respond to Short-Term Resource Adequacy Issues

The System Operator will need to address any shortfalls in Resource Adequacy. In response to this, LUMA will develop a plan for alternatives to serve as a near-term bridge (less than three years) to achieve Resource Adequacy. This plan could include, but not be limited to:

- Non-wire alternatives
- Demand-side management
- Distributed generation
- Storage
- Demand response
- Temporary or mobile generation
- Temporary or mobile substations

LUMA will meet with PREB on an annual basis as defined in OMA section 5.13(d)(iii) to review and assess prepared analyses, demand projections and existing generation supply to discuss the current and projected Resource Adequacy in the system. LUMA will indicate whether additional resources are needed, along with other potential responses to a projected shortfall in resources compared to demand. At that time, LUMA will identify potential solutions, trade-offs and technical considerations in selecting a path to restore Resource Adequacy.

9.5 System Operator Will Administer the LUMA Procedure for Critical Loads

The System Operator will implement LUMA's policy regarding consideration of critical loads during emergencies. Procedures for prioritizing critical loads for restoration of service to sustain essential services and maintain community functionality are included in the ERP. Critical loads may include but are not limited to the following critical facilities:

- Hospitals
- Police, fire and other first responder facilities
- Utilities, including water and telecommunications
- Government facilities providing lifeline services to communities.

LUMA will also review policy regarding consideration of critical-care customers, which may include residential facilities and individual residences that have life-support equipment. Factors to consider include the process for identifying critical-care customers, validation of the list for accuracy and updates of datasets for use by on-shift Operators.

10.0 Balancing Frequency & System Impacts

Using a hierarchy of methods and measures, the System Operator will maintain a balanced system and minimize impacts wherever possible.

10.1 Systems Operations Will Implement Prudent Utility Practice to Maintain Proper Frequency & Voltage

The System Operator will develop procedures and schedules to test generators, reactors and capacitors connected to the system to provide current performance data. These procedures will enable the collection of secure, accurate and timely data, so that the on-shift Operator will be able to optimize responses to sub-optimal voltage and/or frequency situations.

Critical frequency support elements include voltage and frequency support. Voltage support is required to maintain system level voltages within established limits, thus preventing voltage collapse and system instability. Frequency support is required to support stable frequency on the synchronized system and to maintain continuous load and resource balance by employing automatic response functions in response to deviations from normal operating frequency.

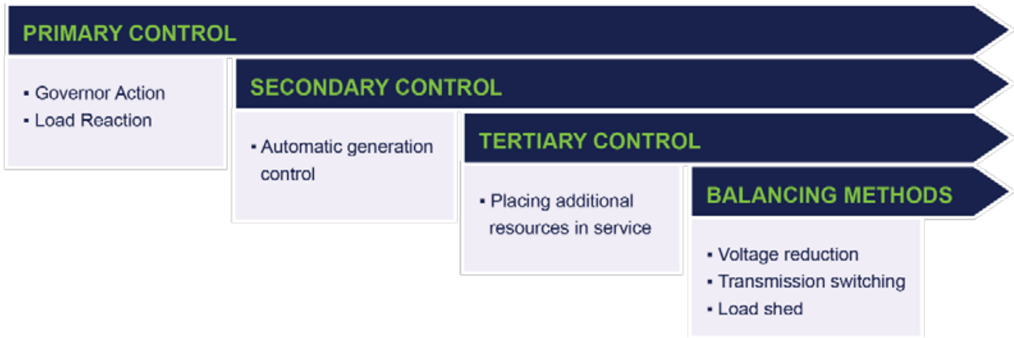
The on-shift Operators must have the capability to raise or lower generation or load, either automatically or manually, under normal and post-contingency conditions.

10.2 Controlling Actions for Proper Voltage & Frequency

Figure 10-1 illustrates an operator's typical hierarchy of control to maintain frequency and voltage.

System Operation Principles

Figure 10-1. Typical hierarchy of control to maintain frequency and voltage



PRIMARY RESPONSE: The governor in each operating generator will respond to subtle frequency variations

SECONDARY RESPONSE: Automatic generation control is required to allow the System Operator to control the system during a G-1 event

TERTIARY RESPONSE: When the primary and secondary responses are not capable of rectifying the system disturbances, the System Operator could add additional generation, typically quick start

BALANCING METHODS: **Voltage Reduction:** System Operator will develop a voltage reduction plan to avoid or limit load shed
Load Shed: As a last resort, System Operator could take actions that safely unload the transmission system

Appendix A: Appendices

A.1 List and Description of Procedures for System Operator

As part of LUMA's Front-End Transition deliverables and as a Condition Precedent to Service Commencement, LUMA was required to 'prepare principles related to the dispatch of Power and Electricity' *OMA, Section 4.1(h)* (called the System Operation Principles) that are 'generally consistent with those set forth in Schedule 1 to Annex I'.

