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

IN RE: REVIEW OF THE PUERTO RICO ELECTRIC POWER AUTHORITY INTEGRATED RESOURCE PLAN	**CASE NO.:** NEPR-AP-2023-0004 **SUBJECT**: Motion Submitting Responses to the Seventh Set of IRP Prefiling Period Requests of Information

MOTION SUBMITTING RESPONSES TO THE SEVENTH SET OF IRP PREFILING PERIOD REQUESTS OF INFORMATION

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

COME NOW LUMA Energy, LLC ("ManagementCo"), and **LUMA Energy ServCo, LLC** ("ServCo"), (jointly referred to as "LUMA"), and respectfully state and request the following:

1. LUMA is committed to supporting and advancing the transformation of Puerto Rico's energy system into one that is more resilient, cleaner, and sustainable for all. As Operator of the transmission and distribution system, LUMA is responsible for developing an Integrated Resource Plan ("IRP") that outlines the transformation of the island's energy resources over the next two decades. The goal of the 2025 IRP is to reflect the energy needs and priorities of customers while advancing responsibly towards clean energy objectives that will serve Puerto Rico for generations to come.

2. LUMA's approach to energy planning considers diverse factors, including resource constraints, cost dynamics, and technological integration. Its objective is to ensure that the 2025 IRP presents a diverse and analytically robust set of future scenarios and resource portfolios. This will help create a sustainable and reliable energy future for Puerto Rico, aligning with both customer needs and the island's public policy energy goals.

3. LUMA herein submits as *Exhibit 1* the responses addressing inquiries included in the *Seventh Request for Information* from the Puerto Rico Energy Bureau ("Energy Bureau") pertaining to material submitted in response to the 6th Requests of Information and in the Interim Filing and the Revised Interim Filing.

4. On January 25, 2024, the Energy Bureau entered a Resolution and Order in which it instructed LUMA, among other matters, to respond within fifteen (15) business days to a *Seventh Requests of Information* set forth in Attachment A to the Resolution and Order ("January 24th Order").

5. In compliance with the January 24th Order, LUMA hereby submits as *Exhibit 1* the information responsive to the *Seventh Requests of Information*. LUMA provides these documents supported by preliminary information. Data, estimates, and other information provided now may change and be revised as LUMA develops the 2025 IRP.

WHEREFORE, LUMA respectfully requests that the Energy Bureau **take notice** of the aforementioned for all purposes and **deem** LUMA to have complied with the Resolution and Order of January 24, 2025.

WE HEREBY CERTIFY that this Motion was filed using the electronic filing system of this Energy Bureau and that electronic copies of this Motion will be notified to the Puerto Rico Electric Power Authority: lionel.santa@prepa.pr.gov and through its attorneys of record González & Martínez, Mirelis Valle-Cancel, mvalle@gmlex.net; and Alexis G. Rivera Medina, arivera@gmlex.net; and Genera PR, LLC: brannen@genera-services.com; kbolanos@genera-pr.com; regulatory@genera-pr.com.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, on February 14th , 2025

.

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Exhibit 1

2025 Integrated Resource Plan (2025 IRP)

Attachment A Responses to Seventh Set of 2025 IRP Prefiling RFI

NEPR-AP-2023-0004

LUMA

Executive Summary

LUMA is committed to transforming Puerto Rico's energy system into one that is more reliable, resilient, cleaner, and sustainable for all 1.5 million customers that LUMA is privileged to serve. As part of LUMA's responsibilities as planner for the electrical system, LUMA is developing the 2025 Integrated Resource Plan (2025 IRP). This filing serves as a comprehensive response by LUMA to address inquiries from the Puerto Rico Energy Bureau (Energy Bureau) regarding the Seventh Set of 2025 IRP Prefiling RFI pertaining to material submitted in response to the Sixth Requests of Information[1] and the First Interim Filing[2] and the Revised First Interim Filing.[3] The responses herein contain inputs and assumptions used by LUMA and the 2025 IRP Technical Consultant to model the 2025 IRP Revised Scenarios and Characteristics.[4]

Puerto Rico's Integrated Resource Plan (IRP)

The significant progress that LUMA has made to improve the reliability and resiliency of the grid is related to one of LUMA's core planning responsibilities: the development and proposal of the 2025 IRP. The 2025 IRP is a long-term plan on how Puerto Rico will reliably and sustainably meet the energy needs of the Island over the coming decades.

Since the beginning of 2022, LUMA has been working cooperatively and diligently to develop a realistic and pragmatic 2025 IRP that reflects industry standards and the diverse perspectives of stakeholders from across the Island. This report is based on accurate and comprehensive data and analyses. It reflects Puerto Rico's future energy needs and priorities as the Island moves toward a more reliable, more resilient, and cleaner energy system. Notably, in developing the 2025 IRP, LUMA has prioritized stakeholder engagement through the *Solutions for the Energy Transformation for Puerto Rico* (SETPR) initiative. This collaborative process is designed to engage with a broad variety of customers and stakeholders to gain their input regarding Puerto Rico's energy future. Gathering and understanding diverse views and opinions is an important part of the 2025 IRP development process, which will help ensure that the finalized report incorporates broad stakeholder input.

