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 of System Operating Principles for Review and Approval by the Puerto Rico Energy Bureau

LUMA'S SUBMITTAL AND REQUEST FOR APPROVAL OF SYSTEM OPERATION PRINCIPLES

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 present this Petition to the honorable Puerto Rico Energy Bureau (the "PREB," "Bureau" or "Energy Bureau"), submitting for the Energy Bureau's evaluation and approval its System Operation Principles, Exhibit 1 to this Petition, as required under Section 4.1(h) of the Puerto Rico Transmission and Distribution System Operation and Maintenance Agreement dated as of June 22, 2020, by and among the Puerto Rico Electric Power Authority ("PREPA" or "Owner"), the Puerto Rico Public-Private Partnerships Authority ("P3 Authority") and LUMA (the "OMA") and in accordance with the requirements of this honorable Energy Bureau in its Resolution and Order of January 15, 2021 in the referenced case (the "SOP Order"), through the undersigned legal counsel and respectfully submit the following:

I. Introduction

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.

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,

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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.

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[7] is required to provide "Front-End Transition Services"[8] 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).[9]

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 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).

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[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] ManagementCo in particular.

[8] 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; provided that the Front-End Transition Services shall not be O&M Services." [8] OMA, Section 1.1 (Emphasis ours).

[9] Although both ManagementCo and ServCo constitute the Operator under the OMA, after the Commencement Date, ServCo will provide the vast majority of the O&M Services while ManagementCo's role will be mainly providing oversight and management of ServCo.

Among other actions, during the Front-End Transition Period, LUMA is required to prepare and submit to the P3 Authority for review and approval "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 shall 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. 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[10] 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. Consistent with these general mandates and the more detailed guidelines included in such Schedule 1 to Annex I of the OMA, LUMA prepared the System Operation Principles attached to this Petition as Exhibit 1.

In accordance with the procedural requirements of the OMA discussed above, 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. These 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

[10] 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.

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 as Exhibit 1 hereto.

LUMA respectfully requests that the Energy Bureau issue an order of approval of the System Operation Principles.

II. Energy Bureau's Authority

As the main entity in charge of ensuring compliance with energy public policy and to carry out energy policy mandates, this honorable Bureau has authority to review this submission pursuant to Act 57-2014 and to Act 17-2019. Specifically, Act 57-2014 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).

III. The SOP Order

On January 15, 2021, this honorable Energy Bureau issued the SOP Order 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 indeed 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 this honorable 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]

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 compliance with the SOP Order's requirements, as clarified by this honorable Energy Bureau during the Pre-Filing Technical Conference of January 29, 2021.

IV. Coordinated Approach to FET Deliverables

A. Assess, Analyze and Plan

As part of Front-End Transition Period activities, LUMA has 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

[11] *See* LUMA's "Motion submitting LUMA's presentation given at the Pre-Filing Technical Conference held on January 29, 2021" dated February 2, 2021 in the referenced case.

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-TEMP-2380, 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;[12] the COR3 Grid Modernization Plan for

[12] Resolution and Order dated August 24, 2020 in Case No. CEPR-AP-2018-0001, *In re: Review of the Puerto Rico*

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; (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

Electric Power Authority's Integrated Resource Plan.

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-TEMP-2380).

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 are being submitted to the PREB, separately, for review and approval.

V. 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. 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, Act 17-2019, Section 1.6 (8), promoting demand response and energy efficiency programs, *id.*, Section 1.6 (10), 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).

Specifically, Act 17-2019, in Section 1.8 (b) 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. Section 1.11 (c) of Act 17-2019 further states that the operator of the T&D System shall also fix the level of reserves for planning.

VI. System Operation Principles: Purposes, Framework and Compliance with SOP Order Requirements

The System Operation Principles, as a ground-breaking document, 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. This 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 proposed by LUMA 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.[13] 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. Advancing the Modified Action Plan of the Integrated Resource Plan[14] while working to lower costs to customers and improve resilience and reliability, requires a diverse set of investors and operators competing to install and operate new renewable energy and storage.[15]

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.*

[13] 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).

[14] 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.

[15] Note that Act 17-2019 set the path to 100% renewable energy. See Section 1.6(7), Act 17-2019.

LUMA will coordinate short-term and long-term system planning processes across the following areas: load forecasting, integrated resource planning, Resource Adequacy[16] 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.* Section 3.1. The results of these plans will be reviewed periodically, presented to the Energy Bureau and shared with stakeholders.

As explained 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 describe 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

As explained in Section 5.3, 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 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.

[16] 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.

The Performance Metrics and the System Remediation Plan help align LUMA's activities with greater resilience, reliability and the delivery of value to customers. 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.

VII. Conclusion

Adoption of the System Operation Principles is a decisive step forward to provide safe, reliable and cost-effective electric services in Puerto Rico as required by Act 57-2014, Act 120-2018 and Act 17-2019. As stated in Section 5.13(c) of the OMA, the System Operation Principles will be reviewed from time to time, as needed, in coordination with the P3 Authority. If LUMA and the P3 Authority determine that the System Operation Principles should be revised, the revised document shall be submitted to the Energy Bureau for review and approval.

WHEREFORE, LUMA respectfully requests that the Energy Bureau accept the System Operation Principles and approve Exhibit 1 in its entirety.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 25th day of February 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
System Operation Principles

Prefacio radicación regulatoria LUMA Energy

Febrero 2021

¿Quiénes somos?

Los puertorriqueños dependen de la electricidad. Un sistema eléctrico robusto y resiliente es la columna vertebral del desarrollo económico.

En LUMA, nuestro compromiso es proveer a los puertorriqueños un sistema eléctrico en el que puedan confiar. Nuestro norte es transformar la red eléctrica en una centrada en el servicio al cliente, confiable, resiliente y segura para todos los puertorriqueños, tal y como ellos merecen. Queremos mejorar la calidad de vida y el crecimiento económico del país proveyendo el sistema eléctrico para ellos.

La gente, nuestros empleados, nuestros clientes y las comunidades en las que vivimos y trabajamos son prioridad para LUMA.

- Motivamos e inspiramos a nuestra gente a aprovechar todas las oportunidades que reciben, mientras trabajan para construir un mejor sistema eléctrico para Puerto Rico.
- Nuestra meta es proveer un servicio al cliente excepcional e implementar políticas públicas a través de una operación de excelencia.

Creados para
Comprometidos con
Escuchando a
Puerto Rico

LUMA

Nuestra misión para Puerto Rico

Reconstruir y transformar el sistema eléctrico para proveer un servicio sostenible, centrado en el cliente, confiable, resiliente, seguro y a precios razonables para todos los puertorriqueños.