During O&M Services, LUMA will provide generation related power supply dispatch and management services in accordance with Section 5.13 of the OMA and the System Operation Principles, including:

- Dispatch, schedule and coordinate Power and Electricity from available generation assets and power related services
- Coordinate the scheduling of load requirements and Power and Electricity with IPPs pursuant to their respective contracts
- Implement and apply on a continuous basis on the relevant time basis applicable the System Operation Principles in order to ensure and coordinate the delivery of Power and Electricity
- Develop load and energy forecasts, scheduling requirements and capacity requirements taking into consideration unit outages
- Request and consider information with respect to operational constrains
- Perform other services related to dispatch, scheduling or coordination of Power and Electricity from existing and future available generation assets

This includes periodic review of System Operation Principles and submit revised System Operation Principles to this Bureau.

Implementing the System Operation Principles will consist of:

- Implementation of procedures over time
- Operator training
- Recording of data and findings as required by procedures
- Development of additional procedures, as necessary
- Review procedures for improvements and updates

LUMA discovered through the Gap Assessment that PREPA currently operates the system without written procedures and with minimal documentation, below industry standards. The development of procedures was not contemplated during the Front-End Transition. Rather than verifying, modifying and adding to an existing set of procedures, LUMA has undertaken the challenge of developing a large number of procedures from scratch for the Puerto Rico bulk electric system. LUMA recognized the benefit of accelerating the development of the higher priority procedures and began developing the procedures after submitting the System Operation Principles to the Energy Bureau.

In support of the operationalization of the System Operation Principles, Phase I procedures, listed and described below, will be completed in advance of June 1st, 2021 and will begin implementation soon after commencement. Phase II procedures will be completed in advance of December 31, 2021 and will begin implementation soon after January 1, 2022. Draft Phase I procedures are presented to the Bureau within RFI-LUMA-MI-21-0001-210511-PREB-009.

The following table lists each major principle and the corresponding procedures LUMA intends to utilize to implement that principle.

System Operation Principles

Principle	Procedure	Procedure Description
Planning	Load Forecasting - Phase II	Describes data input requirements, processing and data reporting to enable load forecast data reporting requirements.
	New Generation Interconnections - Phase I	Provides guidance to a new Generator through the application and agreement process including specific requirements and rights
	Resource Adequacy Assessments - Phase I	Describes the process and procedure for establishing the amount of generating capacity required to supply load with sufficient reserve for reliable service
	Retirements - Phase II	Describes the process for submitting a notification/requests for retirement of a unit to System Operator. The process will include reason for retirement, timing of the retirement and system impact study
Standards	G&T Demarcation & Metering - Phase I	Describes the demarcation point between generation and transmission and the process and requirements necessary to properly provide for the demarcation point
	Generator Capabilities - Phase I	Provides specific requirements and rules to Generators who operate on the Puerto Rico bulk system
	Black Start - Phase I	Describes all the requirements for each unit's capability for a Black Start, including items such as ramp rate, time to be online, fuel capacity, available run time and other critical items for a successful Black Start
	Telemetry - Phase II	Describes all the telemetry needed for generation, substations and transmission; also addresses needed fiber, back-up capabilities, testing requirements

System Operation Principles

Principle	Procedure	Procedure Description
	Data / Cybersecurity - Phase II	Describes data submittal and maintenance rules and requirements for all interconnected Generators and commercial and industrial loads to maintain safe, secured and accurate data, which allow the Participant to continue in good standing with the System Operator and in accordance with all data requirements. Cybersecurity standards establish best practices that comply with LUMA requirements. These cybersecurity standards with also comply with all governmental and regulatory requirements.
	Root Cause & Lessons Learned - Phase II	Describes how to properly perform a root-cause analysis when an event occurs on equipment or personnel. Provides a detailed and thorough investigation into and event. Also describes how to properly communicate all lessons learned throughout the organization.
	Public Reporting - Phase I	Provides guidance regarding communication requirements to the regulatory and public stakeholders. Also provides recommended metrics such as Estimated Time of Restoration to be reported and a frequency for reporting
	Performance Reporting - Phase II	Provides guidance regarding appropriate metrics including but not limited to safety, reliability, status of equipment, corrective and preventative maintenance and budgetary reporting.
	Stakeholder Management - Phase II	Provides guidance on the stakeholder process including an issues resolution process and process to develop and evaluate enhancements and other changes that impact multiple stakeholders.
Management of Reserves	Policy on Reserves - Phase I	Describes the rules, procedures and requirements for adequate availability of necessary resources that can be called upon to support reliability.