LUMA's 2025 IRP Role: Objective Planner

Throughout the development of the 2025 IRP, LUMA has remained committed to maintaining transparency and communication with the Energy Bureau and stakeholders. It is important to keep in mind that LUMA's role is to be the data-driven planner and author of the 2025 IRP, using technically robust analyses and modeling to recommend the optimal plan for Puerto Rico. LUMA does not own or operate generation resources and does not hold primary responsibility for the policy decisions that determine future energy resource projects. As operator of Puerto Rico's T&D System, LUMA works to enable the safe and reliable interconnection of any approved energy resource additions and carries out

[1] Find at https://energia.pr.gov/wp-content/uploads/sites/7/2024/11/20241118-AP20230004-Motion-Subm-Responses-to-6TH-Set-of-IRP-Prefil-Period-Req-of-Inf-Req-for-Conf-Treat.pdf
[2] Find at: https://energia.pr.gov/wp-content/uploads/sites/7/2024/11/20241125-AP20230004-Motion-First-Interim-Filing.pdf
[3] Find at: https://energia.pr.gov/wp-content/uploads/sites/7/2025/01/20240110-AP20230004-Motion-Subm-Revised-1st-Interim-Filing-of-2025-IRP-Req.-for-Conf-Treatment.pdf
[4] Find at: https://energia.pr.gov/wp-content/uploads/sites/7/2024/03/20240311-AP20230004-Motion-Submitting-Revised-2024-Integrated-Resource-Plan-Scenarios-and-Characteristics.pdf

multiple planning functions that examine the current and future shape of the grid and the resources interconnected to the grid. Furthermore, LUMA's role as planner and operator for the grid and the interconnected resources (but not as investor or generation operator) gives it a unique perspective, aligned with the outcomes that most benefit customers.

As part of the 2025 IRP development process, LUMA continues to work with key stakeholders, including the Energy Bureau, the Financial Oversight and Management Board (FOMB) and the Puerto Rico Authority for Public Private Partnerships (P3A) to ensure that plans are comprehensive and practical and that they meet Puerto Rico's energy needs. LUMA will also continue collaborating with customers during the SETPR stakeholder engagement process to receive and incorporate meaningful feedback into the analysis. LUMA looks forward to continuing to work with the Energy Bureau and stakeholders on the 2025 IRP development process. LUMA's goal is to produce a final report promoting the continued transformation and recovery of the Island's electrical system to benefit its customers and Puerto Rico.

2025 IRP Timeline

The 2025 IRP planning process is a detailed analysis and energy resource planning effort for the Island's electrical system. As evidenced by other utilities across the mainland, the process involves an incredibly complex data analysis which, in the case of Puerto Rico, is compounded by ongoing challenges faced across the energy system. Given these unique complexities and challenges, and LUMA's absolute commitment to getting the 2025 IRP right for our customers, LUMA requested an additional 10 months from the Energy Bureau to file the 2025 IRP on May 16th, 2025.[5]

The extended timeline, divided into three milestones, is intended to ensure the 2025 IRP reflects the highest industry standards, meets current regulatory requirements, and reflects the energy priorities of LUMA's customers while progressing toward Puerto Rico's clean energy goals at the most reasonable cost. The filing extension allows LUMA and the 2025 IRP Technical Consultant time to develop scenarios, perform a complete transmission analysis, gather additional information, and conduct all SETPR meetings to present modeling results and preferred plans to stakeholders before the filing on May 16th, 2025.

Puerto Rico's Energy System: Overcoming Decades of Neglect and Mismanagement under PREPA

PREPA's legacy of operational, financial, and management failures is well documented, and the pain of these failures continues to impact Puerto Rico. The poor condition of the electric system that LUMA inherited in 2021 – defined by outdated, degraded infrastructure that had not been properly maintained due to decades of PREPA's neglect – continues to challenge the grid to this day. Furthermore, PREPA leadership's careless financial mismanagement led to their 10-year, $10 billion bankruptcy, which remains unsolved and continues negatively impacting LUMA's operations. Despite these challenges, our 4,000-strong LUMA team is committed to taking the necessary actions to provide more reliable, resilient, safe, customer-focused, and clean electric service, no less than the people of Puerto Rico expect and deserve. All the information contained herein is preliminary and subject to change as further work is completed for the 2025 IRP. LUMA appreciates the opportunity to provide responsive information to the Energy Bureau and its consultants to submit a more robust 2025 IRP. LUMA's goal is to ensure that the 2025 IRP presents a diverse, analytical, and sophisticated set of future scenarios and resource portfolios to map a brighter energy future for Puerto Rico, one that is responsive to customer needs and Puerto Rico's energy public policy objectives.

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[5] Find at: https://energia.pr.gov/wp-content/uploads/sites/7/2024/09/20240927-AP20230004-Motion-Req-of-Resol.-Aug-20-2024-and-Modification-of-2024-IRP-Filing-Schedule.pdf

Resumen Ejecutivo

LUMA se compromete a transformar el sistema energético de Puerto Rico en uno más confiable, resiliente, limpio y sostenible para los 1.5 millones de clientes a quienes tenemos el privilegio de servir. Como parte de nuestras responsabilidades como planificador del sistema eléctrico, LUMA está desarrollando el informe actual del Plan Integrado de Recursos del 2025 (PIR 2025). Esta presentación sirve como una respuesta integral de LUMA para abordar las consultas del Negociado de Energía de Puerto Rico (Negociado de Energía) con respecto al Séptimo Conjunto de Solicitud de Información de Prerradicación del PIR 2025 relacionado con el material presentado en las respuestas del Sexto Conjunto de Solicitud de Información de Prerradicación del PIR 2025[6] y la Primera Radicación Interina[7] y la Primera Radicación Revisada.[8] Las respuestas contienen las aportaciones y supuestos utilizados por LUMA y el Consultor Técnico del PIR 2025 para modelar los Escenarios y Características Revisados del PIR 2025.[9]