OBJETIVOS CLAVE

LA SEGURIDAD ES PRIORIDAD
Reformar los estilos de trabajo, enfocados en una cultura de seguridad para nuestros empleados y la gente de Puerto Rico

MEJORAR LA SATISFACCIÓN DEL CLIENTE
Transformar las operaciones para ofrecer un excelente servicio al cliente y electricidad confiable a precios razonables

RECONSTRUCCIÓN DEL SISTEMA Y RESILIENCIA
Utilización efectiva de fondos federales para restaurar la red eléctrica y mejorar la resistencia de la infraestructura, que actualmente está muy vulnerable

EXCELENCIA OPERACIONAL
Inspirar a los empleados a conseguir la excelencia operativa a través de nuevos sistemas, procesos y capacitación

TRANSFORMACIÓN ENERGÉTICA SOSTENIBLE
Modernizar la red eléctrica para permitir la transformación energética sostenible

¿Cómo llegamos aquí?

El sistema eléctrico de Puerto Rico está en un punto de inflexión crucial. Puerto Rico aprobó reformas legales fundamentales que establecieron un regulador independiente; la necesidad de nuevos operadores para el sistema de distribución y transmisión y separadamente para el de generación de la Autoridad de Energía Eléctrica (AEE) y así allanó el camino para una red eléctrica más limpia y resistente.

La AEE está en bancarrota. Puerto Rico necesita un operador profesional para manejar y administrar los fondos federales que son tan necesarios para poner en marcha la operación de recuperación y transformación.

Luego de un riguroso proceso competitivo que duró 18 meses, se seleccionó y adjudicó a LUMA un contrato para operar y mantener el sistema de transmisión y distribución eléctrica. Esto luego de evaluaciones y aprobaciones de la Junta de Directores de la Autoridad de Alianzas Público-Privadas, la Junta de Gobierno de la Autoridad de la AEE, la Junta de Supervisión Fiscal, el Negociado de Energía de Puerto Rico y el Gobernador de Puerto Rico.

LUMA fue escogida de manera unánime por el Comité de Alianza por:

- Nuestra experiencia líder en la industria
- Historial de cumplir con nuestros compromisos y
- El enfoque en soluciones diseñadas para cumplir con los objetivos del gobierno de transformar el sistema de transmisión y distribución.

Lo que hemos hecho desde junio 2020

Desde junio de 2020, LUMA ha estado revisando información y visitando las instalaciones de la Autoridad de Energía Eléctrica (AEE), como parte de un proceso de evaluación detallada de las condiciones actuales de la red y los servicios que se ofrecen. Los problemas encontrados no se limitaron a daños causados por los huracanes. Las evaluaciones resaltaron un desempeño por debajo de los estándares de la industria eléctrica y condiciones precarias en la mayoría de las instalaciones.

Hemos diseñado programas para la recuperación de la infraestructura, lograr mejoras operacionales y aumentar la satisfacción de los clientes. Nuestro enfoque entrelaza políticas públicas claves con planes factibles. Dimos prioridad y se establecieron planes de acción para cumplir con nuestros clientes, y al mismo tiempo satisfacemos los requisitos de política pública y contractuales.

Desarrollamos planes, presupuestos, métricas de desempeño y principios de operación para el sistema que estamos presentando al Negociado de Energía de Puerto Rico. Todos estos informes serán revisados y deberán ser aprobados por el Negociado de Energía antes de que LUMA asuma la operación del sistema de trasmisión y distribución, calendarizada para junio de 2021.

Nuestra gente primero.
Seguridad siempre.

Lo que estamos presentando para la aprobación del Negociado de Energía

Plan de remediación

Nuestros planes

El plan de remediación del sistema se enfoca en atender las áreas que están por debajo del estándar de la industria y plantean los mayores riesgos para los puertorriqueños, incluyendo a nuestros empleados.

Presupuestos iniciales

Cómo llegaremos allí

Los presupuestos iniciales no proponen un aumento de la tarifa básica. Cubren todos los planes durante los primeros tres años de operación, abarcan los gastos de operación y mantenimiento, y las inversiones (incluyendo aquellas subvencionadas por del gobierno federal).

Métricas de desempeño

Cómo seremos responsables

Las métricas de desempeño son indicadores numéricos para medir el buen desempeño de LUMA, alineados con las políticas públicas y la creación de mejoras tangibles para Puerto Rico.

Principios del sistema de operación

Cómo operaremos la red eléctrica

Los principios del sistema de operación definen cómo funcionará el despacho y control para garantizar el suministro y entrega de energía eficiente y confiable.

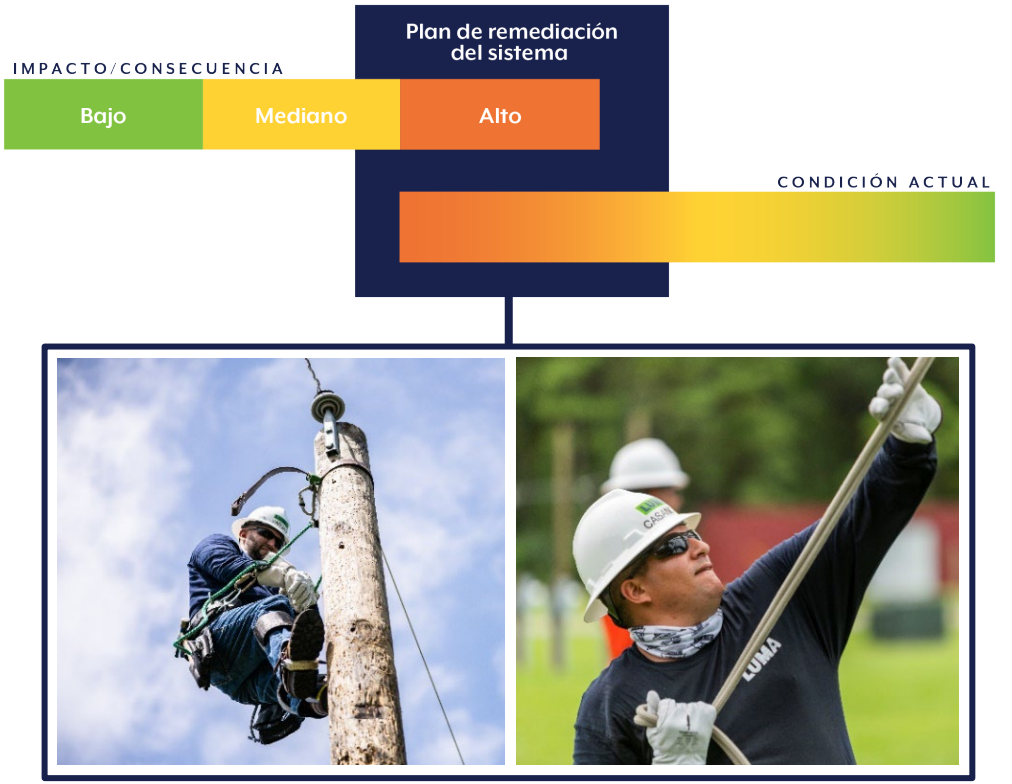
Nuestro plan

Plan de remediación del sistema

El plan de remediación de LUMA establece la estrategia para remediar, reparar, reemplazar y estabilizar el sistema, las prácticas y los servicios, así como los equipos del sistema de transmisión y distribución. Las iniciativas de este plan son fundamentales para la recuperación y transformación y abordan los aspectos más peligrosos y frágiles del sistema eléctrico de Puerto Rico. Estas estrategias le permitirán a LUMA operar y mantener el sistema eléctrico de la isla en cumplimiento con los estándares de la industria, los requisitos contractuales y las leyes aplicables.