System Operation Principles

Principle	Procedure	Procedure Description
	Reducing Risk Exposure to Contingencies - Phase II	Provides guidance, rules and procedures that establish how to proactively monitor and react to contingencies and be able to analyze and react to system issues to prevent contingencies.
Contingency Planning	Critical Loads - Phase I	Identifies steps to maintain critical loads online, prevent load shedding and other switching steps to mitigate interruption of service to critical loads and critical-care customers. Overall policy to be developed by other groups outside System Operations, including Utility Transformation and Customer Service.
	Load Shedding - Phase II	Provides guidance regarding under-frequency conditions and sets limits and timeframes for deviation from these limits; defines procedures for load shedding or bus isolation, frequency limits and the steps to shed load in a safe and controlled manner.
	Contingency & System Operating Limits - Phase I	Describes contingencies and establishes operating limits with corrective actions and timeline for proper response.
Dispatch Operations	Energy Dispatch, Scheduling & Merit Order - Phase I	Procedure for the On Shift Operators to maintain adequate regulation, and system frequency and voltage within tolerances. Also describes responsibilities for switching and blocking and other daily shift responsibilities.
	Transmission Operations - Phase II	Transmission operations, including switching, communications and reporting describes all activities involved with the transmission system, including operations, maintenance, and planning.
	Plant-Level Agreements - Phase I	Template for all plant-specific technical and communication protocols for Generator interfaces with System Operator.
	Balancing Frequency & Voltage - Phase I	Describes how to manage capacity resources, monitor transmission and provide services within the Puerto Rico service territory.

System Operation Principles

Principle	Procedure	Procedure Description
	Demand-Side Resources (NWAs) - Phase II	Outlines the demand-side response rules, including non-wire alternatives, that could support reliability during high demand or unstable periods.
	Shift System Operator Training Requirements - Phase II	Addresses initial and ongoing training programs for On Shift Operators.
Outage Management	Scheduling Planned T&G Outages - Phase II	Provides operating philosophies and operating parameters with respect to outage planning and scheduling. Also addresses the reporting, analyzing and approval of scheduled generation and transmission outages.
	Forced Outage Response - Phase I	Describes actions to be taken in response to a forced outage to either generation or transmission. Includes communications responsibilities regarding cause of outage, outage duration and other steps to recover in a timely manner.
	Outage Execution & Closeout - Phase II	Describes process for executing work during outages, reporting t and steps for recovery and closeout of an outage.
Emergency Response	Emergency Response Execution - Phase I	Provides guidance for emergency response, including roles and responsibilities, system operating conditions, system restoration and blackout restoration.
	Emergency Drills - Phase II	Provides guidance on periodic drills of emergency response procedure.

A.2 Generating capacity data operating characteristics to be compiled for all units

Table A-1. Generation Data

Data Element	Unit
Plant / unit name	—
Location	—
Company	—
Contact information	—
Phone and email	—
Commercial operation date	—
Name plate rating	MW
Max output	MW
Total gross energy	MW
Aux load (how connected)	MW/MVAR
Station service load (how connected)	MW/MVAR
Leading under-excited	MVAR
Lagging over-excited	MVAR
Single line diagrams	Attachment

Intermediate Units		Major Generation Units		Independent Power Plants
Cambalache 1	Aguirre CC1-3	Palo Seco 1	San Juan 9	EcoEléctrica
Cambalache 2	Aguirre CC1-4	Palo Seco 3	San Juan 10	AES
Cambalache 3	Aguirre ST-1	Palo Seco 4	Aguirre 1	Solar
Mayaguez 1	Aguirre CC2-1	San Juan 5	Aguirre 2	Wind
Mayaguez 2	Aguirre CC2-2	San Juan 6	Costa Sur 5	Landfill Gas
Mayaguez 3	Aguirre CC2-3	San Juan 7	Costa Sur 6	**PREPA Hydro**
Mayaguez 4	Aguirre CC2-4	San Juan 8		—
Aguirre CC1-1	Aguirre ST-2			
Aguirre CC1-2				

Appendix B: Glossary of Technical Terms

The following general technical terms are used in this report. They are provided below for convenience.

Automatic Generation Control (AGC): AGC is a system for adjusting the power output of multiple generators at different power plants, in response to changes in the overall system load. AGC is used in real-time control to match the area generation changes to area load changes to keep frequency at nominal value. For successful operation of the power system, the load must be fed with constant voltage and frequency.

Automatic Voltage Regulator (AVR): A generator control device that adjusts voltage output from a generator to support system voltage.

Blackout: A total failure of the Bulk Power System or a large portion thereof. While the criteria for "large" can vary by country and power system, this SOP has designated a threshold of 50,000 customers and 300 MW as "large."

Bus: A point of interconnection to the system where power produced becomes available for transmission. Also, an electrical conductor that serves as a common connection for two or more electrical circuits.

