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Received:

Dec 19, 2025

10:00 PM

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 Supplemental Scenarios, Request for Confidential Treatment, and Memorandum in Support of Confidentiality

MOTION SUBMITTING SUPPLEMENTAL SCENARIOS, REQUEST FOR CONFIDENTIAL TREATMENT, AND MEMORANDUM IN SUPPORT OF CONFIDENTIALITY

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:

I. Introduction and Submission of Supplemental Scenarios

1. On May 13, 2025, the Energy Bureau issued a Resolution and Order setting October 17, 2025, as the date for LUMA to submit the 2025 Integrated Resource Plan ("2025 IRP"), specifically the primary sections of the *Regulation on Integrated Resource Plan for the Puerto Rico Electric Power Authority*, Regulation No. 9021, dated April 20, 2018 ("Regulation 9021") that require resource plan development, selection of a Preferred Resource Plan, and reporting on existing and planned transmission and distribution system elements ("May 13th Order").

2. Further, the Energy Bureau provided two additional filing deadlines: (a) November 21, 2025, to file the portion of the requirements that commands LUMA to test the Preferred Resource Plan to determine any implications it may have on the transmission and distribution

system; and (b) "shortly thereafter" November 21, 2025 to file the "Supplemental" modeling runs identified in the May 13th Order.

3. On October 17, 2025, LUMA filed a *Motion Submitting 2025 IRP and Request for Confidential Treatment*. Therein, LUMA submitted the 2025 IRP recommending that the Energy Bureau approve Resource Plan Hybrid A as LUMA's Preferred Resource Plan. Resource Plan Hybrid A represents a balanced, cost-effective path to meeting Puerto Rico's energy needs, reflecting current expectations for fuel and technology costs. In compliance with the May 13th Order, LUMA filed the 2025 IRP as *Exhibit 1,* and the workpapers and models relied on in developing the 2025 IRP as *Exhibit 2.*

4. On October 17, 2025, LUMA also filed the *Motion Requesting Extension of the Review Period for Determination of Completeness*, requesting to extend the completeness review period until the Supplemental Scenarios are filed on December 12, 2025, or until after December 19, 2025, when the Rate Review Process evidentiary hearings have concluded.

5. On October 24, 2025, the Energy Bureau issued a Resolution and Order granting LUMA until December 19, 2025, to file the five Supplemental Scenarios and indicating that on that same date, the Energy Bureau will formally commence the 2025 IRP Report completeness review specified in Section 3.02(A) of Regulation 9021 ("October 24th Order").

6. On October 29, 2025, LUMA filed a *Memorandum of Law in Support of Request for Confidential Treatment of Revised 2025 IRP and Submission of Public Version and Confidential Version of Revised 2025 IRP*. LUMA submitted a revised, redacted version of the 2025 IRP Report, along with the workpapers and models relied on in developing the 2025 IRP

Report, for public disclosure.[1] Moreover, pursuant to this Energy Bureau's Policy on Confidential Information, LUMA filed the corresponding memorandum of law stating the legal basis for the request to treat certain portions of the revised version of the 2025 IRP Report and the workpapers and models relied on in developing the 2025 IRP confidentially.

7. On November 21, 2025, LUMA filed a *Motion Submitting the Transmission Needs Studies Report, Request for Confidential Treatment, and Memorandum in Support of Confidentiality*. LUMA submitted the Transmission Needs Studies Report in compliance with the portion of Regulation 9021 that requires LUMA to test the Preferred Resource Plan to determine any implications it may have on the transmission and distribution system. It also filed a revised version of the pre-filed direct testimony of Dr. Ajit Kulkarni, Grid Modernization Manager, in support of the Transmission Needs Studies Report.

8. In compliance with the May 13th and October 24th Orders, LUMA hereby submits as *Exhibit 1* the Appendix 7 of the 2025 IRP Report, which includes the results of modeling the five Supplemental Scenarios. All scenarios were modeled over a twenty-year period from 2025 to 2044. The resulting resource plans were assessed using a broad range of performance indicators, combined into a performance scorecard.[2]

9. LUMA also presents with this submission the workpapers and models relied on in the development of the five Supplemental Scenarios, as *Exhibit 2* to this Motion. In addition, LUMA submits the revised pre-filed direct testimonies of Dr. Kulkarni in support of the five

[1] The revised version differed from the version filed on October 17, 2025, in that it addressed some grammatical errors and formatting issues, and revised the data presented in Tables 66, 67, and 68, specifically the values in the second column labeled "PR100 Cost Scaling Factor." It also revisited some of the confidential designations originally made.
[2] A Transmission Needs Study (PSS®E analysis) was not executed for the Supplemental Scenarios. As a result, the evaluation does not include T&D system impacts or considerations of all associated cost implications for these Scenarios. These elements would require a separate, dedicated PSS®E analysis to assess system-wide effects and costs fully.

Supplemental Scenarios, as *Exhibit 3* to this Motion. Dr. Kulkarni previously submitted versions of his pre-filed direct testimony on October 17, 2025, and November 21, 2025, in support of certain sections of the 2025 IRP Report and the Transmission Needs Studies Report. The revised version submitted herein incorporates testimony in support of the five Supplemental Scenarios.

10. The current filing fulfills all requirements under Regulation 9021 pertaining to the 2025 Integrated Resource Plan, as directed by the Energy Bureau in its May 13th and October 24th Orders.

11. LUMA respectfully submits that Appendix 7 and the workpapers and models relied on in the development of the five Supplemental Scenarios contain confidential information that garners protection from public disclosure pursuant to applicable law and regulations, as will be expounded upon below. Thus, LUMA is submitting a redacted version of Appendix 7 for public disclosure. Accordingly, pursuant to this Energy Bureau's Policy on Confidential Information, LUMA hereby submits the corresponding memorandum of law stating the legal basis for the request to treat certain portions of Appendix 7 confidentially.

II. Applicable Laws and Regulations for submitting information confidentially before the Energy Bureau

12. Section 6.15 of Act 57-2014 regulates the management of confidential information filed before this Energy Bureau. It provides, in pertinent part, that: "[i]f any person who is required to submit information to the Energy [Bureau] believes that the information to be submitted has any confidentiality privilege, such person may request the Commission to treat such information as such . . . . " 22 LPRA § 1054n (2025). If the Energy Bureau determines, after appropriate evaluation, that the information should be protected, "it shall grant such protection in a manner that least affects the public interest, transparency, and the rights of the parties involved in the

administrative procedure in which the allegedly confidential document is submitted." *Id*., Section 6.15(a).

13. In connection with the duties of electric power service companies, Section 1.10(i) of Act 17-2019[3] further provides that electric power service companies shall submit information requested by customers, except for: (i) confidential information in accordance with the Rules of Evidence of Puerto Rico. 22 LPRA § 1141i (2025).

14. Access to the confidential information shall be provided "only to the lawyers and external consultants involved in the administrative process after the execution of a confidentiality agreement." Section 6.15(b) of Act 57-2014, 22 LPRA § 1054n (2025). Finally, Act 57-2014 provides that this Energy Bureau "shall keep the documents submitted for its consideration out of public reach only in exceptional cases. In these cases, the information shall be duly safeguarded and delivered exclusively to the personnel of the [Energy Bureau] who needs to know such information under nondisclosure agreements. However, the [Energy Bureau] shall direct that a non-confidential copy be furnished for public review". *Id*., Section 6.15(c).