El plan de remediación es la culminación de las evaluaciones que LUMA realizó durante el período de transición inicial. LUMA ha planeado la inversión de aproximadamente $4 mil millones de dólares en iniciativas y proyectos como parte del plan de remediación y más de $10 mil millones de dólares totales en todos los programas de mejora.

El plan de remediación trabajará las áreas que están por debajo del estándar en la industria y que representan el mayor riesgo para los puertorriqueños, incluidos los empleados y el propio sistema eléctrico. Es una parte crítica de un conjunto más grande de medidas para mejorar y reconstruir la red eléctrica.

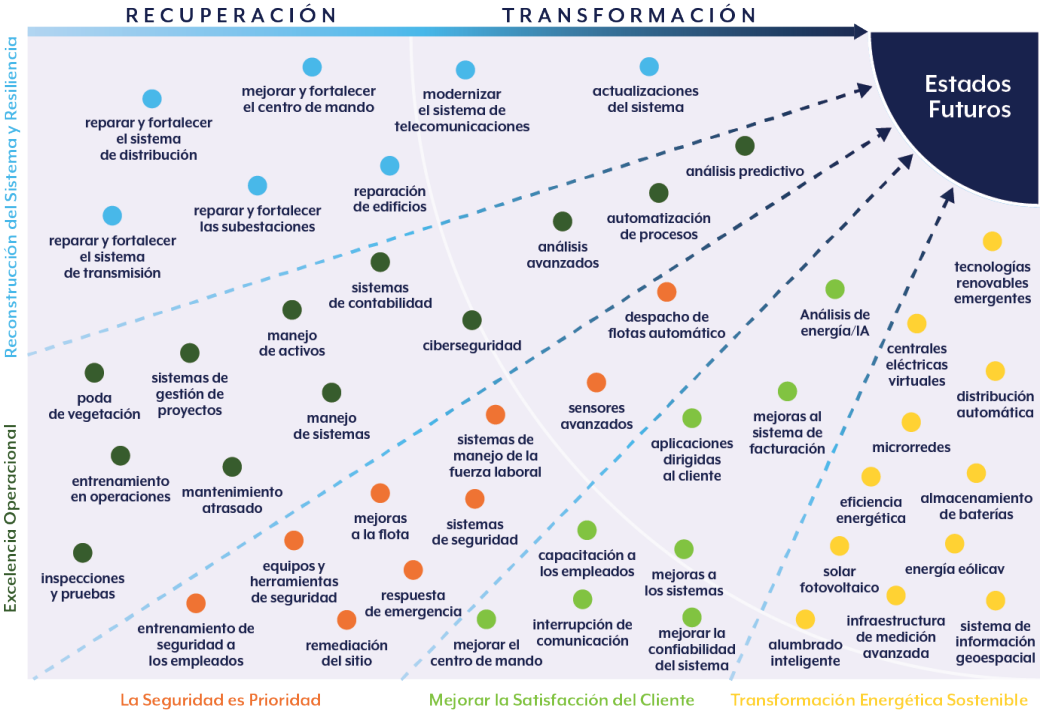


Hacia dónde vamos

La estrategia general de LUMA para implementar el cambio de acuerdo a las políticas públicas se compone de dos fases: Recuperación y Transformación.

La FASE DE RECUPERACIÓN conlleva restaurar la infraestructura y los procesos de la utilidad a un estado de funcionamiento correcto, reparar la red a corto plazo y aprovechar la experiencia de los empleados actuales de la Autoridad de Energía Eléctrica (AEE) que se unirán a LUMA. Simultáneamente, se implementarán nuevos procesos, sistemas y capacitación para gestionar de manera más eficaz la operación de los servicios fundamentales.

Mientras se recupera el nivel del servicio eléctrico, LUMA acelerará el paso de la TRANSFORMACIÓN, en concordancia con las metas del gobierno y las políticas públicas adoptadas, rediseñando el sistema eléctrico para que esté a la altura de las necesidades del pueblo de Puerto Rico durante las próximas décadas. La transformación estará enfocada en energías renovables y más opciones para los clientes a través de sistemas y tecnologías avanzadas. Muchos de los programas de transformación se llevarán a cabo concurrentes con los programas de recuperación.



Cómo lo alcanzaremos

Presupuestos iniciales

Los presupuestos iniciales cubren todas las gestiones de LUMA durante los primeros tres años de operación e incluyen los programas asociados con el plan de remediación del sistema y las métricas de desempeño. Hemos identificado 69 áreas de reparación y mejoras para encaminar a la utilidad hacia la recuperación y transformación mediante la implementación de políticas públicas, mejoras de desempeño y el uso de fondos federales. Comenzaremos la mayoría de estos programas durante nuestro primer año de operación.

LO QUE INCLUYE

Nuestros presupuestos iniciales comprenden partidas para costos operacionales y de capital (incluyendo aquellos sufragados por subvenciones federales) para el sistema de transmisión y distribución.

Propuesta de presupuesto de LUMA

Sin aumento en la tarifa base

* LUMA no está solicitando aumento en la tarifa base. LUMA no posee autoridad legal para determinar las tarifas de servicio eléctrico. El Negociado de Energía, como regulador independiente y especializado y como monitor del cumplimiento con la política pública energética en Puerto Rico, es el organismo autorizado en ley para evaluar y fijar las tarifas.

Cómo seremos responsables

Métricas de desempeño

LUMA evaluó el desempeño de la Autoridad de Energía Eléctrica (AEE) utilizando métodos estándar de la industria. Analizamos los procesos existentes en la AEE, los sistemas y los datos sobre sus operaciones e identificamos áreas a mejorar al compararlas con las prácticas en la industria. Los hallazgos (incluidos los de un tercero independiente) muestran que el desempeño de la AEE se posiciona por debajo de otras compañías de energía en América del Norte.

SERVICIO AL CLIENTE
(J.D. Power)

Más Bajo de 144 compañías de energía en América del Norte

47% más bajo que el de peor porcentaje

INCIDENTES DE SEGURIDAD
(OSHA, 2019)

5 veces mayor al estándar de la industria

200% más que la empresa de peor porcentaje

INTERRUPCIONES DE SERVICIO
(IEEE)

9 veces más largos y frecuentes que la media

LUMA SERÁ RESPONSABLE

Los puertorriqueños merecen responsabilidad de su proveedor de servicios de electricidad.

Las métricas de rendimiento de LUMA son indicadores numéricos que indicarán cómo va el desempeño de LUMA. Diseñadas para la industria de la energía eléctrica y compartidas con el público para garantizar la transparencia, utilizamos métricas estándar para medir nuestro desempeño y mostrar cuán bien adelantamos los compromisos contractuales y de política pública contraídos. Cada indicador mide el desempeño de LUMA en funciones clave como: servicio al cliente, seguridad, trabajo técnico y gestión financiera.