Capacitor: An electronic component that stores an electric charge and releases it when required. When connected to the power system, capacitors will provide reactive power and thereby increase the voltage on the system.

Capacity Resource: A generating unit, demand resource, energy efficiency resource or aggregate resource that has obligated itself to deliver electricity or reduce load whenever the System Operator determines it is needed to meet power system emergencies.

Cascading Event: An occurrence when one element fails (completely or partially) and shifts its load to nearby elements in the Bulk Power System. Those nearby elements are then pushed beyond their capacity, so they become overloaded and shift their load onto other elements. Cascading failure can occur in high-voltage systems, when a single point of failure (SPF) on a fully loaded or slightly overloaded system results in a sudden spike across all nodes of the system. This surge current can induce the already overloaded nodes into failure, setting off more overloads and thereby taking down the entire system in a very short time.

Cold Load Pickup: An occurrence of increased current that takes place when a distribution circuit is reenergized following an extended outage.

Constraint: A limitation on one or more transmission elements, which may be reached during normal or contingency System Operations, that restricts and prevents the dispatch of electrical energy on a specific transmission line.

Contingency: An event, usually involving the loss of one or more elements such as a generator or transmission equipment, that affects the power system at least momentarily.

Contingency Reserve: The synchronized and non-synchronized generation, available in a short period of time (30 minutes or less), to allow for the system to recover from either a unit trip, voltage event or frequency event. Some System Operators require contingency reserves equal to one-times the largest operating generator.

System Operation Principles

Controlling Actions: Operator actions taken to mitigate or minimize a contingency/system event.

Critical Load: A prioritized collection of load or customers that are defined as critical for the purposes of avoiding load shed and/or prioritizing restoration. These customers may include hospitals, telecom facilities, wastewater treatment facilities, emergency response facilities and other critical infrastructure.

Demand Side Resource: A resource with a demonstrated capability to provide a reduction in demand or otherwise control load.

Demand Side Response: A change in electricity usage by a customer in response to price or an emergency event affecting system reliability.

Distribution: Distribution is the final stage of delivering electricity to an end user. A distribution system steps down electricity from the higher voltage levels on the transmission system to deliver it directly to homes or businesses. In Puerto Rico distribution includes equipment with voltage levels of less than 38 kV.

Distributed Generation: Electrical generation and energy storage performed by small grid-connected or distribution-connected devices.

Economic Dispatch: The short-term determination of the optimal output of generation facilities, to meet the system load, at the lowest possible cost, subject to transmission and operational constraints.

Electrical Islanding: Islanding is a condition in which a distributed generator continues to feed nearby load even when the supply is disconnected from the Bulk Power System.

Energy Management System: A combined system of information technology hardware and software tools that provide real-time monitoring of operational information for critical electrical equipment in the Bulk Power System.

Emergency Command Center: The physical location(s) where coordination of information and resources to support incident management activities during an emergency.

Emergency Operating Conditions: Abnormal conditions that require manual or automatic response to maintain system frequency and prevent loss of load, equipment damage and tripping of system elements that would affect the reliability or safety of the system. Emergency operating conditions may also relate to loss of fuel situations and/or implementation of emergency procedures.

Emergency Response Organization: The organization responsible for managing all emergency situations on the system, restoring the electrical system to best configuration and restoring power to customers. The emergency response organization has complete command and control of all emergency response personnel and actions to restore the system consistent with Incident Command Structure protocols.

Federal Energy Management Agency: The Federal Emergency Management Agency (FEMA) is an agency of the United States Department of Homeland Security. It was initially created by President Jimmy Carter under Presidential Reorganization Plan No. 3 of 1978 and implemented by two executive orders on April 1, 1979.

Forced Outage: A term describing the immediate unplanned removal of either a transmission line or generator due to circumstances not foreseen.

System Operation Principles

Frequency: Frequency is the rate at which current changes direction per second.

Frequency Control: The process of controlling frequency within predefined limits to avoid unexpected disturbances that can create problems to the connected loads or even cause equipment and/or system failure.

G-1 Standard: A planning standard describing an operating requirement whereby a generator can be lost from service for any reason without immediately causing a contingency requiring a Load-Shed Event or other action that has significant impact on service.

Generation: Generation describes both the process of producing electrical energy from other forms of energy (e.g., a power plant producing energy from a fuel or a wind turbine turning moving air into energy) as well as the amount of electrical energy produced.

Generator Control System: Controls that perform multiple functions such as overspeed control, regulating, protection and other functions to respond to demand and protect the generator.

Governor: A device used to measure and regulate the speed of a machine, such as a generator. Also called a speed limiter or controller.

Grid: An electrical grid is an interconnected network of generation, transmission and distribution elements that delivers electricity from suppliers to consumers.