Desde que LUMA asumió las operaciones del Sistema de Transmisión y Distribución de Puerto Rico (Sistema de T&D), se ha enfocado en prioridades críticas, consistentes con el Plan de Remediación del Sistema (PRS) y los presupuestos aprobados. La meta de LUMA es lograr un progreso real y sostenible que resulte en un mejor servicio eléctrico para nuestros clientes y, en el proceso, deshacer décadas de mala gestión de la Autoridad de Energía Eléctrica de Puerto Rico (AEEPR). En solo tres años y medio, el equipo de 4,000 empleados de LUMA ha mejorado la resiliencia de la red mediante la instalación de más de 21,600 nuevos postes resistentes a las tormentas, la limpieza de la vegetación de casi 5,500 millas de líneas eléctricas y la instalación de casi 10,000 dispositivos de automatización de la red para reducir los impactos de los apagones. LUMA también ha reemplazado más de 166,300 farolas para mejorar la seguridad y ha conectado a más de 135,000 clientes a sistemas de energía solar en azoteas para avanzar la transformación de Puerto Rico hacia energía limpia.

Plan Integrado de Recursos (PIR) de Puerto Rico

El progreso significativo que LUMA ha logrado para mejorar la confiabilidad y resiliencia de la red está relacionado con una de sus principales responsabilidades de planificación: el desarrollo y la propuesta de un PIR 2025. Más específicamente, el PIR 2025 es el plan a largo plazo sobre cómo Puerto Rico satisfará de manera confiable y sostenible las necesidades energéticas de la Isla durante las próximas décadas.

Desde principios de 2022, LUMA ha estado trabajando de manera cooperadora y diligente para desarrollar un PIR 2025 realista y pragmático que refleje los estándares de la industria y las diversas perspectivas de las partes interesadas a través de toda la Isla. El plan se basa en datos y análisis precisos y complejos, y refleja las futuras necesidades y prioridades energéticas de Puerto Rico a medida que la Isla avanza hacia un sistema energético más confiable, resiliente y limpio. En particular, al desarrollar el PIR 2025, LUMA ha priorizado la participación de las partes interesadas a través de la iniciativa *Soluciones Energéticas para Transformar a Puerto Rico* (SETPR). Este proceso colaborativo está diseñado para engranar con una amplia variedad de clientes y partes interesadas con el fin obtener

[6] Localizado en: https://energia.pr.gov/wp-content/uploads/sites/7/2024/11/20241118-AP20230004-Motion-Subm-Responses-to-6TH-Set-of-IRP-Prefil-Period-Req-of-Inf-Req-for-Conf-Treat.pdf
[7] Localizado en: https://energia.pr.gov/wp-content/uploads/sites/7/2024/11/20241125-AP20230004-Motion-First-Interim-Filing.pdf
[8] Localizado en: https://energia.pr.gov/wp-content/uploads/sites/7/2025/01/20240110-AP20230004-Motion-Subm-Revised-1st-Interim-Filing-of-2025-IRP-Req.-for-Conf-Treatment.pdf
[9] Localizado en: https://energia.pr.gov/wp-content/uploads/sites/7/2024/03/20240311-AP20230004-Motion-Submitting-Revised-2024-Integrated-Resource-Plan-Scenarios-and-Characteristics.pdf

su insumo en cuanto al futuro energético de Puerto Rico. Recopilar y entender distintos puntos de vista y opiniones son aspectos importantes dentro del proceso de desarrollo del PIR 2025, ya que ayuda a LUMA a incorporar un amplio insumo de las partes interesadas en el reporte final.

El rol del PIR 2025 de LUMA: Planificador Objetivo

A través del desarrollo del PIR 2025, LUMA mantiene su compromiso de sostener transparencia y comunicación con el Negociado de Energía y con las partes interesadas. Es importante tener en mente que el rol de LUMA es ser el ente planificador impulsado por datos y autor del PIR 2025, usando análisis técnicamente robustos y modelaje para recomendar un plan que sea óptimo para Puerto Rico. LUMA no es propietaria, ni es el operador de recursos de generación, y no es responsable de las decisiones de política pública que puedan determinar futuros proyectos de recursos energéticos. Como operador del Sistema de T&D de Puerto Rico, LUMA trabaja para habilitar la interconexión segura y confiable de cualquier aportación de recursos energéticos aprobados, y lleva a cabo múltiples funciones de planificación que examinan el estado actual y futuro de la red y de los recursos interconectados a la red. Además, el rol de LUMA como planificadora y operadora de la red y de sus recursos interconectados (no como inversora ni operadora generatriz) le provee una perspectiva única alineada a los resultados que más beneficien a sus clientes.

Como parte del proceso de desarrollo del PIR 2025, LUMA continúa trabajando con partes interesadas clave, incluyendo el Negociado de Energía, la Junta de Supervisión y Control Fiscal (FOMB, por sus siglas en inglés) y la Autoridad de Alianzas Público-Privadas (P3A, por sus siglas en inglés) para asegurarse de que los planes sean comprehensivos y prácticos y que cumplan con las necesidades energéticas de Puerto Rico. LUMA también continuará colaborando con sus clientes durante el proceso de intercambio de ideas, SETPR, para recibir e incorporar todo insumo significativo al análisis.

A LUMA le entusiasma la oportunidad de continuar trabajando con el Negociado de Energía y con las partes interesadas en el proceso de desarrollo del PIR 2025. La meta de LUMA es producir un reporte final que promueva la continua transformación y la recuperación del sistema eléctrico de la Isla para el beneficio de los clientes de LUMA y de Puerto Rico.