15. Moreover, the Energy Bureau's Policy on Confidential Information details the procedures that a party should follow to request that a document or portion thereof be afforded confidential treatment. In essence, the Energy Bureau's Policy on Confidential Information requires identification of the confidential information and the filing of a memorandum of law, "no later than ten (10) days after filing of the Confidential Information", explaining the legal basis and support for a request to file information confidentially. *See* Policy on Confidential Information, Section A, as amended by the Resolution of September 16, 2016, CEPR-MI-2016-0009. The memorandum should also include a table identifying the confidential information, a summary of

[3] Known as the "Puerto Rico Energy Public Policy Act" (hereinafter, "Act 17-2019").

the legal basis for the confidential designation, and a summary of the reasons each claim or designation conforms to the applicable legal basis for confidentiality. *Id*., paragraph 3. The party that seeks confidential treatment of information filed with the Energy Bureau must also file both a "redacted" or "public version" and an "unredacted" or "confidential" version of the document that contains confidential information. *Id*., paragraph 6.

16. The Energy Bureau's Policy on Confidential Information also states the following with regard to access to Validated Confidential Information:

> 2. Critical Energy Infrastructure Information ("CEII")
>
> The information designated by the [Energy Bureau] as Validated Confidential Information on the ground of being CEII may be accessed by the parties' authorized representatives only after they have executed and delivered the Non-Disclosure Agreement.
>
> Those authorized representatives who have signed the Non-Disclosure Agreement may only review the documents validated as CEII at the [Energy Bureau] or the Producing Party's offices. During the review, the authorized representatives may not copy or disseminate the reviewed information and may bring no recording device to the viewing room.

Id., Section D (on Access to Validated Confidential Information).

17. Relatedly, Energy Bureau Regulation No. 8543, *Regulation on Adjudicative, Notice of Noncompliance, Rate Review, and Investigation Proceedings*, includes a provision for filing confidential information in adjudicatory proceedings before this honorable Energy Bureau. To wit, Section 1.15 provides that, "a person has the duty to disclose information to the [Energy Bureau] considered to be privileged pursuant to the Rules of Evidence, said person shall identify the allegedly privileged information, request the [Energy Bureau] the protection of said information, and provide supportive arguments, in writing, for a claim of information of privileged nature. The [Energy Bureau] shall evaluate the petition and, if it understands [that] the material merits protection, proceed accordingly to . . . Article 6.15 of Act No. 57-2015, as amended."

III. Legal Basis and Arguments in Support of Confidentiality

18. Act 40-2024, better known as the *Commonwealth of Puerto Rico Cybersecurity Act*, defines "Critical Infrastructure" as those "services, systems, resources, and essential assets, whether physical or virtual, the incapacity or destruction of which would have a debilitating impact on Puerto Rico's cybersecurity, health, economy, or any combination thereof." 3 LPRA § 10124(p) (2024). Generally, CEII or critical infrastructure information is generally exempted from public disclosure because it involves assets and information, pose public security, economic, health, and safety risks. Federal Regulations on CEII, particularly, 18 C.F.R. § 388.113, state that:

> Critical energy infrastructure information means specific engineering, vulnerability, or detailed design information about proposed or existing critical infrastructure that:
>
> (i) Relates details about the production, generation, transportation, transmission, or distribution of energy;
> (ii) Could be useful to a person in planning an attack on critical infrastructure;
> (iii) Is exempt from mandatory disclosure under the Freedom of Information Act, 5 U.S.C. 552; and
> (iv) Does not simply give the general location of the critical infrastructure.

Id.

19. Additionally, "[c]ritical electric infrastructure means a system or asset of the bulk-power system, whether physical or virtual, the incapacity or destruction of which would negatively affect national security, economic security, public health or safety, or any combination of such matters." ***Id.*** Finally, "[c]ritical infrastructure means existing and proposed systems and assets, whether physical or virtual, the incapacity or destruction of which would negatively affect security, economic security, public health or safety, or any combination of those matters." *Id.*

20. The Critical Infrastructure Information Act of 2002, 6 U.S.C. §§ 671-674 (2020), part of the Homeland Security Act of 2002, protects critical infrastructure information ("CII").[4] CII is defined as "information not customarily in the public domain and related to the security of critical infrastructure or protected systems...." 6 U.S.C. § 671 (3).[5]

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[4] Regarding protection of voluntary disclosures of critical infrastructure information, 6 U.S.C. § 673, provides in pertinent part, that CII:

(A) shall be exempt from disclosure under the Freedom of Information Act;
(B) shall not be subject to any agency rules or judicial doctrine regarding ex parte communications with a decision making official;
(C) shall not, without the written consent of the person or entity submitting such information, be used directly by such agency, any other Federal, State, or local authority, or any third party, in any civil action arising under Federal or State law if such information is submitted in good faith;
(D) shall not, without the written consent of the person or entity submitting such information, be used or disclosed by any officer or employee of the United States for purposes other than the purposes of this part, except—

(i) in furtherance of an investigation or the prosecution of a criminal act; or
(ii) when disclosure of the information would be--

(I) to either House of Congress, or to the extent of matter within its jurisdiction, any committee or subcommittee thereof, any joint committee thereof or subcommittee of any such joint committee; or
(II) to the Comptroller General, or any authorized representative of the Comptroller General, in the course of the performance of the duties of the Government Accountability Office;

(E) shall not, be provided to a State or local government or government agency; of information or records;

(i) be made available pursuant to any State or local law requiring disclosure of information or records;
(ii) otherwise be disclosed or distributed to any party by said State or local government or government agency without the written consent of the person or entity submitting such information; or
(iii) be used other than for the purpose of protecting critical Infrastructure or protected systems, or in furtherance of an investigation or the prosecution of a criminal act.

(F) does not constitute a waiver of any applicable privilege or protection provided under law, such as trade secret protection.

[5] CII includes the following types of information:

(A) actual, potential, or threatened interference with, attack on, compromise of, or incapacitation of critical infrastructure or protected systems by either physical or computer-based attack or other similar conduct (including the misuse of or unauthorized access to all types of communications and data transmission systems) that violates Federal, State, or local law, harms interstate commerce of the United States, or threatens public health or safety;
(B) the ability of any critical infrastructure or protected system to resist such interference, compromise, or incapacitation, including any planned or past assessment, projection, or estimate of the vulnerability of critical infrastructure or a protected system, including security testing, risk evaluation thereto, risk management planning, or risk audit; or
(C) any planned or past operational problem or solution regarding critical infrastructure or protected systems, including repair, recovery, construction, insurance, or continuity, to the extent it is related to such interference, compromise, or incapacitation.

21. The portions of Appendix 7 identified in Section IV of the present Motion, and the workpapers and models relied on in the development of the Supplemental Scenarios, include CEII, because it contains single-line diagrams that qualify as CEII. They contain information on the engineering and design of critical infrastructure, existing and proposed, for the transmission of electricity, provided in sufficient detail to be helpful to a person planning an attack on this or other energy infrastructure facilities interconnected with or served by this facility and its equipment. In addition, the portions of Appendix 7 that have been identified in Section IV and the workpapers and models relied on in the development of the Supplemental Scenarios qualify as CEII because each of these documents contains the express coordinates for power transmission and distribution facilities (18 C.F.R. § 388.113(iv)), and these specific coordinates could potentially be helpful to a person planning an attack on the energy facilities. The information identified as confidential in this paragraph is not common knowledge, is not made publicly available, and if disclosed to the public, will expose key assets to security vulnerabilities or attacks by people seeking to cause harm to the systems. Therefore, it is in the public interest to keep the information confidential. Confidential designation is a reasonable and necessary measure to protect critical infrastructure from attacks and to enable LUMA to leverage information without external threats, *see e.g.,* 6 U.S.C §§ 671-674; 18 C.F.R. §388.113 (2020), and the Energy Bureau's Policy on Confidential Information.