Incident Command Structure (ICS): A standardized, on-scene and integrated emergency management organizational structure that reflects the complexity and demands of single or multiple incidents without being hindered by jurisdiction boundaries

Lagging Over-Excited: The term ‘lagging power factor’ is used when the load current lags behind the supply voltage. It is a property of an electrical circuit that signifies that the load current is inductive, meaning inductive loads will cause a lagging power factor.

Leading Under-Excited: For capacitive circuits, when the load current leads the supply voltage.

Load (Demand): Load is the overall usage or consumption of electricity on a power supply. Load is generally expressed in kilowatts or megawatts.

Load Relief: A controlled system response to relieve stress on a primary energy source when demand for electricity is greater than what the primary power source can supply.

Nameplate Rating: The generation capacity of a completed generation facility, expressed in megawatts, consistent with the recommended power factor and operating parameters provided by the manufacturer.

North American Electric Reliability Corporation (NERC): NERC operates as an electric reliability organization to improve the reliability and security of the Bulk Power System in North America. While NERC guidelines are an indicator of current industry best practice, use of NERC rules, definitions and procedures in Puerto Rico are not obligatory.

Non-Wire Alternative(s): Electric utility system investments and operating practices that can defer or replace the need for specific transmission and/or distribution projects.

Operating Procedures: The collection of procedures that define how LUMA and the System Operations Group will implement the principles defined in the SOP.

System Operation Principles

On-Shift Operator: The personnel at the control center responsible for operating the system.

Outage: Planned or unplanned intervals of time (short term or long term) when either transmission lines or power plants are temporarily removed from service.

Power: Power is the rate at which energy is transferred, used or transformed. It is measured in watts.

Ramp Rate: The rate, expressed in megawatts per minute, at which a generating unit can change output level.

Reactor: Equipment installed at transmission and distribution substations to help stabilize the power system.

Regulation: The capability of a specific resource with appropriate telecommunications, control and response capability to increase or decrease its output in response to a regulating control signal to control for frequency deviations.

Operating Reserves: Capacity that currently is not being used but that can be quickly available for the unexpected loss of generation.

Resource: All supply and demand side assets and programs that a System Operator can use to maintain system stability. This includes generators, reactors, capacitors, storage and non-wire alternatives.

Root-Cause Analysis: Use of a systematic approach to analyze an event that had negative consequences, with the goal of finding the causal and contributing factors of the event and developing recommendations to prevent a recurrence of the event.

Remote Terminal Unit (RTU): An electronic device that is controlled by a microprocessor and interfaces with physical objects to a Supervisory Control and Data Acquisition (SCADA) system by transmitting telemetry data to the master system.

Supervisory Control and Data Acquisition (SCADA): A system of remote control and telemetry used to monitor and control the electric system components.

Security Constrained Economic Dispatch: A system operation method that co-optimizes energy costs and system security. The goal is to minimize production costs while enforcing all security constraints on the system.

Steady State Stability: The condition of a power system operating equilibrium.

System Operating Limit (SOL): The value (such as MW, MVAR, amperes, frequency or volts) that satisfies the most limiting of the prescribed operating criteria for a specified system configuration to ensure operation within acceptable reliability criteria.

System Restoration: The process of sequentially restoring generation and transmission elements to a system following a system blackout event. The process would involve coordinating and executing Black Start procedures in place at one or more locations.

T-1 Standard: A planning standard describing an operating requirement whereby a transmission asset can be lost from service for any reason without immediately causing a contingency situation.

System Operation Principles

Telemetry: The automatic collection of measurements or other data at remote points and subsequent automatic wireless transmission of data to receiving equipment (telecommunications) for monitoring. See SCADA definition.

Thermal Overload: A state when the amount of power carried by an element exceeds its rated thermal limits and the heating effect can potentially damage the device.

Transient Stability: The ability of the power system to return to its normal conditions after a large disturbance.

Transmission: Transmission is the bulk movement of electrical energy from a generating site to an electrical substation closer to areas of demand for electricity. The interconnected lines which facilitate this movement are known as a transmission network that deliver power to distribution equipment and then to customers. Transmission in Puerto Rico is all equipment with voltages 38 KV or above.

Voltage: The potential difference in electrical charge between two points in an electrical field. It is measured in volts.

Voltage Reduction: A means to reduce customer demand by lowering voltage.

Watt: A watt is a unit of power that measures the rate at which energy is transferred or converted.

System Operations Principles
Docket ID: NEPR-MI-2021-0001

Information Response to PREB Resolution & Order

Reference: RFI-LUMA-MI-21-0001-210511-PREB-002

Subject: Revise Section 3.3 & Figure 3.1

Clarification:

Revise Section 3.3 and Figure 3-1 so they reflect the current public policy related to the retirement of generations resources (including but not limited to the scope of each of the parties involved) and the recent determinations9 issued by the Energy Bureau regarding the retirement of generation resources.