Línea de Tiempo del PIR 2025

El proceso de planificación del PIR 2025 consiste en un análisis detallado y de un esfuerzo de planificación de recursos energéticos para el sistema eléctrico de la Isla. Tal como queda evidenciado por utilidades en otros estados de EE. UU., el proceso involucra un análisis de datos sumamente complejo al cual, en el caso de Puerto Rico, se le suman retos recurrentes que enfrenta el sistema energético. Debido a estas complejidades y a estos retos únicos, y el absoluto compromiso de LUMA a desarrollar el PIR 2025 adecuado para nuestros clientes, LUMA solicitó 10 meses adicionales al Negociado de Energía para radicar el PIR 2025 el 16 de mayo de 2025.[10] La extensión solicitada, divide en tres hitos la radicación final del PIR 2025, que busca asegurar que el PIR 2025 refleje los estándares más altos de la industria, que cumpla con los requerimientos regulatorios actuales y que refleje las prioridades energéticas de los clientes de LUMA a la vez que progresamos hacia las metas de energía limpia al costo más razonable. Esta extensión para radicar le permite más tiempo a LUMA y al Consultor Técnico del PIR 2025 para desarrollar los escenarios, conducir un análisis completo de transmisión, recopilar

[10] Localizado en: https://energia.pr.gov/wp-content/uploads/sites/7/2024/09/20240927-AP20230004-Motion-Req-of-Resol.-Aug-20-2024-and-Modification-of-2024-IRP-Filing-Schedule.pdf

información adicional y llevar a cabo todas las reuniones de SETPR para presentar resultados de modelaje y planes preferidos a las partes interesadas antes de la radicación del 16 de mayo de 2025.

El sistema energético de Puerto Rico: Superando décadas de descuido y pobre manejo bajo la AEEPR

El legado de fracasos operacionales, financieros y administrativos de la AEEPR está bien documentado y el dolor ocasionado por estas fallas continúa impactando a Puerto Rico. La condición pobre en la que se encuentra el sistema eléctrico que heredó LUMA en 2021 -definido por infraestructura anticuada y degradada que no ha sido mantenida adecuadamente debido al descuido de la AEEPR por décadas – continúa retando a la red actualmente. Además, el mal manejo financiero por parte del liderato de la AEEPR la condujo a su quiebra de diez años por una suma de $10 mil millones, lo cual continúa sin resolverse y aún impacta negativamente nuestras operaciones. A pesar de estos retos, el equipo de 4,000 empleados de LUMA está comprometido con tomar las acciones necesarias para proveer un servicio eléctrico más resiliente, seguro, enfocado en el cliente y limpio, nada menos que lo que merece y espera el pueblo de Puerto Rico.

Toda la información y los resultados del modelaje que contiene este documento son preliminares y sujetos a cambio a medida que se completa más trabajo para el PIR 2025. LUMA aprecia la oportunidad de proveer información responsiva al Negociado de Energía y a sus consultores para radicar un PIR 2025 más robusto. La meta de LUMA es asegurarse que el PIR 2025 presente un conjunto de escenarios y de cartera de recursos diversos, analíticos y sofisticados para trazar un futuro energético más brillante para Puerto Rico, uno que responda a las necesidades de los clientes y a los objetivos de la política pública energética de la Isla.

2025 INTEGRATED RESOURCE PLAN

NEPR-AP-2023-0004

RESPONSE: RFI-LUMA-AP-2023.0004-20250124-PREB

INTRODUCTION

On January 24th, 2025, the Energy Bureau issued a Resolution and Order (January 24th R&O), with the Seventh Set of 2025 IRP Prefiling Request for Information (7th Set of 2025 IRP Prefiling RFI), ordering LUMA to submit responses to a total of eight (8) questions in two separate filings. Responses to questions 1 through 7 must be filed by February 14th, 2025, and question number 8 must be filed by April 1st, 2025.

This filing focuses on questions 1 through 7 of the 7th Set of 2025 IRP Prefiling RFI addressing: 1) battery energy storage system cost assumptions; 2) biodiesel fuel price projections; 3) build costs, outage rates, and heat rate for the 460 MW natural gas-fired combined cycle plant included in the PLEXOS model; 4) workpapers to present value revenue requirement (PVRR) tables in the Revised Interim Filing; 5) workpapers for the load forecast; 6) updates regarding assumptions for the Solar Rebound Effect; and 7) analysis regarding capacity reserve margin modeling.

Please note that all results provided by LUMA throughout this process are considered preliminary until the final filing on May 16th, 2025. LUMA will include in the upcoming Second Interim Filing, due on February 28th, 2025, an updated version of Portfolios A to D resulting from Scenarios 1 to 4. The updated results will vary from what was filed on the First Interim Filing and in the Revised First Interim Filing.

2025 INTEGRATED RESOURCE PLAN

NEPR-AP-2023-0004

RESPUESTA: RFI-LUMA-AP-2023.0004-20250124-PREB

INTRODUCCIÓN

El 24 de enero de 2025, el Negociado de Energía emitió una Resolución y Orden (R&O del 24 de enero), con el Séptimo Conjunto de Solicitud de Información de Prerradicación del IRP 2025 (7mo Conjunto de RFI de Prerradicación del IRP 2025), ordenando a LUMA a responder a ocho (8) preguntas en total, en dos radicaciones por separado. Las respuestas a las preguntas 1 a la 7 deberán radicarse a más tardar el 14 de febrero de 2025, mientras que la respuesta a la pregunta 8 deberá radicarse a más tardar el 1 de abril de 2025.