22. In several proceedings, this Energy Bureau has considered and granted requests by PREPA to submit CEII under seal of confidentiality.[6] In at least two proceedings on Data Security[7] and Physical Security,[8] this Energy Bureau, motu proprio, has conducted proceedings confidentially, thereby recognizing the need to protect CEII from public disclosure.

23. Additionally, this Energy Bureau has granted requests by LUMA to protect CEII in connection with LUMA's System Operation Principles. *See* Resolution and Order of May 3, 2021, table 2 on page 4, Case No. NEPR-MI-2021-0001 (granting protection to CEII included in LUMA's Responses to Requests for Information). Similarly, in the proceedings on LUMA's proposed Initial Budgets and System Remediation Plan, this Energy Bureau granted confidential designation to several portions of LUMA's Initial Budgets and Responses to Requests for Information. *See* Resolution and Order of April 22, 2021, on Initial Budgets, table 2 on pages 3-4, and Resolution and Order of April 22, 2021, on Responses to Requests for Information, table 2 on pages 8-10, Case No. NEPR-MI-2021-0004; Resolution and Order of April 23, 2021, on Confidential Designation of Portions of LUMA's System Remediation Plan, table 2 on page 5, and Resolution and Order of May 6, 2021, on Confidential Designation of Portions of LUMA's

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[6] *See e.g., In re Review of LUMA's System Operation Principles,* NEPR-MI-2021-0001 (Resolution and Order of May 3, 2021); *In re Review of the Puerto Rico Power Authority's System Remediation Plan*, NEPR-MI-2020-0019 (order of April 23, 2021); *In re Review of LUMA's Initial Budgets*, NEPR-MI-2021-0004 (order of April 21, 2021); *In re Implementation of Puerto Rico Electric Power Authority Integrated Resource Plan and Modified Action Plan,* NEPR MI 2020-0012 (Resolution of January 7, 2021, granting partial confidential designation of information submitted by PREPA as CEII); *In re Optimization Proceeding of Minigrid Transmission and Distribution Investments*, NEPR MI 2020-0016 (where PREPA filed documents under seal of confidentiality invoking, among others, that a filing included confidential information and CEII); *In re Review of the Puerto Rico Electric Power Authority Integrated Resource Plan*, CEPR-AP-2018-0001 (Resolution and Order of July 3, 2019 granting confidential designated and request made by PREPA that included trade secrets and CEII) *but see* Resolution and Order of February 12, 2021 reversing in part, grant of confidential designation).

[7] *In re Review of the Puerto Rico Electric Power Authority Data Security Plan,* NEPR-MI-2020-0017.

[8] *In re Review of the Puerto Rico Electric Power Authority Physical Security Plan,* NEPR-MI-2020-0018.

Responses to Requests for Information on System Remediation Plan, table 2 at pages 7-9, Case No. NEPR-MI-2020-0019.

24. Likewise, Section 4(x) of the *Puerto Rico Open Government Data Act*, Act 122-2019, exempts from public disclosure commercial or financial information whose disclosure will cause competitive harm. 3 LPRA § 9894. The workpapers and models relied on in the development of the Supplemental Scenarios, included as *Exhibit 2* to this Motion, contain or reference proprietary PLEXOS© formulas and pivot tables belonging to third parties. These PLEXOS© formulas and pivot tables constitute commercial or financial information within Section 4(x) of Act 122-2019, as they possess independent economic value and provide a business advantage by virtue of not being generally known or readily accessible to competitors or the public.

25. Moreover, reasonable measures have been taken to maintain the confidentiality of this information, consistent with statutory requirements. Disclosure of these PLEXOS© formulas and pivot tables would risk competitive harm to the third party and undermine public policy favoring the protection of commercially valuable confidential information. Therefore, LUMA requests that the Energy Bureau grant confidential treatment to these PLEXOS© formulas and pivot tables, all of which are proprietary to third parties, to ensure compliance with the statutory protections afforded under Puerto Rico law.

IV. Identification of Confidential Information

26. In compliance with the Energy Bureau's Policy on Confidential Information, CEPR-MI-2016-0009, a table summarizing the hallmarks of this request for confidential treatment is hereby included.

Document	Name	Pages in which Confidential Information is Found	Summary of Legal Basis for Confidentiality Protection	Date Filed
Exhibit 1	Table 7: Scenario 13 Annual Emissions by resource (CO2eq)	Pages 19	Third-Party Proprietary Information	December 19, 2025
	Table 8: Scenario 13 Annual Fuel Consumption by Fuel Type (BBtu)	Page 19	Third-Party Proprietary Information	December 19, 2025
	Table 13: Scenario 14 Annual Emissions by resource (CO2eq)	Page 24	Third-Party Proprietary Information	December 19, 2025
	Table 14: Scenario 14 Annual Fuel Consumption by Fuel Type (BBtu)	Page 24	Third-Party Proprietary Information	December 19, 2025
	Table 19: Scenario 15 Annual Emissions by resource (CO2eq)	Page -30	Third-Party Proprietary Information	December 19, 2025
	Table 20: Scenario 15 Annual Fuel Consumption by Fuel Type (BBtu)	Page 30	Third-Party Proprietary Information	December 19, 2025

Document	Name	Pages in which Confidential Information is Found	Summary of Legal Basis for Confidentiality Protection	Date Filed
	Table 25: Scenario 16 Annual Emissions by resource (CO2eq)	Page 35	Third-Party Proprietary Information	December 19, 2025
	Table 26: Scenario 16 Annual Fuel Consumption by Fuel Type (BBtu)	Page 35	Third-Party Proprietary Information	December 19, 2025
	Table 31: Scenario 17 Annual Emissions by resource (CO2eq)	Page 40	Third-Party Proprietary Information	December 19, 2025
	Table 32: Scenario 17 Annual Fuel Consumption by Fuel Type (BBtu)	Page 40	Third-Party Proprietary Information	December 19, 2025
Exhibit 2	CONFIDENTIAL_ LUMA PLEXOS Database	Entire File	Third-Party Proprietary Information	December 19, 2025
	CONFIDENTIAL_25.10.20 IRP Summary Results_Sc13	Entire File	Third-Party Proprietary Information	December 19, 2025

Document	Name	Pages in which Confidential Information is Found	Summary of Legal Basis for Confidentiality Protection	Date Filed
	CONFIDENTIAL_25.10.20 IRP Summary Results_Sc14	Entire File	Third-Party Proprietary Information	December 19, 2025
	CONFIDENTIAL_25.10.20 IRP Summary Results_Sc15	Entire File	Third-Party Proprietary Information	December 19, 2025
	CONFIDENTIAL_25.10.20 IRP Summary Results_Sc16	Entire File	Third-Party Proprietary Information	December 19, 2025
	CONFIDENTIAL_25.10.20 IRP Summary Results_Sc17	Entire File	Third-Party Proprietary Information	December 19, 2025
	CONFIDENTIAL_25.12.01 Thermal and Cable Costs for DR	Entire File	Third-Party Proprietary Information	December 19, 2025
	CONFIDENTIAL_HVDC Cable Hostos SIS Final 11152024	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6 U.S.C. §§ 671-674	December 19, 2025