Métricas de desempeño propuestas por LUMA

SATISFACIÓN DEL CLIENTE

- J.D. Power-Encuesta de satisfacción al cliente: Clientes residenciales y comerciales
- Rapidez media de respuesta
- Tasa de quejas
- Tasa de abandono

SEGURIDAD

- Tasa de incidentes registrables de OSHA
- Fatalidades OSHA
- Tasa de gravedad OSHA
- Tasa OSHA DART

TÉCNICO

- Índice de frecuencia de Interrupción media del sistema (SAIFI)
- Índice de duración de Interrupción media del sistema (SAIDI)
- Inspecciones (Líneas de distribución y transmisión, subestaciones)

FINANCIERA

- Presupuesto operativo
- Presupuesto de capital: Financiado por el gobierno federal y el cobro de tarifas
- Días Ventas Pendientes: Clientes Generales y Gubernamentales
- Horas extras

MÉTRICAS DE RESPUESTA DE EMERGENCIA

Cómo operaremos la red eléctrica

Principios de operación del sistema

Estos principios definen cómo funcionará el sistema de despacho y control de la red. Habrá reglas para lograr un suministro de energía eficiente, entrega de energía confiable y toma de decisiones transparentes. El despacho de recursos en tiempo real, la planificación del sistema y los procedimientos de emergencia se enfocarán en conseguir resultados positivos para el sistema en general y nuestros clientes. Esto será cada vez más importante, a medida que se mejore el sistema de transmisión y distribución y las energías renovables se conviertan en la mayor fuente y opción energética para el País.

Lo que esto significa

- LUMA entregará energía lo más económicamente posible, mientras se mantiene la confiabilidad del sistema para reducir los costos del combustible y las emisiones
- Con reglas definidas y mejoras al sistema seremos capaces de “ver” las interrupciones del servicio antes de que ocurran para evitar desconexión de carga, acelerar los tiempos de respuesta y minimizar las interrupciones del servicio a los clientes
- Observarán mejoras en la respuesta a emergencias como huracanes y terremotos
- El Sistema operativo sentará las bases para que los inversionistas y el público tengan un mejor entendimiento de los aspectos técnicos y las limitaciones de la red eléctrica, permitiendo propuestas más competitivas y focalizadas en proyectos de energía renovable y soluciones de mayor valor para Puerto Rico

principios definidos
de operación
del sistema

Mejor
Confiabilidad

Qué esperar

A la expectativa de la aprobación de nuestros informes regulatorios, continuamos trabajando para asumir la operación del sistema de transmisión y distribución en junio 2021.

Una vez arranquemos, verán:

- Mejoras en la capacidad de respuesta a los clientes
- Desganche de vegetación
- Inspecciones de áreas que reportan un gran número o significativas interrupciones del servicio
- Mejoras en la seguridad pública, incluyendo el alumbrado de las calles

Queremos ser una compañía de la que los puertorriqueños se sientan orgullosos y en la que quieran trabajar. Para conseguirlo vamos a:

- Priorizar la seguridad
- Mejorar la satisfacción del cliente
- Reconstruir y mejorar la resiliencia del sistema
- Enfocarnos en la excelencia operacional
- Asegurar una transformación energética sostenible

Queremos que tengas la energía segura y confiable que te mereces.

LUMA Energy's Regulatory Filings

February 2021

Who We Are

Puerto Ricans rely on electricity. A robust and resilient energy system is the backbone for economic development.

At LUMA, our job is to provide electricity that Puerto Ricans can depend on. Our commitment is to transform the electric system by implementing public policy to achieve the customer-centric, reliable, resilient, safe energy that Puerto Ricans deserve — energy that will support economic growth and quality of life.

- We put people first, our employees, our customers and the Puerto Rican communities where we live and work
- We encourage and inspire our people to embrace opportunities as they work to build a better electric system for Puerto Rico
- Our goal is to provide exceptional customer service and implement public policy through operational excellence

Built for Puerto Rico
Invested in Puerto Rico
Listening to Puerto Rico

LUMA

Our mission for Puerto Rico

To recover and transform the utility to deliver customer-centric, reliable, resilient, safe and sustainable electricity at reasonable prices.

KEY GOALS

PRIORITIZE SAFETY
Reform utility activities to support a strong safety culture focused on employee safety and the safety of the people of Puerto Rico

IMPROVE CUSTOMER SATISFACTION
Transform utility operations to deliver a positive customer experience and reliable electricity at reasonable prices

SYSTEM REBUILD & RESILIENCY
Effectively deploy federal funding to restore the grid and improve the resilience of vulnerable infrastructure

OPERATIONAL EXCELLENCE
Enable employees to pursue operational excellence through new systems, processes and training

SUSTAINABLE ENERGY TRANSFORMATION
Modernize the grid and the utility to enable the sustainable energy transformation

How we got here

Puerto Rico's electricity system is at a crucial inflection point. Puerto Rico introduced fundamental legal reforms that established an independent regulator; required new operators for PREPA's distribution, transmission and generation assets; and paved the way for a cleaner, more resilient grid.

With PREPA in bankruptcy, Puerto Rico needs a professional operator to manage and administer the critical federal funds required for this recovery and transformation.

After a rigorous 18-month selection process, LUMA was awarded a partnership contract to operate and maintain the electric transmission and distribution system following evaluations and approvals from the Public-Private Partnership Committee, Board of Directors of the Public-Private Partnership Authority, PREPA Governing Board, Financial Oversight Board, Puerto Rico Energy Bureau and Governor of Puerto Rico.

LUMA was unanimously chosen by the Public-Private Partnership Authority Board because of:

- Our industry-leading expertise
- History of delivering on our commitments and
- Our focus on solutions designed to meet the government's goals for transforming the transmission and distribution system.

Regulator: PREB — Puerto Rico Energy Bureau

PUBLIC-PRIVATE PARTNERSHIP: O&M AGREEMENT

Asset Owner | **Administrator** (P3 Puerto Rico Public-Private Partnerships Authority) | **Operator** (LUMA / IEM)

PROMESA & Title III (Financial Oversight & Management Board for Puerto Rico)

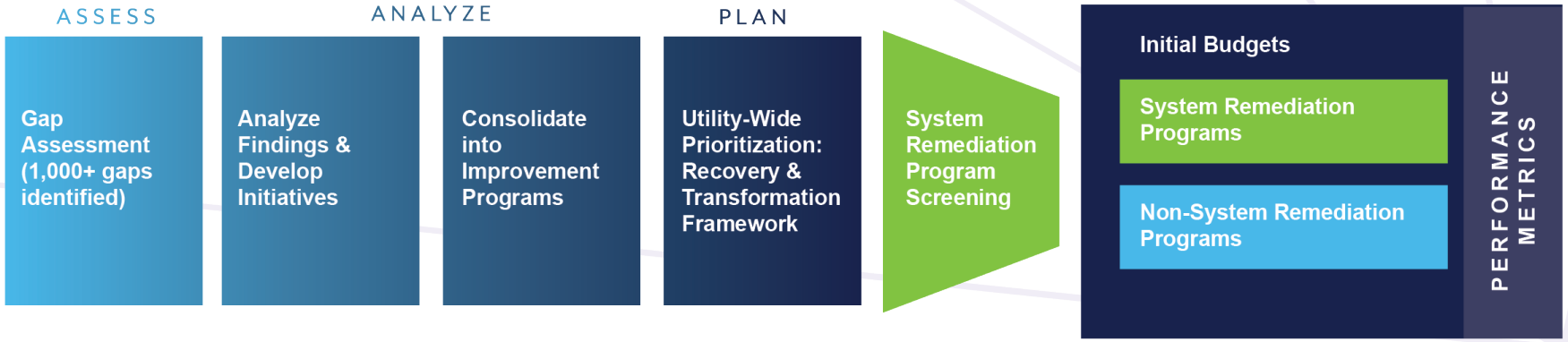
Federal Recovery Funds (CDBG-DR, FEMA and other agencies)