Esta presentación se enfoca en las preguntas 1 a la 7 del 7mo Conjunto de RFI de Prerradicación del IRP 2025 respondiendo a: 1) supuestos de costo para sistemas de almacenamiento de energía de batería; 2) proyecciones de precios para combustible biodiesel; 3) costos de construcción, índices de interrupción y rendimiento térmico para la planta de ciclo combinado de gas natural de 460 MW incluida en el modelaje de PLEXOS; 4) documentos que contengan las tablas de requisito de ingresos de valor presente (PVRR, por sus siglas en inglés) según encontradas en la Radicación Interina Revisada; 5) documentos relacionados con el pronóstico de carga; 6) actualizaciones de los supuestos para el Efecto de Rebote Solar; y 7) análisis sobre el modelaje del margen de reserva de capacidad.

Es importante tener en cuenta que todos los resultados provistos por LUMA a través de este proceso son considerados preliminares hasta la radicación final del 16 de mayo de 2025. LUMA incluirá en la Segunda Radicación Interina, pautada para el 28 de febrero de 2025, una versión actualizada de los porfolios A al D resultantes de los Escenarios 1 al 4. Los resultados actualizados variarán de lo presentado en la Primera Radicación Interina y en la Primera Radicación Interina Revisada.

List of Responses and Attachments

Response ID	Document Type	Response Subject
RFI-LUMA-AP-2023.0004-20250124-PREB-001A-C	Excel document	BESS cost Excel file
RFI-LUMA-AP-2023.0004-20250124-PREB-002	Excel document	Biodiesel cost forecast
RFI-LUMA-AP-2023.0004-20250124-PREB-003A-D	Excel document	Build Costs, Outage Rates, and Heat Rate for new 460 MW San Juan NGCC unit and other fossil plants
RFI-LUMA-AP-2023.0004-20250124-PREB-005A.001	Excel document	Load Forecast Update (Summary)
RFI-LUMA-AP-2023.0004-20250124-PREB-005A.002	Excel document	Load Forecast Update (Hourly Data 2025- 2030)
RFI-LUMA-AP-2023.0004-20250124-PREB-005A.003	Excel document	Load Forecast Update (Hourly Data 2031- 2040)
RFI-LUMA-AP-2023.0004-20250124-PREB-005A.004	Excel document	Load Forecast Update (Hourly Data 2041- 2045)

List of Acronyms

ACRONYM	DEFINITION
AEO	Annual Energy Outlook
ASAP	Accelerated Storage Addition Program
B100	100% biodiesel blend
BESS	Battery Energy Storage System
CC	Combined Cycle
CHP	Combined Heat and Power
CO2	Carbon Dioxide
COD	Commercial Operation Date
DBESS	Distributed Battery Energy Storage
DPV	Distributed Photovoltaic
DR	Demand Response
EE	Energy Efficiency
ELCC	Effective Load Carrying Capacity
EPC	Engineering, Procurement and Construction
EV	Electric Vehicle
FO&M	Fixed Operation and Maintenance
IRP	Integrated Resource Plan
LOLE	Loss Of Load Expectation
LOLP	Loss Of Load Probability
LT	Long-Term
NEM	Net Energy Metering
NGCC	Natural Gas Combined-Cycle
PR	Puerto Rico
PVRR	Present Value Revenue Requirement
RFI	Request for Information
RPS	Renewable Portfolio Standard
ST	Short-Term
TPA	Transmission Planning Area

2025 INTEGRATED RESOURCE PLAN

ACRONYM	DEFINITION
T&D	Transmission and Distribution
VO&M	Variable Operation and Maintenance

Attachment A
NEPR-AP-2023-0004

Response: RFI-LUMA-AP-2023.0004-20250124-PREB-001a

SUBJECT

Battery Energy Storage Systems Costs Assumptions

REQUEST

a. Provide the current assumptions used by LUMA in the PLEXOS modeling runs for utility-scale battery energy storage build costs under base, low, and high resource cost categories associated with different scenarios as seen (for example) in Table 1 at page 11 of the Revised Interim Filing. Provide in Excel file format with formulas intact.

RESPONSE

The Battery Energy Storage Systems (BESS) additions include Tranche 1 and 2 BESS with costs based on their contracts, Accelerated Storage Addition Program (ASAP) program batteries with costs based on the Energy Bureau approved prices, or Genera BESS and generic BESS additions with estimated costs developed by the 2025 IRP Technical Consultant. The Tranche 1 and 2 BESS, ASAP BESS, and Genera BESS additions are the only fixed decision BESS, starting with in-service dates in 2026 and 2027. Generic utility-scale systems can be added starting in 2027.

The cost of the Genera BESS additions and the generic BESS are estimated using the 2025 IRP Technical Consultant's proprietary data of actual bids and project costs for projects in the U.S., which are then adjusted using a "Cost Scale Factor," developed by the National Renewable Energy Laboratory (NREL) and used in the costs estimates of the Puerto Rico Grid Resilience and Transitions to 100% Renewable Energy Study (PR100) developed by the Department of Energy (DOE). The Cost Scale Factors contain declining annual escalation factors that are applied to mainland USA cost estimates to estimate the equivalent Puerto Rico-specific costs. The PR100 Study, Section 8.2.6.1.7 (page 222) further explains the Cost Scale Factors.