Document	Name	Pages in which Confidential Information is Found	Summary of Legal Basis for Confidentiality Protection	Date Filed
	CONFIDENTIAL_Appx A Interconnection Studies Report_HVDC Cable Hostos SIS Final 11152024	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6 U.S.C. §§ 671-674	December 19, 2025
	CONFIDENTIAL_Appx B Facility Study - POI Package_36940A - Mayaguez TC Cost Estimate	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6 U.S.C. §§ 671-674	December 19, 2025
	CONFIDENTIAL_Appx B Facility Study - POI Package_Attachment #2 - Hostos HVDC 230kV One Line Diagram Drawing	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6 U.S.C. §§ 671-674	December 19, 2025
	CONFIDENTIAL_Appx B Facility Study - POI Package_Attachment #3 - Hostos HVDC 230kV GA - Conduits Drawing	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6 U.S.C. §§ 671-674	December 19, 2025
	CONFIDENTIAL_Appx B Facility Study - POI Package_Attachment #4 - Hostos HVDC 230kV GA - Grounding Drawing	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6	December 19, 2025

Document	Name	Pages in which Confidential Information is Found	Summary of Legal Basis for Confidentiality Protection	Date Filed
			U.S.C. §§ 671-674	
	CONFIDENTIAL_Appx B Facility Study - POI Package_Attachment #6 - Hostos HVDC 230kV Basis of Estimate	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6 U.S.C. §§ 671-674	December 19, 2025
	CONFIDENTIAL_Appx B Facility Study - POI Package_Attachment #7 - Hostos HVDC 230kV Estimate 36940A	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6 U.S.C. §§ 671-674	December 19, 2025
	CONFIDENTIAL_Appx B Facility Study - POI Package_Attachment #8 - Hostos HVDC 230kV Project Schedule	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6 U.S.C. §§ 671-674	December 19, 2025
	CONFIDENTIAL_Appx B Facility Study - POI Package_Attachment #9 - Hostos HVDC 230kV Risk Matrix	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6 U.S.C. §§ 671-674	December 19, 2025

Document	Name	Pages in which Confidential Information is Found	Summary of Legal Basis for Confidentiality Protection	Date Filed
	CONFIDENTIAL_Appx B Facility Study - POI Package_Hostos HVDC Cable Project Facility Study Report	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6 U.S.C. §§ 671-674	December 19, 2025
	CONFIDENTIAL_Appendix D Hostos HVDC Cable	Entire File	Critical Energy Infrastructure Information 18 C.F.R. § 388.113; 6 U.S.C. §§ 671-674	December 19, 2025

WHEREFORE, LUMA respectfully requests that the Energy Bureau **take notice** of the aforementioned; **accept** Appendix 7 of the 2025 IRP Report, which includes the results of modeling the five Supplemental Scenarios, as *Exhibit 1* of this Motion, the workpapers and models relied on in the development of the Supplemental Scenarios, as *Exhibit 2* of this Motion, and revised pre-filed direct testimony of Dr. Ajit Kulkarni, as *Exhibit 3* to this Motion; **approve the request for confidential treatment** of the information submitted in *Exhibits 1 and 2* to this Motion; and **deem** LUMA complied with the May 13th and October 24th Orders based on the information that is currently available.

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 Mirelis

Valle-Cancel, mvalle@gmlex.net; and Alexis G. Rivera Medina, arivera@gmlex.net; and Genera PR, LLC, through its attorney of record Luis R. Román Negrón, lrn@roman-negrom.com.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, on December 19, 2025.

DLA Piper (Puerto Rico) LLC
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San Juan, PR 00901-1969
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/s/ Yahaira De la Rosa Algarín
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Exhibit 1

2025 Integrated Resource Plan

(2025 IRP)

NEPR-AP-2023-0004

December 19, 2025

Appendix 7
Supplemental Scenarios

2025 Integrated Resource Plan Report

Contents

List of Terms and Acronyms

TERM OR ACRONYM	DEFINITION
ASAP	Accelerated Storage Addition Program
BESS	Battery Energy Storage System
BBtu	Billion British Thermal Unit
Btu	British Thermal Unit
CHP	Combined heat and Power
CCGT	Combined Cycle Gas Turbine
CO2eq	Carbon Dioxide Equivalent
CS	Costa Sur
DBESS	Distributed Battery Energy Storage System
DER	Distributed Energy Resources
DPV	Distributed Solar Photovoltaic
DR	Demand Response
EcoElec	EcoEléctrica plant
EE	Energy Efficiency
FERC	Federal Energy Regulatory Commission
Flex	Flexibility – an abbreviation to designate portfolios included in the flexibility analysis
New Gas Gen	New Gas Generation
GWh	Gigawatt-hour
IRP	Integrated Resource Plan
kWh	Kilowatt-hour
LCOE	Levelized Cost of Energy
LNG	Liquefied Natural Gas
LOLE	Loss of Load Expectation
LOLP	Loss of Load Probability
MW	Megawatt
MWh	Megawatt-hour
NGCC	Natural Gas Fueled Combined Cycle generator

2025 Integrated Resource Plan Report

TERM OR ACRONYM	DEFINITION
O&M	Operations and Maintenance
PRP	Preferred Resource Plan
PV	Solar Photovoltaic
PVRR	Present Value Revenue Requirement
RPS	Renewable Portfolio Standard
R&O	Resolution and Order
SETPR	Solutions for the Energy Transformation of Puerto Rico
SJ	San Juan
TPA	Transmission Planning Area
T&D	Transmission and Distribution
UBESS	Utility-scale Battery Energy Storage System
UPV	Utility-scale Solar Photovoltaic

Executive Summary

This Appendix 7 provides a summary of the modeling results for the five Supplemental Scenarios included in the Puerto Rico Energy Bureau (Energy Bureau) Resolution and Order of May 13, 2025 (May 13 R&O), which defined the required scenarios to be modeled, and the Resolution and Order of October 24, 2025 (October 24 R&O), which established the filing due dates. LUMA submits this information as a supplement to LUMA's 2025 IRP Report. The 2025 IRP includes the results of modeling twelve Core Scenarios and was filed with the Energy Bureau on October 17, 2025, along with the Transmission Needs Studies Report filed on November 21, 2025 (collectively, the 2025 IRP). Together, these filings summarize LUMA's data-driven analysis and recommendations to meet Puerto Rico's long-term energy objectives, including the 2050 requirement to achieve 100% Renewable Portfolio Standard (RPS), while continuing to improve the reliability of service to LUMA's customers.

The modeling results of the Supplemental Scenarios do not change LUMA's recommendation of Resource Plan Hybrid A as the Preferred Resource Plan (PRP) for Puerto Rico.

Appendix 7 fulfills all requirements under Regulation 9021 applicable to the 2025 IRP, as directed by the Energy Bureau in its Resolutions and Orders issued on May 13, 2025, and October 24, 2025.

1.0 Introduction

In accordance with Regulation 9021 and Puerto Rico's energy public policy, LUMA developed 17 scenarios for the 2025 IRP. Section 8 of the 2025 IRP Report describes seventeen (17) scenarios, each of which was defined by different combinations of future conditions and cost projections. The scenarios were divided into Core Scenarios and Supplemental Scenarios. The 12 Core Scenarios were filed with the 2025 IRP Report on Oct 17, 2025. These were developed to evaluate a range of potential pathways for meeting Puerto Rico's future electricity needs and to support a transparent, well-informed selection of the PRP. The resource plans resulting from modeling the remaining five (5) Supplemental Scenarios (numbered 13 to 17) are filed herein as part of the analysis approved by the Energy Bureau.

A Transmission Needs Study (PSS®E analysis) was not executed for the Supplemental Scenarios. As a result, the evaluation does not include T&D system impacts or considerations of all associated cost implications for these scenarios. These elements would require a separate, dedicated PSS®E analysis to fully assess system-wide effects and costs.

Table 1 summarizes the characteristics of the five (5) Supplemental Scenarios addressed in this Appendix 7 to the 2025 IRP Report.