Response:

Please refer to RFI-LUMA-MI-21-0001-210511-PREB-001 Attachment 1 for a revised version of the February 25 Petition inclusive of the response outlined in TC-RFI-LUMA-MI-21-0001-210510-PREB-001 provided to the Bureau on May 14th, 2021.

System Operations Principles
Docket ID: NEPR-MI-2021-0001

Information Response to PREB Resolution & Order

Reference: RFI-LUMA-MI-21-0001-210511-PREB-003

Subject: Plant Level Agreement (PLA)

Clarification:

Provide copies of the final version and/or the preliminary draft of the template Plant Level Agreement ("PLA") described in Appendix A.2.V of the February 25 Petition and RFI-LUMA-MI-221-0001-2 10406-PREB-006.

Response:

Please find the Plant Level Agreement Procedure provided in RFI-LUMA-MI-21-0001-210511-PREB-009 that specifies objective, scope, responsibilities, and steps to be followed between each plant and System Operations. This includes the content for each individual PLA that will be developed for each plant.

System Operations Principles
Docket ID: NEPR-MI-2021-0001

Information Response to PREB Resolution & Order

Reference: RFI-LUMA-MI-21-0001-210511-PREB-004

Subject: Plant Level Agreement (PLA)

Clarification:

Discuss the process envisioned by LUMA to execute a PLA with an independent power generator under contract for PREPA (i.e., under a Power Purchase and Operation Agreement) and whether or not the PLA will require an amendment to the PPOA.

Response:

The Plant Level Agreement (PLA) that will be developed with current IPPs will not require any change to existing PPOAs. The SOP is clear that operations will be subject to existing PPOAs. The PLA for an existing IPP will be based on the agreements that exist today. Many of the clauses within the PLA are the result of discussions with IPPs and reflect the current informal way plants operate today.

The PLA is designed to standardize procedures across plants on a go-forward basis. This allows LUMA to standardize communication and coordination. However, they are still unique documents between LUMA and the IPP and can recognize specific differences that may need to be addressed on an exception basis. Therefore, if an issue is identified that is particularly troublesome for an IPP then a reasonable adjustment to the PLA can be negotiated to ensure consistency with plant capabilities and the currently effective PPOAs.

The procedure to develop the PLAs will result in a completed PLA that follows the procedural template. The parties will execute the agreement once it has been completed and agreed to.

System Operations Principles
Docket ID: NEPR-MI-2021-0001

Information Response to PREB Resolution & Order

Reference: RFI-LUMA-MI-21-0001-210511-PREB-005

Subject: Emergency Response Plan (ERP)

Clarification:

Provide the final version and/or the preliminary draft of LUMA's emergency response plan as it relates to the operation of the system in response to an emergency.

Response:

LUMA submitted the Emergency Response Plan as part of this proceeding on May 14^{th}, 2021 as part of the 'Motion Submitting Emergency Response Plan in Response to May 11^{th} Resolution and Order'.

System Operations Principles
Docket ID: NEPR-MI-2021-0001

Information Response to PREB Resolution & Order

Reference: RFI-LUMA-MI-21-0001-210511-PREB-006

Subject: SOP Draft Procedures

Clarification:

Provide the final version and/or the preliminary draft of the procedures and/or standards to be used to implement the proposed operating principles.

Response:

Please find drafts of the procedures to be used to implement the proposed operating principles in response RFI-LUMA-MI-21-0001-210511-PREB-009. The drafts are still subject to edits, additions and deletions.

System Operations Principles
Docket ID: NEPR-MI-2021-0001

Information Response to PREB Resolution & Order

Reference: RFI-LUMA-MI-21-0001-210511-PREB-007

Subject: NERC Standard TPL-001-4

Clarification:

Revise the February 25 Petition to incorporate NERC Standard TPL-001-4 and any other standard that LUMA intends to use for the operation of the system.

Response:

Please refer to RFI-LUMA-MI-21-0001-210511-PREB-001 Attachment 1 for a revised version of the February 25 Petition inclusive of the following language:

LUMA based its work on information from PREPA (in particular the System Operations function and its dispatch of generation) and industry practice and principles employed in Bulk Power Systems in North America, including NERC guidelines such as NERC Standard TPL-001-4.

System Operations Principles
Docket ID: NEPR-MI-2021-0001

Information Response to PREB Resolution & Order

Reference: RFI-LUMA-MI-21-0001-210511-PREB-008

Subject: Timeline of SOP Procedures

Clarification:

Provide a detailed timeline for each procedure pending completion indicating the tasks that LUMA needs to undertake for the procedures described on page 30 of the May 7 Presentation and Page 4 of RFI-LUMA-MI-221-0001-210406-PREB-007 to be completed, the responsible parties, milestones and any applicable task prerequisite or precursor.