The base, low and high capex assumptions for the 4-hour BESS used in the 2025 IRP are shown in the attached file: "***RFI-LUMA-AP-2023.0004-20250124-PREB-001A-C***" (Response subject: BESS cost Excel file). The worksheet also allows a comparison with representative Tranche 1 projects and is organized as follows:

1. The base cost of generic new 4-hour BESS options is shown in column H, rows 8-25 for the years 2027-2044. These costs reflect a projected decrease in BESS costs (2023$) over time and include the renewable energy and BESS Cost Scale Factors adopted. Similar values for the low case and high case are placed in columns I and J, respectively.
2. The Cost Scale Factors for renewable energy and BESS projects are shown in columns L, M, and N. This adjustment decreases over time, starting at a 2.25 factor through 2025 and then decreasing to a value of 1.39 in 2035 and after for the base case (1.1 for the low case and 1.82 for the high case).

3. The 4-hour BESS capital costs without the Cost Scale Factor are shown in columns Q, R and S for the base, low, and high cases, respectively.
4. The remainder of the worksheet compares the 20-year capital cost of the generic BESS compared to a representative Tranche 1 BESS project. In column U, the base generic 4-hour BESS capital cost listed in column H for 2027-2029 is converted to a monthly cost/MW, assuming a 10% levelized fixed charge rate. The costs listed include adjustments to put the capital cost into nominal first-year costs (assuming a yearly cost escalation of 2.5%). As a result, the estimated projected cost for a generic 4-hour BESS coming online in 2027 is $38,792/MW/month (see cell U8) (and is $37,431/MW/month for a Commercial Operating Date (COD) date of 2028 and $35,979/MW/month for COD date of 2029). In column Y, the cost of a representative Tranche 1 BESS option, the Caguas Energy Storage project, is shown. The 2027 cost is $29,927/MW/month, based on the 2026 cost, which is escalated at 2 percent per year according to the contract.
5. Column AC shows the 20-year representative cost of Tranche 1 bids (using Caguas Energy Storage for this comparison) and totals $727,143/MW/month (cell AC 30). This compares to a total 20-year cost of $775,837/MW/month for a generic BESS coming online in 2027 when a 10 percent levelized fixed charge rate is assumed. The resulting 20-year cost of the 2027 generic BESS is 106.7% of the Tranche 1 project cost (as shown in AF 30).
6. However, due to the decreasing cost of the generic BESS due to lower real costs and a lower Cost Scale Factor, the cost of a generic BESS coming online in 2028 is approximately equal to the cost of a Tranche 1 project operating over a 20-year period starting in 2028 and becomes nearly 5% lower than the Tranche 1 project if a starting year of 2029 is assumed (see cell AF 32).

The conclusion is that the generic costs for a 4-hour BESS initially have a slightly higher 20-year cost (in 2027) but become lower in cost than representative Tranche 1 BESS projects if the in-service date is in 2029 or later.

Attachment A
NEPR-AP-2023-0004

Response: RFI-LUMA-AP-2023.0004-20250124-PREB-001b

SUBJECT

Battery Energy Assumptions System Cost Assumptions

REQUEST

b. Provide all source material and all workpapers used to develop any of the battery energy storage capital costs used in the PLEXOS model.

RESPONSE

Please see the "RFI-LUMA-AP-2023.0004-20250124-PREB-001a" response above and the attachment: "***RFI-LUMA-AP-2023.0004-20250124-PREB-001A-C***" (Response subject: BESS cost Excel file).

Attachment A
NEPR-AP-2023-0004

Response: RFI-LUMA-AP-2023.0004-20250124-PREB-001c

SUBJECT

Base Case Battery Energy Assumptions System Cost Assumptions

REQUEST

c. Explain why current "base" (Scenario 1) and "low" (Scenario 4) battery energy storage costs used in the PLEXOS model are both higher than the costs of battery energy storage resources procured through Tranche 1, 2 and 4 solicitations.

RESPONSE

Please see the “RFI-LUMA-AP-2023.0004-20250124-PREB-001A-C” response above, (Question 1a and 1b). Specifically, items 1 through 6. The analysis concludes that, under base case assumptions, the generic costs for a 4-hour BESS have a slightly higher 20-year cost initially (in 2027) but become lower in cost than representative Tranche 1 BESS projects if the in-service date is 2029 or later.

Attachment A
NEPR-AP-2023-0004

Response: RFI-LUMA-AP-2023.0004-20250124-PREB-002a-b

SUBJECT

Biodiesel fuel price projection in PLEXOS model

REQUEST

a. Re: response to ROI-6, question 2a. Provide the specific set of data sources used by the Technical Consultant to prepare biodiesel fuel costs for use in the PLEXOS model.
b. Provide all workpapers used in the development of the biodiesel fuel cost trajectory used in the PLEXOS model, in Excel file format with formulas intact.

RESPONSE

The biodiesel fuel cost forecast was developed by the 2025 IRP Technical Consultant, who relied primarily on the delivered price quotes provided for this IRP study by the Chevron Renewable Energy Group. The Chevron Renewable Group suggested that the future biodiesel commodity prices be linked to New York Harbor Heating Oil Futures, with a nominal $0.85/gallon adder. Delivery prices were estimated to be at a nominal cost of $0.80/gallon, which can be broken down into $0.30/gallon in US rail and terminal cost, $0.30/gallon in vessel freight to Puerto Rico, and $0.20/gallon in terminal and freight costs in Puerto Rico.

The 2025 IRP Technical Consultant utilized the average New York Harbor Heating Oil Futures from March 2024 to calculate the annual commodity price from 2024 through 2027. From 2028 onwards, the diesel price growth rate from the 2023 Energy Information Administration Annual Energy Outlook (AEO) Reference Case was applied to project the annual commodity prices. The delivery price adders were then applied to determine the final delivered biodiesel prices for various biodiesel blends.