Table 1: Supplemental Scenarios

Scenario	Description	Load	PV & UBESS CapEx	Natural Gas Plant CapEx + Bio Conversion Costs	Level of DBESS Control	LNG Fuel Cost	Include Biodiesel	Fixed Decisions	Resulting Resource Plan
Scenario 13	High DBESS control with base assumptions for other variables	Base	Base	Base	High	Base	Yes	Base	Resource Plan I
Scenario 14	No 460 MW NGCC in San Juan	Base	Base	Base	Base	Base	Yes	No NGCC	Resource Plan J
Scenario 15	Marine Cable to Dominican Republic and 500 MW NGCC	Base	Base	Base	Base	Base	Yes	Base	Resource Plan K
Scenario 16	Alternative RPS 1 – Assumes goal starts in 2025 and then ramps to 100% by 2050.	Base	Base	Base	Base	Base	Yes	Base	Resource Plan L
Scenario 17	Alternative RPS 2 – Initial targets start between 2040 and 2044 and then ramp to 100% by 2050	Base	Base	Base	Base	Base	Yes	Base	Resource Plan M

Core and Supplemental Scenarios were modeled using the industry-standard, energy modeling software PLEXOS®, and the same methodology as described in Section 8 of the 2025 IRP Report[1], over a 20-year horizon, from 2025 to 2044, to identify cost-effective and reliable resource plans for the future conditions described in each scenario.

[1] A copy of the Revised 2025 IRP Report is available https://setpr.com/wp-content/uploads/2025/10/0.00_IRP-Report_Main-Report_Revised_Redacted.pdf

The resulting resource plans were assessed based on a broad range of performance indicators that were combined in a performance scorecard. The primary performance indicator used to compare and assess alternative portfolios was the Present Value Revenue Requirement (PVRR) of the portfolios for the 20-year period between 2025 to 2044. None of the Supplemental Scenario results had incremental additions of utility-scale solar or wind resources beyond those defined in the fixed decisions. Each of the resource plans resulting from the Supplemental Scenarios used the conversion of natural gas-fueled units to biodiesel to meet their respective increases in the RPS requirements.

A summary of the principal differences in the Supplemental Resource Plan results is provided below. A more detailed summary of the Preliminary Portfolio results is provided in Sections 2.0 and 3.0 of this report.

- **Scenario 13 resulting in Resource Plan I:** Scenario 13 has a single scenario characteristic that varies from Scenario 1, the controlled Distributed Battery Energy Storage System (controlled DBESS). All other characteristics for this scenario are the same as the base case (i.e., most likely) characteristics used in Scenario 1. This is the only one of the 17 scenarios that assumed a high version of the forecasted contributions from the controlled DBESS programs. All other scenarios included a base case (most likely) version of the forecasted contributions from the controlled DBESS programs. The base case and high case of the controlled DBESS enrollment have three significant differences. First, in the base case, LUMA assumes customers enroll 30% of their battery energy capacity in the program, and the high case assumes customers enroll 100% of their battery energy capacity in the program. Second, the annual enrollment rate in the program is substantially increased in the high case. Finally, the ultimate percentage of customers enrolled in 2044 is 25% in the base case versus 60% in the high case. Table 37 in Section 3.2.2 of the 2025 IRP Report lists the assumptions for the annual enrollment for both the base case and high case. This scenario incorporates a high forecast of the controlled DBESS contributions to energy supply. The PVRR results of Resource Plan I are higher than those of Resource Plan A driven by Scenario 1, i.e., $36.1B for Resource Plan I versus $35.1B for Resource Plan A.

- **Scenario 14 resulting in Resource Plan J:** Scenario 14 has a single characteristic that varies from Scenario 1; the Energiza combined-cycle plant is removed from the model as either a fixed or optional resource. All other characteristics of the scenario match those of the base case (i.e., most likely) characteristics used in Scenario 1. This scenario eliminates the currently planned 478 MW Natural Gas Fueled Combined Cycle (NGCC) from the planned and optional energy resources. The PVRR results of Resource Plan J are higher than those of Resource Plan A, resulting from Scenario 1, i.e., $35.3B for Resource Plan J versus $35.1B for Resource Plan A. The PVRR for Resource Plan J is 0.6% higher than Resource Plan A.

- **Scenario 15 resulting in Resource Plan K:** Scenario 15 includes the addition of a marine cable that allows the import of up to 500 MW of energy operating at 90% capacity factor from new combined-cycle resources planned to be built in the Dominican Republic (Hostos Project). All other characteristics of the scenario match the base case (i.e., most likely) characteristics used in Scenario 1. The PVRR results of Resource Plan K are higher than those of Resource Plan A resulting from Scenario 1, i.e., $35.3B for Resource Plan K versus $35.1B for Resource Plan A. Resource Plan K is 0.5% higher than Resource Plan A. While the PVRR for Resource Plan K yields close to Resource Plan A (i.e., $35.3B for Resource Plan K versus $35.1B for Resource

Plan A), its cost estimates are based on project cost estimates provided by the Hostos project and LUMA cost estimates for transmission system upgrades required to interconnect the project.

- **Scenario 16 resulting in Resource Plan L:** Scenario 16 is identical to Scenario 1, other than the schedule to meet 2050 RPS requirements. In Scenario 16, the alternate RPS 1 annual milestones are assumed to begin in 2025 and increase to 100% by 2050. Table 81 in Section 8.2.4 of the 2025 IRP Report lists the annual milestones for the base case RPS, Alternate RPS 1 (used only in Scenario 16) and Alternate RPS 2 (used only in Scenario 17). The scenario includes an alternate schedule for the annual RPS targets to achieve 100% RPS by 2050. In the base case, the RPS annual target begins in 2035 and ramps up to 100% by 2050. All Scenarios, except for Scenarios 16 and 17, used the base case assumption for the annual RPS targets. Scenario 16 assumed the Alternate 1 RPS annual target would begin in 2025 and ramp up annually to 100% by 2050. The PVRR results of this resource plan are higher than those of Resource Plan A resulting from Scenario 1, i.e., \$36.6B for Resource Plan L versus \$35.1B for Resource Plan A.

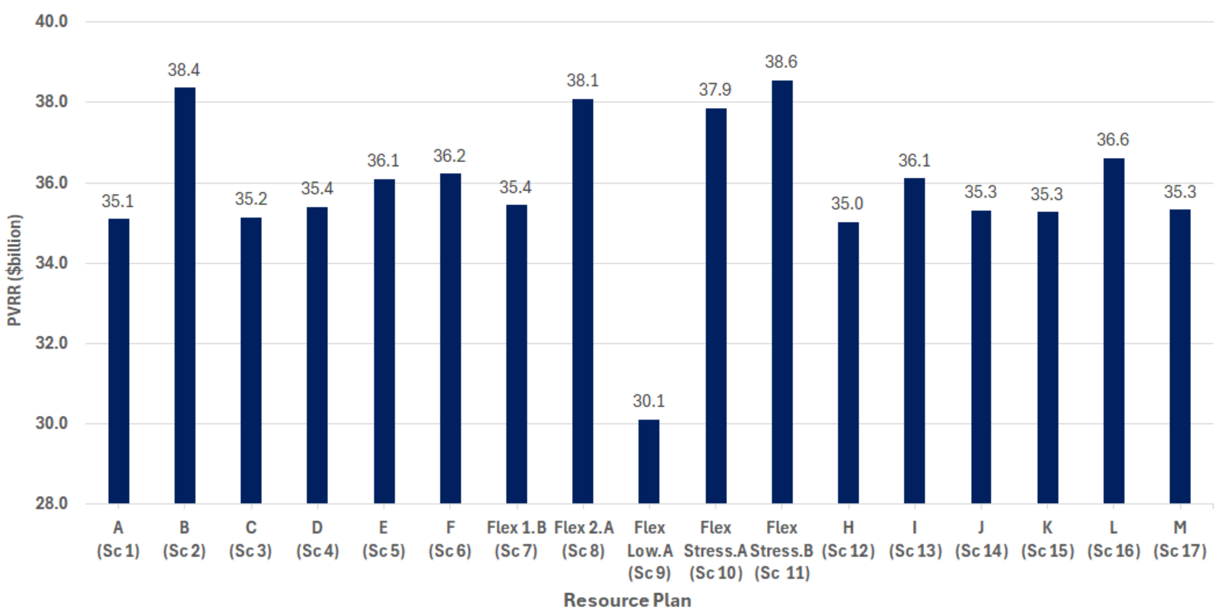
- **Scenario 17 resulting in Resource Plan M:** Scenario 17 is identical to Scenario 1, other than the schedule to meet 2050 RPS requirements. In Scenario 17, the alternate RPS 2 annual milestones are assumed to begin in 2044 and increase to 100% by 2050. All other characteristics for Scenario 17 match base case characteristics used in Scenario 1. Scenario 17 assumed the alternate RPS 2 annual target would begin in 2044 and ramp up annually to 100% by 2050. The PVRR results of this Resource Plan M are \$35.3B versus \$35.1B for Resource Plan A.