What we've been doing since June 2020

Since June 2020, LUMA has been reviewing PREPA's data and sites, conducting a detailed assessment of the current conditions of the grid and utility service. The issues were not limited to hurricane damage. The assessments highlighted performance below industry standards and consistently poor health across most assets.

We then designed programs to carry out infrastructure recovery and achieve operational and customer satisfaction improvements. Our coordinated approach links key public policy to actionable plans. We prioritized and sequenced activities to deliver value to our customers and meet public policy and contractual requirements.

We developed plans, budgets, performance metrics and system operation principles and are now submitting our work to the PREB. These submissions will be reviewed and approved by PREB before LUMA begins operations, currently targeted for June 2021.



People First.
Safety Always.

What we're submitting for PREB approval

System Remediation Plan

What we have planned

The System Remediation Plan (SRP) addresses areas that are below standard and pose the highest risk to Puerto Ricans, including our employees, and the system.

Initial Budgets

How we'll get there

Initial budgets do not propose a base rate increase. They cover all activities during the first 3 years of operations and include O&M, non-federally funded capital and federally funded capital.

Performance Metrics

How we'll be accountable

Performance metrics are numeric indicators to measure how well LUMA is performing in alignment with public policy and making tangible improvements for Puerto Rico.

System Operation Principles

How we'll operate the grid

System Operation Principles (SOP) define how the bulk power system will operate to ensure efficient energy generation and reliable energy delivery.

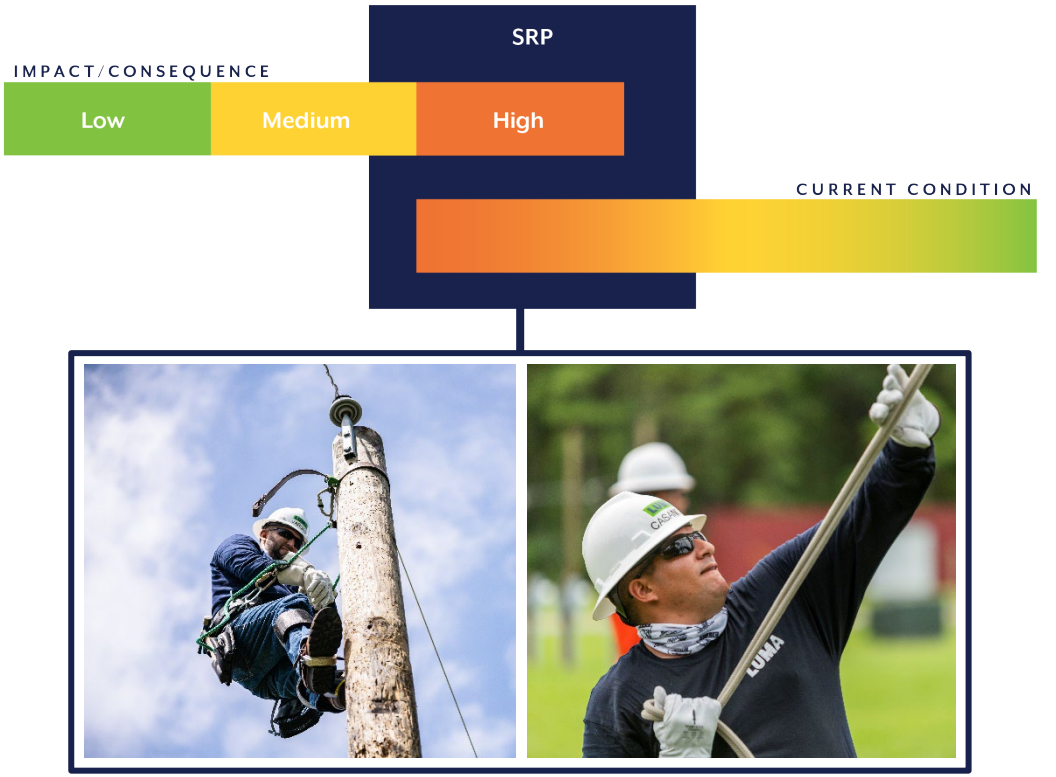
What we have planned

System Remediation Plan

LUMA's SRP establishes our strategy to remediate, repair, replace and stabilize transmission and distribution system equipment, systems, practices and services. The initiatives are foundational to recovery and transformation and address the most dangerous and fragile aspects of Puerto Rico's electricity system. They will enable LUMA to operate and maintain Puerto Rico's electricity system in compliance with industry standards, contractual requirements and applicable laws.

The SRP is a culmination of the assessments LUMA performed during the front-end transition period. LUMA has planned for approximately $4 billion in initiatives as part of the SRP and over $10 billion in total improvement programs.

The SRP is our plan to address areas that are below standard and pose the highest risk to Puerto Ricans, including employees, and the system. It's a critical part of a larger set of improvement activities to recover and transform the grid.