Concerning the biodiesel blends assumed for the study, the 2025 IRP Technical Consultant developed and utilized a schedule for introducing biodiesel, with the initial phase involving a blend of 60% biodiesel and 40% diesel (B60) in 2024. Subsequently, it was assumed that there would be a gradual increase of 1-2% in the blend each year until 2045 when the blend will reach 100% biodiesel (B100) and remain at this level thereafter.

See attachment "***RFI-LUMA-AP-2023.0004-20250124-PREB-002***" (Response subject: Biodiesel cost forecast).

Attachment A
NEPR-AP-2023-0004

Response: RFI-LUMA-AP-2023.0004-20250124-PREB-03a-d

SUBJECT

Build Costs, Outage Rates, and Heat Rate for new 460 MW Unit

REQUEST

3. Build Costs, Outage Rates, and Heat Rate for new 460 MW (as indicated in PLEXOS) San Juan NGCC plant for operation in mid-2028 and build costs for other fossil plants in PLEXOS model

a. Re. Build Costs: confirm, or explain otherwise, that LUMA will use the San Juan NGCC plant contract as the basis for the capital costs for this plant.
b. Re. Build Costs source information in workpapers in Revised Interim Filing: provide the specific source for the capital costs used for all nine (9) fossil plants listed in the "PVRR" tab (in columns to the right of the main tabulation, and in "sheet 2" tab) of the confidential workpapers included in the Revised Interim Filing.
c. Outage Rates: provide specific source(s) for the planned (and if applicable, forced) outage rates used to represent the San Juan NGCC plant in PLEXOS.
d. Heat Rate: provide specific source(s) for the heat rate parameters used to represent the San Juan NGCC plant in PLEXOS.

RESPONSE

The cost and performance information requested is contained in the attached Excel file, "***RFI-LUMA-AP-2023.0004-20250124-PREB-003A-D"*** (Response subject: Build Costs, Outage Rates, and Heat Rate for new 460 MW San Juan NGCC unit and other fossil plants).

Capital costs are in 2023 dollars and include the Puerto Rico Cost Scale Factors for conventional technologies shown in the "***RFI-LUMA-AP-2023.0004-20250124-PREB-003A-D***" file attached. In the absence of Power Purchase Agreement (PPA) information, the capital cost for the 460 MW San Juan Natural Gas Combined Cycle (NGCC) unit for 2028 was estimated based on an interpolation of capital costs for the 7F.05 1x1 combined cycle and the 7HA.02 1.1 combined cycle, as shown in the "***RFI-LUMA-AP-2023.0004-20250124-PREB-003A-D***" file. This is an update from the previous assumptions used in the First Interim Filing and the Revised First Interim Filing, which had a higher capital cost for the San Juan NGCC unit. The cost and performance data for other new conventional technologies listed are based on estimates developed for other IRPs or supply-side cost studies developed for utilities in Florida.

Attachment A
NEPR-AP-2023-0004

Response: RFI-LUMA-AP-2023.0004-20250124-PREB-004

SUBJECT

PVRR Scenarios 1-4

REQUEST

4. PVRR Tables in PLEXOS results workpaper for Scenarios 1-4, and at (e.g.) Table 10, Table 37 (pages 48, and 97) of Revised Interim Filing
a. How does LUMA interpret a comparison between the PVRR values for scenarios with different load, such as Scenario 1 and Scenario 4? Include discussion of the use and interpretation of both the PVRR and the Total System Cost (USD/kWh) metrics provided in the results for these two scenarios.

RESPONSE

To ensure a fair comparison between the Present Value Revenue Requirement (PVRR) across different scenarios with different loads, LUMA uses a Flexibility analysis of the Portfolios and the Levelized Cost of Energy (LCOE). The PVRR and LCOE values referenced here represent only the electricity production costs and are not equivalent to a retail electric rate.

The 2025 IRP development process incorporates the definition of a different optimal portfolio for the conditions defined by each scenario, including the differences in loads reflected in the scenarios. The six core scenarios planned for the 2025 IRP (i.e., scenarios 1 to 6) result in the definition of six different optimal portfolios (i.e., A to F, where Portfolio A is the optimal portfolio for the conditions Scenario 1, Portfolio B is the optimal portfolio for the conditions in Scenario 2 and so on), The Flexibility analysis assesses each of the Portfolios A to F against each of the conditions and loads described by each Scenario. For example, Portfolio A is tested under the conditions described in Scenarios 2, 3, 4, 5, and 6: Portfolio B is tested against the conditions in Scenarios 1, 3, 4, 5, and 6. The primary indicator used to assess and compare the portfolios is PVRR. PVRR is the total cost of electricity production over the 20-year term of the IRP, discounted to reflect the time value of money. The matrix of PVRR that results from the Flexibility analysis (i.e., PVRR of each of the 6 portfolios modeled against the conditions in each of the 6 scenarios) enables a comparison of how flexible a Portfolio is to adapt to a range of future conditions, including the different loads' forecasts in the different scenarios.

In addition, LUMA plans to calculate a Levelized Cost of Energy (LCOE) for the portfolios to compare their results on a per kWh basis. LCOE is a common utility industry indicator used to enable comparison of unitized costs of different technologies and resource plans.

LCOE, expressed in $/kWh is defined as:

LCOE = (Present Value Revenue Requirement) / (Present Value of Electricity Generated)

The Portfolio Flexibility analysis and LCOE are intended to enable a robust comparison of the portfolios that account for the different loads incorporated across the scenarios.