2.0 Summary Results of Supplemental Scenarios

2.1 Summary of PVRR Results

PVRR was the principal performance indicator used to compare the resource plans resulting from each scenario. Figure 1 contains the PVRR results for the Core Scenarios, 1 to 12, and the Supplemental Scenarios, 13 to 17.

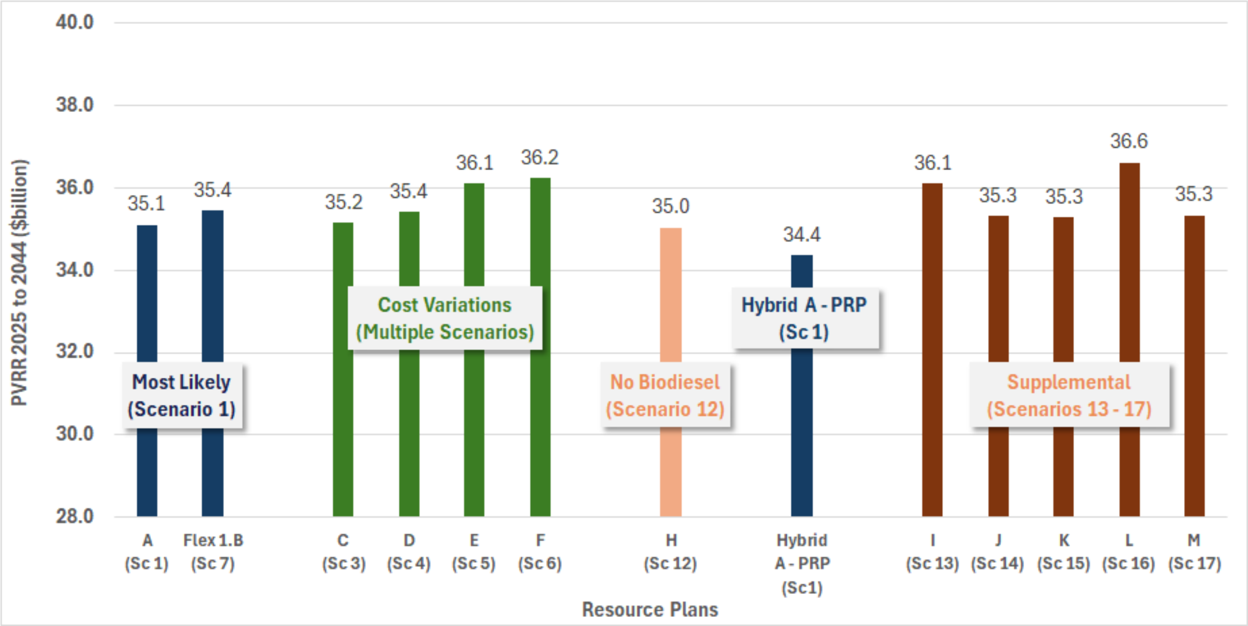
Figure 1: PVRR Results for Core and Supplemental Scenarios



Three (3) load forecast cases were used in these seventeen (17) scenarios. Resource Plan B (Scenario 2), Flex 2.A (Scenario 8), Flex Stress.A (Scenario 10), and Flex Stress.B (Scenario 11) used the high-case load forecast, which resulted in a significantly higher PVRR compared to the other resource plans that used either base case or low case load forecasts. This increase in PVRR was driven by the additional generation capacity and energy costs required to serve the higher loads, relative to the remaining resource plans. Flex Low.A (Scenario 9) was developed with a low case load forecast.

Figure 2 provides a graph of the PVRR for the resource plans that were built using the base case load forecast, including the Hybrid A resource plan which LUMA is recommending as the PRP.

Figure 2: PVRR Results for Core and Supplemental Scenarios at Base Case Load Conditions



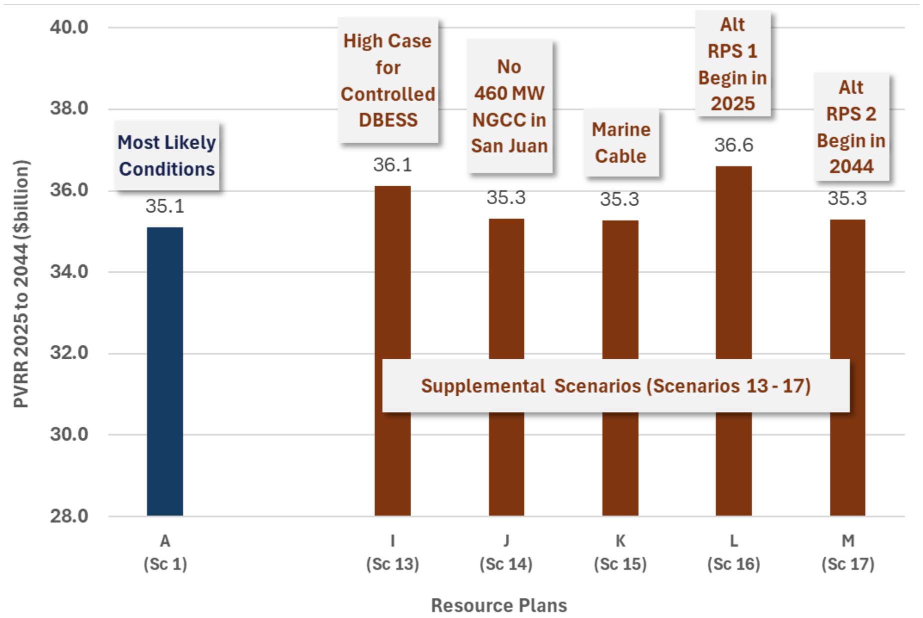
The Hybrid A resource plan, identified as the PRP, is not included in Figure 3 below since it included changes to the fixed decisions that were not included in the Supplemental Scenarios[2]. Resource Plan A is shown in comparison to the Supplemental Scenarios, since its fixed decisions align with those of the Supplemental Scenarios, except for the single characteristic change described above for each Supplemental Scenarios.

The cost and performance of the resource plans modeled under Supplemental Scenarios do not change LUMA's conclusion that Resource Plan Hybrid A remains its recommended PRP for Puerto Rico.

Figure 3 below summarizes the PVRR results for the resource plans from the five (5) Supplemental Scenarios and Scenario 1.