Response:

Please refer to RFI-LUMA-MI-21-0001-210511-PREB-008 Attachment 1 for a Gantt chart providing a timeline for of tasks to undertake for the development of Phase I and Phase II procedures.

System Operations Principles
Docket ID: NEPR-MI-2021-0001

Information Response to PREB Resolution & Order

Reference: RFI-LUMA-MI-21-0001-210511-PREB-009

Subject: SOP Procedures

Clarification:

Provide copies of the final versions and/or the preliminary drafts of the 14 procedures which LUMA will use for the operation of the system starting June 1, 2021 and explain how they are related to the corresponding system operation principles.

Response:

Please find within RFI-LUMA-MI-21-0001-210511-PREB-009 Att 1 draft Phase I procedures as well as as-is documentation.

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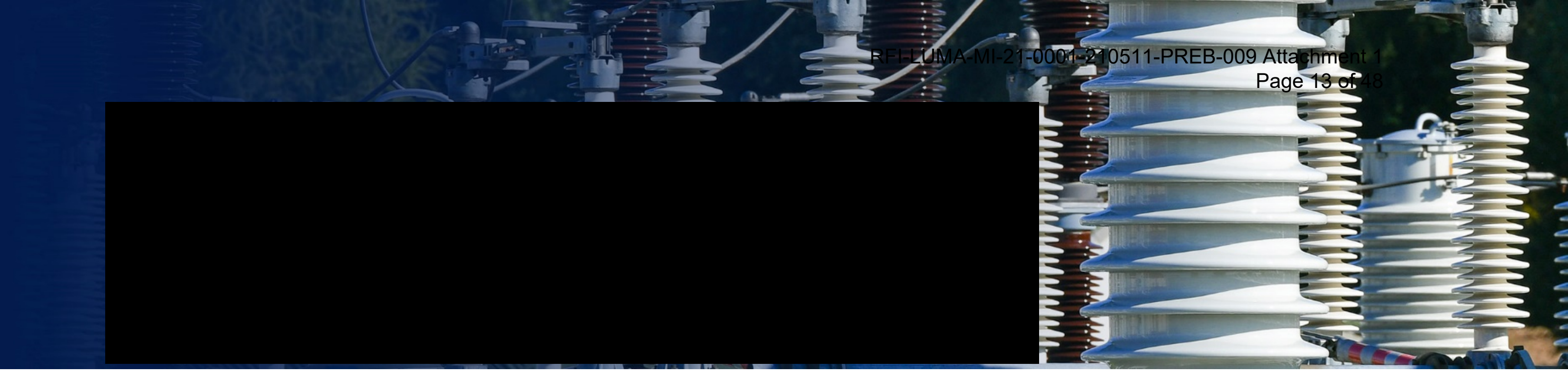

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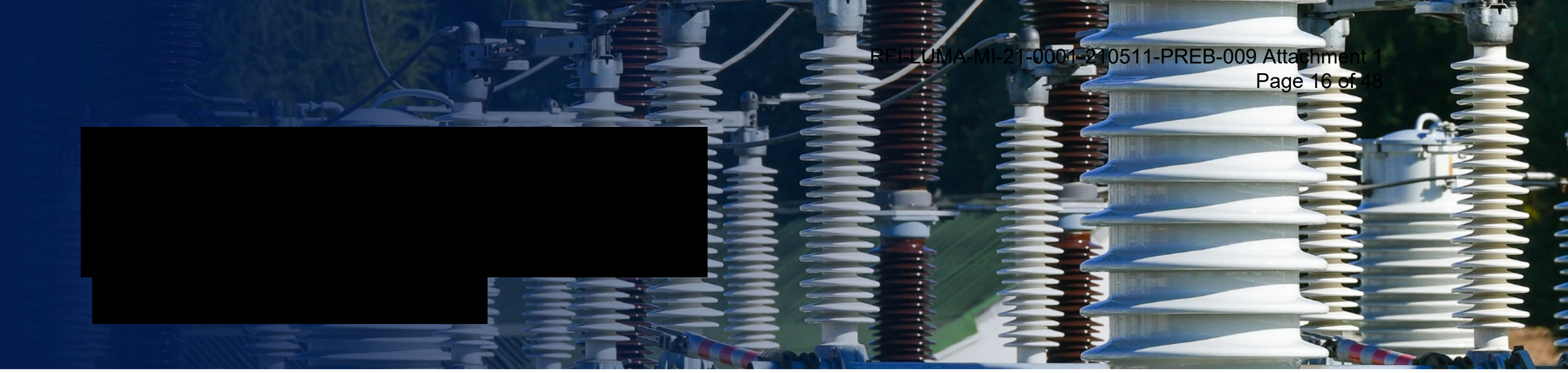