Attachment A

NEPR-AP-2023-0004

Response: RFI-LUMA-AP-2023.0004-20250124-PREB-005

SUBJECT

Load Forecast

REQUEST

a. Provide the final load forecast workpaper (in Excel file format, with all components of the load forecast) that LUMA plans to use in the scenarios to be filed in February and for the scenarios whose results have already been filed in the Revised Interim Filing.

RESPONSE

The 2025 IRP high load forecast was updated in 2024 using the latest actual data to reflect current demand trends and economic conditions.

Details on the updated high-load forecast can be found in the following attachments:

- ***RFI-LUMA-AP-2023.0004-20250124-PREB-005A.001*** (Response subject: Load Forecast Update (Summary))
- ***RFI-LUMA-AP-2023.0004-20250124-PREB-005A.002*** (Response subject: Load Forecast Update (Hourly Data 2025-2030))
- ***RFI-LUMA-AP-2023.0004-20250124-PREB-005A.003*** (Response subject: Load Forecast Update (Hourly Data 2031-2040))
- ***RFI-LUMA-AP-2023.0004-20250124-PREB-005A.004*** (Response subject: Load Forecast Update (Hourly Data 2041-2045))

Attachment A
NEPR-AP-2023-0004

Response: RFI-LUMA-AP-2023.0004-20250124-PREB-006

SUBJECT

Solar Rebound Effect

REQUEST

6. Solar rebound effect. In response to ROI-6 question 10e, LUMA said that they have revised the approach to the rebound effect for solar, and the magnitude may not be as high as 28.5%.
a. Provide an update on LUMA and the IRP Technical Consultant's assessment of this topic and state what assumption LUMA is currently using in its IRP load forecast for this input assumption.

RESPONSE

LUMA contracted with Guidehouse to analyze historical data on electricity use from residential Net Energy Metering (NEM) customers before and after installation of distributed solar, and from a control group of non-NEM residential customers. Preliminary results from the study indicate a rebound effect where residential NEM customers tend to increase their electricity usage over time following the installation of the distributed solar and enrollment in NEM. This results in an immediate drop in utility sales to the customer after installation, assumed to be reasonably aligned with their pre-installation energy consumption, less than the energy output of their distributed solar project. However, over time, the utility sales to these residential NEM customers increased over time. This preliminary finding is consistent with industry findings in other jurisdictions. The results of this analysis are not yet final, and LUMA has not yet determined how it may modify its forecasting methods associated with its residential NEM customer sales to account for these findings.

LUMA has determined that the rebound effect is already embedded within the load and/or DPV forecasts in the 2025 IRP.

Attachment A
NEPR-AP-2023-0004

Response: RFI-LUMA-AP-2023.0004-20250124-PREB-007a

SUBJECT

Capacity Reserve Margin Modeling

REQUEST

Capacity reserve margin modeling. Reference -Table 3 and Table 9, Revised Interim Filing (pages 34 and 46). Re: PLEXOS loss of load results show dramatic declines in expected unserved energy and the number of expected unserved energy events (Table 9), starting in 2027. Table 3 shows reserve margin values after 2031 in exceedance of 50%, presumably due to input assumption requirements
a. LUMA and the technical consultant initially had trouble utilizing the loss-of-load stochastic features of the PLEXOS model and reverted to using planning reserve margins as an input. Comment, with rationale, on whether use of a roughly 50% reserve margin for all years after the early 2030s is a reasonable assumption, given that the retirement of the bulk of the older steam units, with poor availability attributes, occurs by 2032.

RESPONSE

A 54% reserve margin target is used beginning in the year 2033. The 54% reserve margin target was determined to be reasonable using an iterative approach of increasing target reserve margins to meet the reliability targets, specifically, the targeted Loss of Load Probability (LOLP) values adopted for the 2025 IRP. Lower minimum reserve margins resulted in projected LOLP values that exceeded the annual LOLP targets. These targets decrease over time, reaching a value of 2.4 hours per year in 2038. The LOLP target remains constant at 2.4 hours per year for the remainder of the study period. Even at the specified minimum reserve margin of 54%, some plans required additional capacity, determined by an iterative approach, to meet the annual reliability criteria.

Attachment A
NEPR-AP-2023-0004

Response: RFI-LUMA-AP-2023.0004-20250124-PREB-007b

SUBJECT

Capacity Reserve Margin Modeling

REQUEST

Capacity reserve margin modeling. Reference -Table 3 and Table 9, Revised Interim Filing (pages 34 and 46). Re: PLEXOS loss of load results show dramatic declines in expected unserved energy and the number of expected unserved energy events (Table 9), starting in 2027. Table 3 shows reserve margin values after 2031 in exceedance of 50%, presumably due to input assumption requirements
b. What reserve margin trajectory (as input assumption) does LUMA or the technical consultant believe is reasonable for the period after retirement of the worst performing units in Puerto Rico, to avoid "overbuilds" in the PLEXOS model in the outer years of the planning horizon?

RESPONSE

As explained above in question 7a (RFI-LUMA-AP-2023.0004-20250124-PREB-007a), a 54% reserve margin target is used beginning in 2033. The 54% reserve margin target was determined to be reasonable using an iterative approach of increasing target reserve margins to meet the reliability targets. Lower minimum reserve margins resulted in projected LOLP values that exceeded the annual LOLP targets. The LOLP targets decrease over time to a value of 2.4 hours per year beginning in 2038 and hold to that maximum level through the end of the study. Even at the specified minimum reserve margin of 54%, some plans required additional capacity, determined by an iterative approach, to meet the annual LOLP target criteria. Therefore, while some years later in the expansion plan have zero LOLP hours and could arguably involve “overbuilds” for a specific year, capacity additions are needed in other years to meet annual LOLP targets.