[2] The Hybrid A resource plan (Scenario 1), identified as the PRP, included changes to the fixed decisions which reduced its costs relative to Resource Plan A. For the Hybrid A resource plan, identified as the PRP, the Accelerated Storage Addition Program (ASAP), Phase 2 battery additions were changed from fixed additions with an installation in 2026, to optional additions that allowed the modeling software to select later, need-based installations in 2031 and 2037, which resulted in a lower PVRR. The PRP also corrected the BESS round-trip charge and discharge efficiency to 85%, from the prior values of 90% for the utility-scale BESS and 100% for the DBESS. This correction of BESS efficiency served as an increase in costs that was more than offset by the reduction in costs due to the changes of the ASAP Phase 2 batteries to optional additions. The PRP PVRR is $34.4B or $0.746B less than Resource Plan A.

Figure 3: Resources Plan PVRR for the Supplemental Scenarios



2.2 Scorecard Results

The resulting resource plans, which were presented in Section 8 of the 2025 IRP Report, were assessed based on a broad range of performance indicators that were combined in a performance scorecard[3]. Table 2 below provides the scorecard results for each of the Core and Supplemental Scenarios as well as the PRP.

[3] A copy of the Revised 2025 IRP Report is available https://setpr.com/wp-content/uploads/2025/10/0.00_IRP-Report_Main-Report_Revised_Redacted.pdf

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Table 2: Performance Scorecard Part 1

Portfolio / Scenario	Environment				Affordability (Costs)				Compliance	Diversity of Generation				
	Avg CO2eq-2025 to 2044 (tons/GWh)	Avg CO2eq-2044 (tons/GWh)	Acres of Land Used	Year last heavy fuel oil unit operates	PVRR for source scenario ($B)	LCOE ($/kWh) 5-year 2025 to 2029	LCOE ($/kWh) 10- year 2025 to 2034	LCOE ($/kWh) 20-year 2025 to 2044	% RPS Achieved in 2044 (67% was Target)	Fossil energy in 2044 (%)	Solar energy in 2044 (including DPV) (%)	Biodiesel energy in 2044 (%)	Wind energy in 2044 (%)	Other energy sources in 2044 (%)
A / Scenario 1	354	144	6,030	2032	35.106	0.183	0.195	0.212	67%	43%	32%	22%	2%	1%
B / Scenario 2	359	168	6,030	2031	38.366	0.181	0.194	0.209	67%	43%	26%	28%	1%	1%
C / Scenario 3	357	162	6,030	2032	35.150	0.183	0.196	0.212	67%	43%	32%	22%	2%	1%
D / Scenario 4	357	161	6,030	2032	35.406	0.183	0.197	0.214	67%	43%	32%	22%	2%	1%
E / Scenario 5	358	160	6,030	2032	36.103	0.191	0.203	0.218	67%	43%	32%	22%	2%	1%
F / Scenario 6	355	160	6,030	2032	36.228	0.191	0.204	0.219	67%	43%	32%	22%	2%	1%
1.B / Scenario 7	346	161	6,030	2031	35.443	0.184	0.200	0.214	67%	44%	32%	22%	2%	1%
2.A / Scenario 8	362	169	6,030	2034	38.089	0.181	0.193	0.208	67%	44%	26%	28%	1%	1%
Low.A / Scenario 9	339	136	6,030	2031	30.117	0.189	0.202	0.215	67%	43%	50%	2%	3%	1%
Stress.A / Scenario 10	367	168	6,030	2034	37.855	0.181	0.191	0.206	67%	43%	26%	28%	1%	1%
Stress.B / Scenario 11	359	167	6,030	2031	38.552	0.181	0.195	0.210	67%	44%	26%	28%	1%	1%
H / Scenario 12	354	141	71,955	2034	35.028	0.183	0.194	0.211	71%	44%	40%	0%	15%	1%
I / Scenario 13	373	277	6,030	2033	36.112	0.183	0.199	0.217	67%	43%	32%	2%	22%	1%
J / Scenario 14	374	280	6,030	2030	35.321	0.182	0.195	0.212	67%	43%	32%	2%	22%	1%
K / Scenario 15	368	286	6,030	2030	35.274	0.184	0.198	0.214	67%	23%	43%	2%	30%	2%
L / Scenario 16	378	281	6,030	2033	36.615	0.183	0.198	0.221	80%	34%	32%	2%	31%	1%
M / Scenario 17	378	288	6,030	2030	35.332	0.183	0.196	0.214	36%	65%	32%	2%	0%	1%
PRP	379	281	6,030	2032	34.355	0.183	0.193	0.209	67%	44%	31%	22%	2%	1%

Environment, Affordability, Compliance:
- Low - Better
- Medium
- High

Diversity of Generation:
- High - Better
- Medium
- Low

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Table 3: Performance Scorecard Part 2

Portfolio / Scenario	System Reliability and Resiliency											DBESS control (%)
	Year 0.1/year LOLE achieved & sustained	Total LOLP Hours (2025 to 2044)	% Annual Energy from DER (2044)	Year 2044 %TPA Peak Load (MW) at system peak hour* that is served by internal MW capacity in TPA (includes utility scale generation, UBESS, DR & CHP)								
				San Juan	Bayamon	Arecibo	Mayaguez	Ponce OE	Ponce ES	Caguas	Carolina	
A / Scenario 1	2032	417	20%	257%	-2%	97%	4%	241%	103%	26%	10%	25%
B / Scenario 2	2030	1291	17%	218%	3%	91%	13%	352%	120%	19%	24%	25%
C / Scenario 3	2039	404	20%	156%	2%	77%	6%	423%	72%	66%	38%	25%
D / Scenario 4	2028	398	20%	222%	-2%	47%	15%	280%	143%	40%	34%	25%
E / Scenario 5	2034	419	20%	230%	-2%	42%	6%	314%	133%	39%	18%	25%
F / Scenario 6	2033	407	20%	230%	3%	93%	0%	310%	85%	36%	8%	25%
1.B / Scenario 7	2028	399	20%	181%	17%	34%	4%	426%	99%	51%	18%	25%
2.A / Scenario 8	2030	1292	17%	195%	19%	19%	1%	475%	130%	26%	89%	25%
Low.A / Scenario 9	2036	130	28%	166%	6%	75%	5%	349%	109%	72%	14%	25%
Stress.A / Scenario 10	2028	398	20%	229%	14%	82%	40%	359%	46%	34%	25%	25%
Stress.B / Scenario 11	2030	1292	17%	242%	19%	46%	16%	348%	113%	25%	18%	25%
H / Scenario 12	2034	398	17%	183%	2%	83%	6%	343%	112%	41%	35%	25%
I / Scenario 13	2033	391	19%	186%	-16%	51%	-20%	329%	204%	40%	44%	60%
J / Scenario 14	2034	375	20%	249%	-2%	43%	-2%	329%	82%	26%	40%	25%
K / Scenario 15	2043	376	20%	141%	0%	18%	211%	312%	160%	16%	18%	25%
L / Scenario 16	2028	405	20%	179%	-2%	62%	10%	392%	155%	31%	8%	25%
M / Scenario 17	2028	2027	20%	179%	4%	72%	18%	389%	128%	31%	18%	25%
PRP	2032	422	20%	223%	10%	31%	3%	310%	173%	29%	8%	25%

Legend (first three metric columns): Low - Better; Medium; High

Legend (remaining columns): High - Better; Medium; Low

2.3 Conclusions and Recommendations

Based on the results of the modeling for both the Core and Supplemental Scenarios:

1. Resource Plan Hybrid A, as presented in the 2025 IRP Report, remains LUMA's recommended Preferred Resource Plan (PRP) for Puerto Rico.