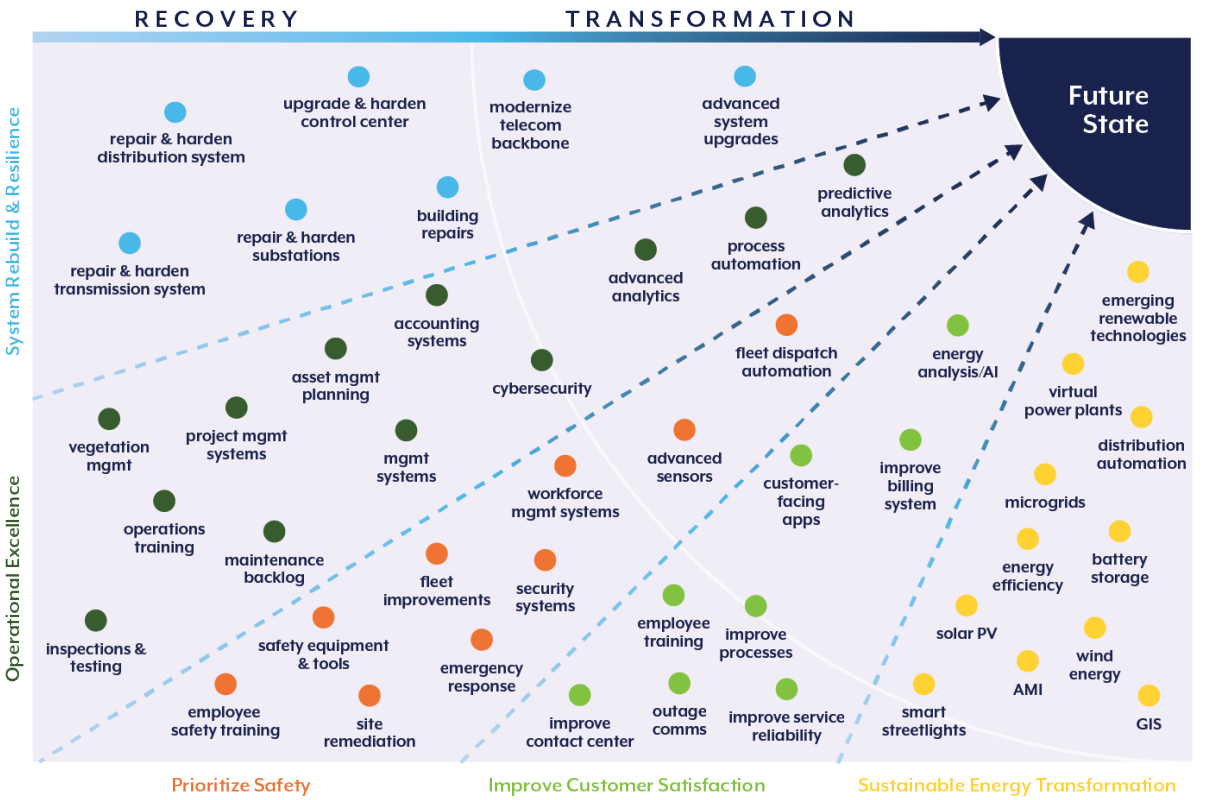


Where we're going

LUMA's overall strategy to implement the change mandated in public policy is composed of two phases: Recovery and Transformation.

The RECOVERY PHASE will involve restoring the utility's infrastructure and processes to a well-functioning state, repairing the grid in the near term and leveraging the experience of current PREPA employees who will be joining LUMA — while implementing new processes, systems and training to more effectively manage fundamental utility operations.

As the utility recovers, LUMA will accelerate the pace of TRANSFORMATION, in accordance with the government's goals and policy, by redesigning the utility to meet Puerto Rico's energy needs for the coming decades, with a focus on renewable generation and distributed energy resources made possible through advanced operational systems and technologies. Many of these Transformation programs will begin alongside Recovery programs.



How we'll get there

Initial Budgets

The initial budgets cover all LUMA activities during the first three years of operations and include activities associated with the system remediation plan and performance metrics. We've identified 69 remediation and improvement activities to start the utility on the path to recovery and transformation by implementing public policy, improving performance and strategically deploying federal funds. We'll start most these programs during our first year of operations.

WHAT'S INCLUDED

Our initial budgets comprise operating and capital (federally funded and ratepayer funded) budgets for transmission and distribution.

LUMA budget proposal

No Increase in Base Rate

* LUMA is not applying for a base rate increase. LUMA does not have legal authority to determine electric rates: PREB, the independent and specialized body to regulate, monitor and enforce energy public policy of the Government of Puerto Rico, is authorized by Puerto Rico laws to evaluate and approve rates.

How we'll be accountable

Performance Metrics

LUMA assessed PREPA's performance using industry-standard methods. We analyzed PREPA's existing processes, systems and data, identifying gaps as compared to electric utility industry practices. Results (including through independent third-party sources) show that PREPA consistently ranks at the bottom of all North American utilities.

CUSTOMER SERVICE
(J.D. Power)

Lowest of 144
North American utilities

47% lower than the next lowest

SAFETY INCIDENTS
(OSHA, 2019 stats)

5 times
the industry average
for workplace incidents

200% more than the next-worst utility

POWER OUTAGES
(IEEE)

9 times
longer & more frequent
than median performers

LUMA WILL BE ACCOUNTABLE.

Puerto Ricans deserve accountability from their electricity service provider.

LUMA's performance metrics are numeric indicators and scorecards of how well we're doing. Tailored to the electric utility business and shared with the public to ensure transparency, they use industry standards to measure performance and show how well we advance public policy. Each indicator measures LUMA's performance in key functional areas such as customer service, safety, reliability and financial management.

LUMA's Proposed Performance Metrics

CUSTOMER SATISFACTION

- J.D. Power Customer Satisfaction Survey: Residential & Business Customers
- Average Speed of Answer
- Customer Complaint Rate
- Abandonment Rate

SAFETY

- OSHA Recordable Incident Rate
- OSHA Fatalities
- OSHA Severity Rate
- OSHA DART Rate

TECHNICAL

- System Average Interruption Frequency Index (SAIFI)
- System Average Interruption Duration Index (SAIDI)
- Inspections (Distribution & Transmission Lines, Substations)

FINANCIAL

- Operating Budget
- Capital Budget: Federally Funded & Ratepayer Funded
- Days Sales Outstanding: General & Government Customers
- Overtime

EMERGENCY RESPONSE METRICS

How we'll operate the grid

System Operation Principles

The SOP defines how the bulk power system will operate. There will be effective rules for efficient energy generation, reliable energy delivery and transparent decision-making on how the grid is managed. Real-time dispatch, resource and system planning and emergency procedures will be focused on achieving outcomes for the overall system and customers. This will become increasingly important as the transmission and distribution system is improved and renewables become a larger source of energy.

What this means

- LUMA will dispatch energy as economically as possible while maintaining reliability to reduce fuel costs and emissions
- With defined rules and system improvements, we'll be able to "see" outages before they happen to avoid load-shedding, expedite response times and shorten most customer outages
- You'll see improved response to emergencies such as major hurricanes and earthquakes
- The SOP will create the basis for developers and stakeholders to better understand grid issues and constraints, allowing for more competitive, tailored proposals for new renewables and value-added solutions for Puerto Rico

defined
operation
principles

Improved
Reliability

What to expect

Pending the required approvals of our regulatory filings, we will commence operations in June 2021.

Following commencement, you'll see:

- Improvement in contact center responsiveness
- Clearing of vegetation from utility rights of way
- Walkdowns and inspections of areas experiencing a significant number or size of outages
- Improved public safety, including streetlights

We want to be a company that Puerto Rico is proud of and that Puerto Ricans want to work for. To get there, we'll

- Prioritize safety
- Improve customer satisfaction
- Rebuild the system and improve system resiliency
- Focus on operational excellence
- Ensure a sustainable energy transformation

We want you to have the safe, reliable energy you deserve.

System Operation Principles

February 23, 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 for the operation of the Bulk Power System. 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.