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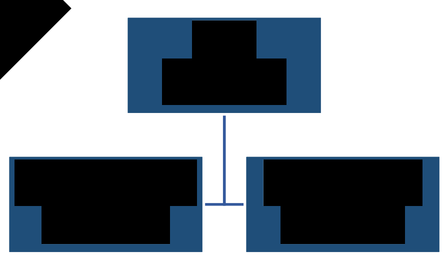

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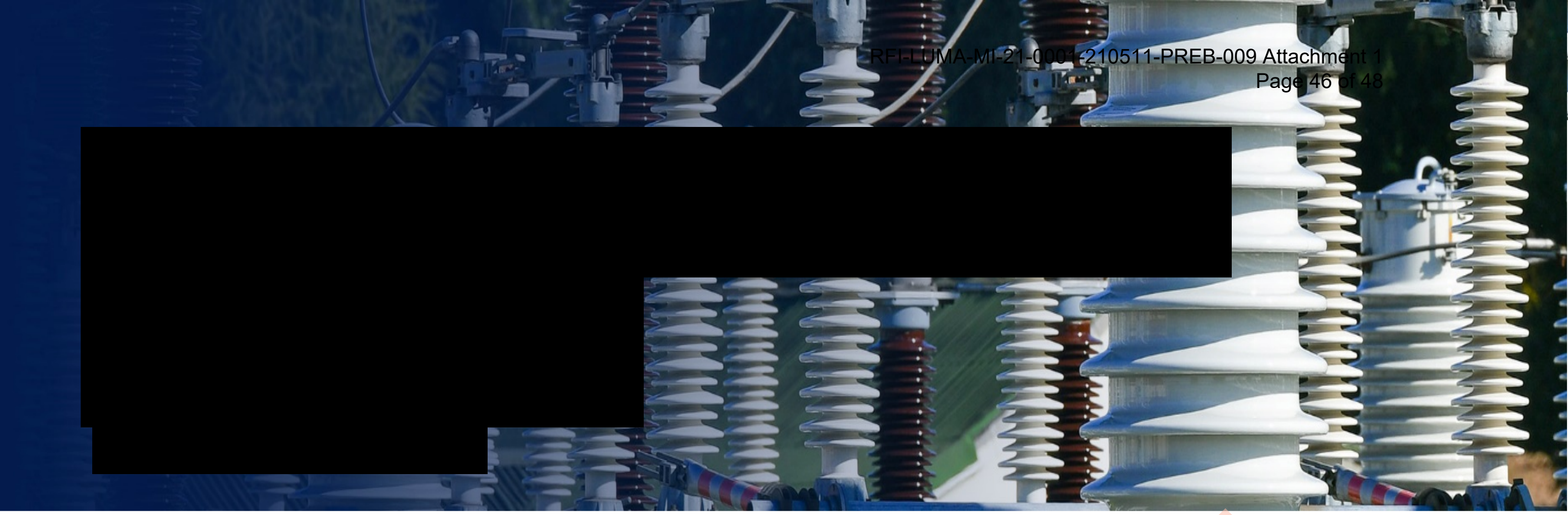

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DRAFT PROCEDURES AS OF MAY 2021

PROCEDURE 2 New Generation Interconnection
Procedure 3 Resource Adequacy Assessments
Procedure 5 Legacy T&G Demarcation
Procedure 6 Generator Capabilities
Procedure 7 Black-Start
Procedure 11Public Reporting
Procedure 14 Policy on Reserves
Procedure 16 Critical Loads procedure
Procedure 18 Contingency and System Operating Limits Response
Procedure 19 Energy Dispatch Scheduling and Merit Order
Procedure 21 Plant Level Agreements
Procedure 22 Balancing Frequency and Voltage
Procedure 26 Forced Outage
Procedure 28 Emergency Response Execution

LUMA

New Generation Interconnection

DRAFT Version #, May 17, 2021

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Resource Adequacy Assessments

DRAFT Version #, May 17, 2021

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Legacy T&G Demarcation

DRAFT Version #, May 17, 2021

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Generator Capabilities

DRAFT Version #, May 17, 2021

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Black Start Procedure

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LUMA

Public Reporting

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Policy on Reserves

DRAFT Version #, May 17, 2021

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LUMA

Critical Loads

DRAFT Version #, May 17, 2021

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Contingency & System Operating Limits Response

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Energy Dispatch, Scheduling & Merit Order

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Plant Level Procedures

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Balancing Frequency & Voltage

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Forced Outage

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Emergency Response Execution

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