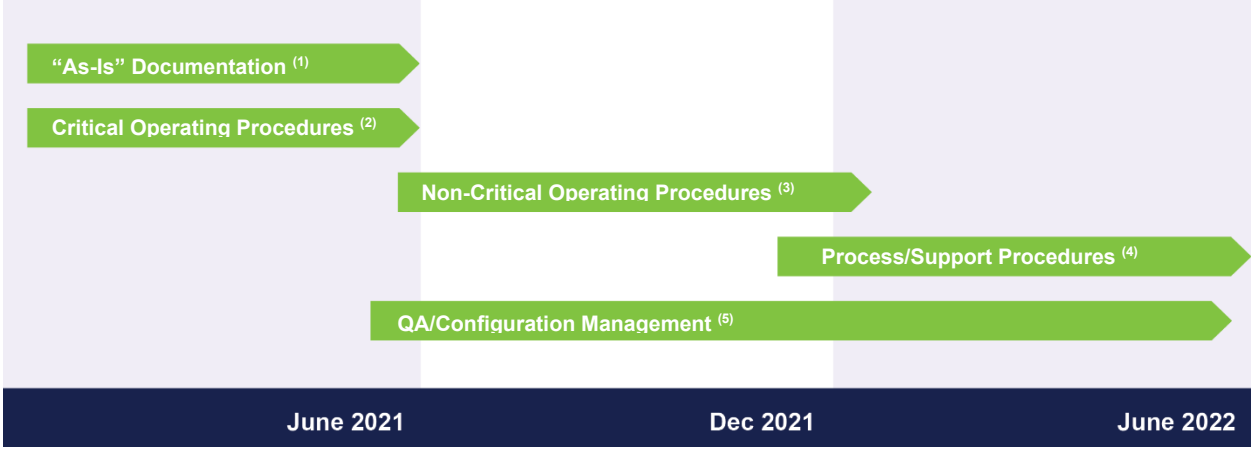
2.5 System Operation Principles Will Support the Later Development of Procedures

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.

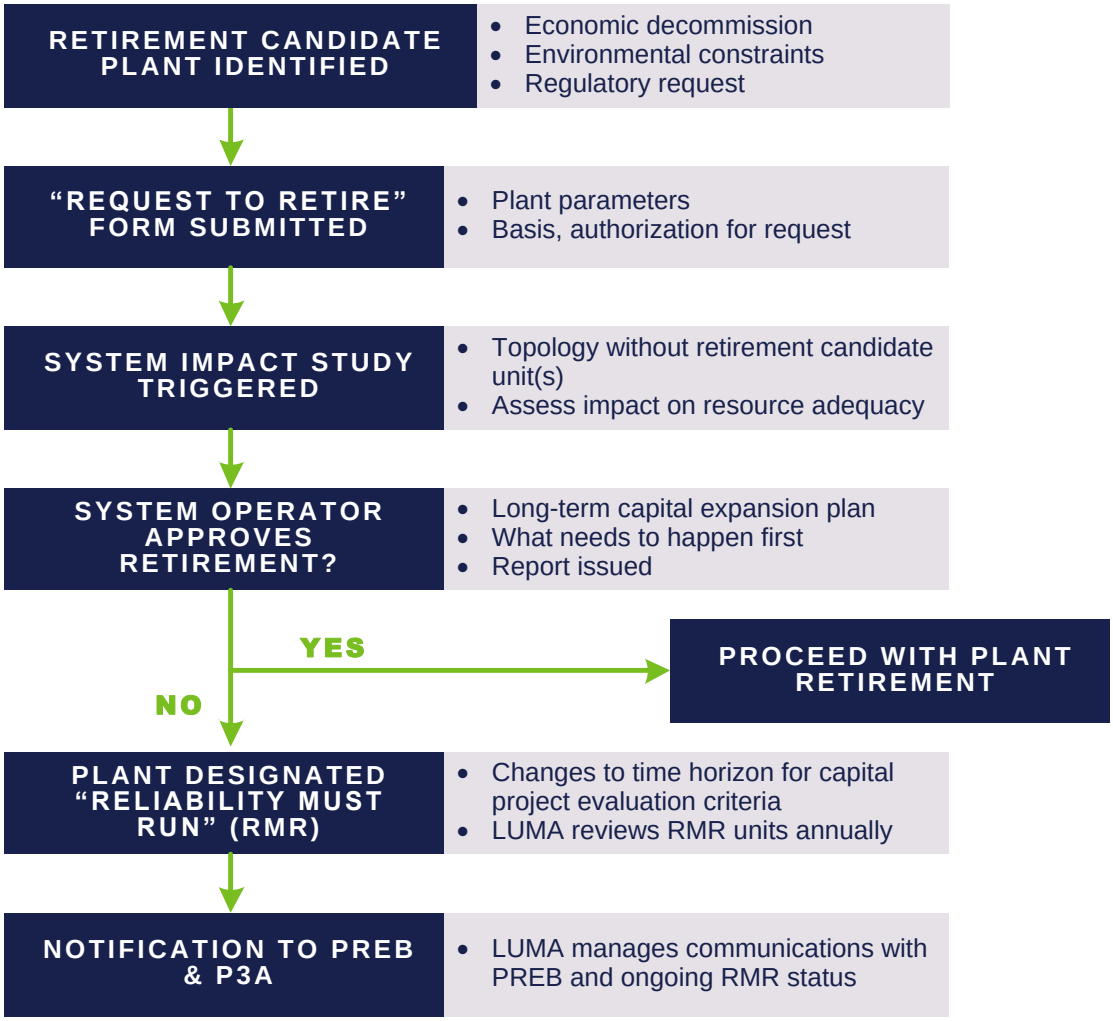
3.3 System Operator Will Coordinate All Generation Retirement Requests

When a generation owner or operator has determined that 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 made consistent with the approved IRP and in accordance with required approvals. LUMA will consider the following associated issues.

- The 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
- 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



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.

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

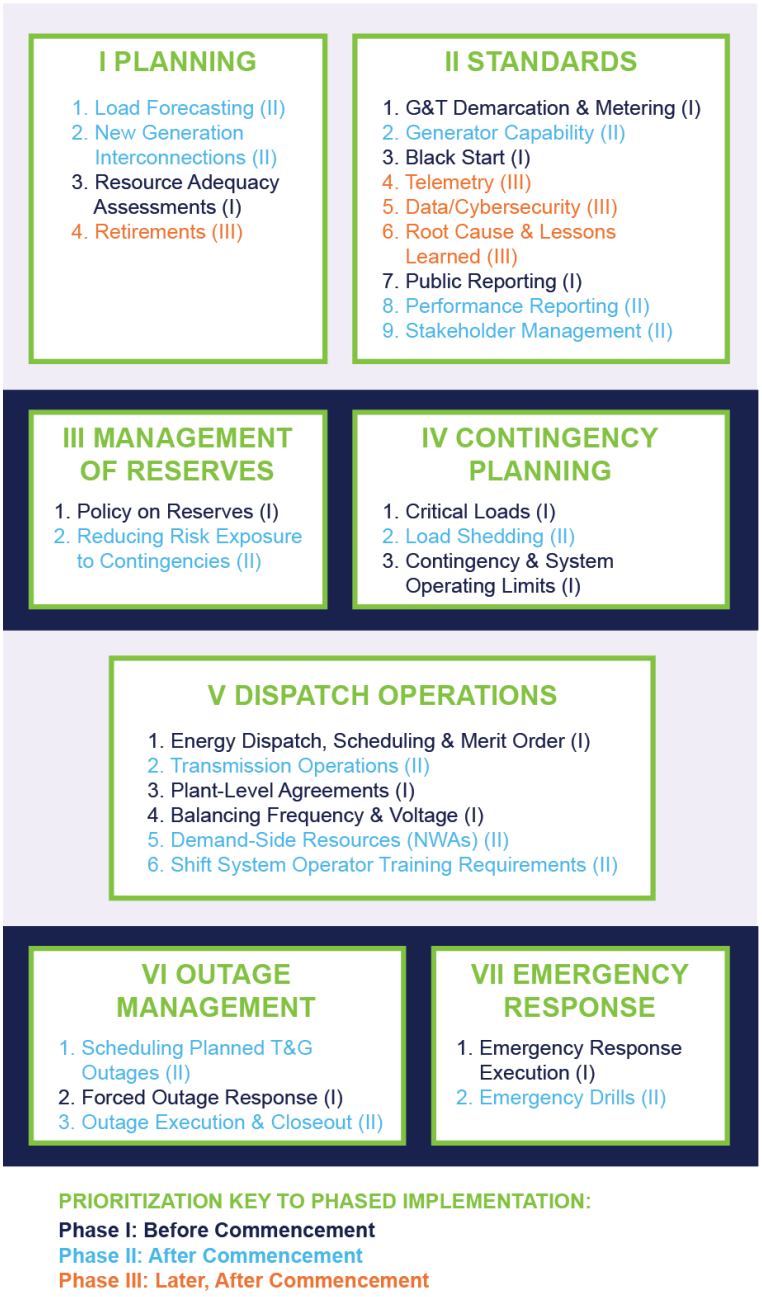
BALANCING METHODS: **Voltage Reduction:** System Operator will develop a voltage reduction plan to avoid or limit load shed
Load Shed: As a last resort, System Operator could take actions that safely unload the transmission system

Appendix A: Appendices

A.1 Preliminary List of Procedures for System Operator

This section provides a preliminary list of procedures to be prepared after approval of the System Operation Principles. LUMA considers each of these items to be significant enough that a separate, written procedure is required. Procedures will include details about how that activity should be carried out, criteria for decision making and standards to be met. Figure A-1 below describes the main procedures that LUMA plans to create.

Figure A-1. Summary of Procedures for System Operations Principles



A.2 List of Specific Procedures

I. PLANNING

1. Load Forecasting

Describes data input requirements, processing and data reporting to enable load forecast data reporting requirements.

2. New Generation Request

Provides guidance to a new generation through the application and agreement process including specific requirements and rights to a Generator on the system.

3. Resource Adequacy

Describes the process and procedure for establishing the amount of generating capacity required to supply load with sufficient reserve for reliable service.

4. Retirements

Describes the process for submitting a notification/request for retirement of a unit to System Operator. The process will include reason for retirement, timing of the retirement and system impact study.

II. LUMA SYSTEM OPERATION STANDARDS

1. Generation-Transmission Demarcation & Metering requirements

Describes the demarcation point between generation and transmission and the process and requirements necessary to properly provide for the demarcation point.

2. Generator Capability Standards

Provides specific requirements and rules to Generators who operate on the Puerto Rico system.

3. Black Start Standards

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.

4. Telemetry Standards

Describes all the telemetry needed for generation, substations and transmission; also addresses needed fiber, back-up capabilities, testing requirements and IT requirements.

5. Data & Cybersecurity Standards

Data standards describe data submittal and maintenance rules and requirements for all interconnected generation 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 will also comply with all governmental and regulatory requirements.

6. 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. Also, the System Operator will describe how to properly communicate all lessons learned throughout the organization.

7. Public Reporting

Provides guidance regarding all communication requirements to regulatory body and the public. Also provides recommended metrics such as Estimated Time of Restoration to be reported and a frequency for reporting.

8. Performance Reporting

Provides guidance regarding all appropriate performance metrics including but not limited to safety, reliability, status of equipment, corrective and preventative maintenance and budgetary reporting.

9. 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.

III. MANAGEMENT OF RESERVES

1. Policy on Reserves

Describes the rules, procedures and requirements for adequate availability of necessary resources that can be called upon to ensure reliability to the customers in the Puerto Rico system.

2. Reducing Risk Exposure to Contingencies

Provide guidance, rules and procedures that establish how to proactively monitor and react to all contingencies and be able to analyze and react to system issues prior to them becoming a contingency.

IV. CONTINGENCY PLANNING

1. Critical Loads

System Operator will provide procedures to identify and steps to take to maintain critical loads online, prevent load shedding and other switching steps to take to mitigate loss of critical loads and critical-care customers. The policy itself will be developed by other groups outside System Operations, including Utility Transformation and Customer Service.

2. Load Shedding

Provide guidance regarding under-frequency conditions and set specific limits and timeframes for deviation from these limits and define the procedure for load shedding or bus isolation. Frequency limits and the ability to properly shed load in a safe and controlled manner will be defined in this procedure.

3. Contingency & System Operating Limits Response

Procedure that describes contingencies and establishes operating limits with corrective actions and a timeline for proper response.

V. DISPATCH OPERATIONS

1. Scheduling, Energy Dispatch

Procedure for the System Operators assigned to the daily operation desks, who are responsible for maintaining adequate regulation and ensuring that system frequency and voltage remain within the tolerances. Also describes responsibilities for switching and blocking and other daily shift responsibilities.

2. Transmission Operations

Transmission operations, including switching, communications and reporting describes all activities involved with the transmission system, including operations, maintenance and planning.

3. Plant-Level Agreements

System Operations will develop a template to allow all plant-specific agreements and communication protocols to be defined in a single package. This will clearly define what each specific plant has agreed to related to technical and communications interfaces with System Operator.

4. Balancing Frequency & Voltage

Describes how to manage capacity resources, monitor transmission and provide services within the Puerto Rico service territory.

5. Demand Side Resources (Non-Wire Alternatives)

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

6. Shift System Operator Training Requirements

Addresses the training programs for transmission and generation operators. It will also address continuing training requirements for all System Operators within the Puerto Rico system.

VI. OUTAGE MANAGEMENT

1. Scheduling Planned Transmission & Generation Outages

Provides operating philosophies and operating parameters with respect to outage planning and scheduling. Also addresses the reporting, analyzing and approval of generation and transmission outages.

2. Forced Outage Response

Describes action to take immediately upon a forced outage to either generation or transmission. Includes communications responsibilities regarding cause of outage, outage duration and other issues to recover in a timely manner.

3. 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.

VII. EMERGENCY RESPONSE

1. Emergency Response Execution

Provides guidance and procedures for emergency response facility, emergency response roles and responsibilities, system operating conditions, system restoration and blackout restoration.

2. Emergency Drills

Provides the procedure to periodically drill the opening of emergency response facilities, all emergency response team members and the emergency response procedure.

A.3 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.

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.

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.

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.

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.