2. After reviewing the results of the Supplemental Scenarios, LUMA reaffirms the recommendation included in the 2025 Integrated Resource Plan (2025 IRP) Report[4] that future solicitations for generation resources include a diverse mix of technologies. Specifically, proposals should incorporate biodiesel-fueled generators, solar photovoltaic systems (PV), and wind energy technologies. Final bid selection should be based on a technology-neutral evaluation of bid prices, technical and commercial merits, and land use considerations.

3. To support the successful implementation of the resource plans outlined in this study, LUMA emphasizes the need for additional investment in electric grid infrastructure. These investments are critical to enabling the integration and reliable operation of new-generation resources.

4. A Transmission Needs Study (PSS®E analysis) was not executed for the Supplemental Scenarios. As a result, the evaluation does not include T&D system impacts or considerations of all associated cost implications for these scenarios. These elements would require a separate, dedicated PSS®E analysis to fully assess system-wide effects and costs.

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[4] *Id.*

3.0 Detail Results of Supplemental Scenarios

3.1 Scenario 13 - High DBESS Control with Base Assumptions for Other Variables

Table 4 and Table 5 present information about the MW of generator and battery resource additions and retirements that occur under Scenario 13. Combined, the information in the tables shows significant activity with additions and retirements over the planning period. This activity is primarily driven by the ramp-up of renewable energy resources to meet the RPS targets and the targeted reduction of Expected Unserved Energy levels.

Table 4: Capacity Addition Summary (MW) for Scenario 13

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
CHP	47	22	13	13	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**100**
DPV	146	44	16	20	23	29	33	40	44	42	37	37	42	50	60	70	80	89	99	108	**1109**
DBESS- Controlled	17	4	1	31	34	38	24	27	31	33	35	29	33	37	41	41	25	29	32	29	**571**
DR	-	-	-	1	14	22	37	31	21	17	13	19	26	41	56	58	75	91	91	48	**661**
Hydro	-	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**38**
Emergency Generator	198	594	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**792**
New Genera Units (Thermal)	-	-	244	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**244**
New Genera Units (BESS)	131	141	158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**430**
Tranche 1, 2 and 4 BESS	-	435	210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**645**
Tranche 1 & 2 Solar	160	579	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**805**
Solar	90	50	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**200**
ASAP BESS, Phase1 and 2	-	615	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**615**

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
New Biodiesel	-	-	-	-	-	-	-	-	-	-	226	-	-	226	-	-	-	-	-	-	**452**
Biodiesel Conversions	-	-	-	-	-	-	-	-	-	-	452	-	-	-	373	-	-	373	18	-	**1216**
BESS,4HR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**
New Gas Gen*	-	-	-	478	-	-	1121	-	-	-	-	-	-	444	-	-	-	-	-	-	**2043**
Total	**789**	**2522**	**768**	**543**	**76**	**89**	**1215**	**98**	**96**	**92**	**763**	**85**	**101**	**798**	**530**	**169**	**180**	**582**	**240**	**185**	**9921**

* Includes LNG SJ, CS, EcoEléctrica and Trucked

Table 5: Scenario 13 Resource Capacity Retirements (MW)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
Coal	-	-	-	-	-	-	-	-	454	-	-	-	-	-	-	-	-	-	-	-	**454**
Diesel	-	63	84	-	-	-	165	-	-	-	-	100	-	-	-	-	-	-	-	-	**412**
Fuel Oil	-	-	-	-	-	300	100	-	-	180	-	-	-	-	-	-	-	-	-	-	**580**
Landfill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	**4**
Emergency Generator	-	-	-	-	792	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**792**
LNG Retirements*	-	-	-	-	-	-	360	-	-	-	678	-	-	-	753	-	-	373	18	-	**2182**
UPV	-	-	-	-	-	-	-	2	20	-	-	30	55	-	-	-	-	-	-	-	**107**
DBESS-Controlled	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**
Total	**0**	**63**	**84**	**0**	**792**	**300**	**625**	**2**	**474**	**180**	**678**	**130**	**55**	**0**	**753**	**0**	**2**	**375**	**18**	**0**	**4531**

* Includes LNG SJ, EcoEléctrica and Trucked. These retirements include conversions to biodiesel. Units converted to biodiesel are listed in the Addition Summary table under the Biodiesel Conversions category.

Energy Production by Fuel or Resource

Table 6 provides details on the source of energy production by fuel type and resource for Scenario 13.

Table 6: Scenario 13 Energy Production by Fuel or Resource (GWh)

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	3134	3383	3143	3111	3139	3075	1675	2037	-	-	-	-	-	-	-	-	-	-	-	-
Diesel	1710	81	14	1	9	27	6	4	7	14	9	7	8	5	2	1	5	7	5	4
Fuel Oil	2310	502	153	2	59	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG–EcoElec and CS	5201	3931	3940	4083	4166	4118	4034	3899	4376	4054	3939	4143	4054	4948	3856	3102	2532	3890	3486	2884
LNG-SJ	3873	3866	3408	5771	5781	5768	7519	6964	8161	8264	8024	7655	7553	6561	6838	6627	6322	4037	3623	3506
Hydro	24	67	149	149	149	177	177	177	177	177	177	178	177	175	177	176	176	177	177	178
UPV	398	740	854	946	945	944	944	942	898	900	899	844	724	725	724	727	722	726	726	726
Land Ba sed Wind	269	268	269	269	269	268	268	268	268	268	268	270	269	269	268	269	269	268	269	269
Landfill	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	11	-	-	-
Offshore Wind	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG-Trucked	607	230	706	69	561	465	40	18	79	73	228	162	203	41	41	31	14	9	24	4
Biodiesel	-	-	-	-	-	-	-	-	-	-	24	4	7	3	542	1223	1903	2431	2910	3308
Solar-Tranche 1	38	940	1263	1266	1264	1263	1264	1267	1264	1263	1263	1266	1262	1263	1262	1266	1260	1261	1260	1263
Solar-Tranche 2	0	0	45	107	107	107	107	107	107	107	106	107	107	107	107	107	107	107	107	107
CHP	347	426	511	667	751	729	698	742	803	787	757	727	699	676	661	651	652	654	653	653
DPV	547	652	687	731	780	841	915	1005	1097	1189	1268	1351	1440	1550	1682	1841	2010	2207	2423	2667
Emergency Generator	227	3124	3059	893	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DR	-	-	-	-	1	2	3	4	2	7	6	7	8	8	3	14	15	21	25	27
BESS-4HR	6	116	149	158	172	166	128	146	119	105	132	145	138	149	139	144	159	145	162	187
BESS-Tranche1	-	152	270	232	258	249	194	231	173	157	205	222	218	211	228	230	243	217	257	274
BESS-Tranche2	-	-	14	31	33	32	24	28	22	20	26	27	23	32	25	27	31	27	31	36
BESS-Tranche4	-	-	17	34	33	31	23	25	22	19	24	27	26	32	27	30	32	26	31	34
ASAP BESS	-	97	350	283	300	276	211	246	187	169	213	233	225	254	229	241	270	242	274	308
DBESS	25	31	32	78	129	185	222	262	307	357	407	450	492	553	616	678	712	757	805	847

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Annual Emissions by Resource

Table 7 below showcases the annual emissions by resource. The table does not show hydro, solar PV, demand response, wind and batteries, as there are no emissions associated with energy generation by these resources.

Table 7: Scenario 13 Annual Emissions by resource (CO2eq)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	[redacted]																			
Diesel	1708184	82922	21415	669	17273	25422	22191	10084	16172	8270	8158	14178	9624	15591	4075	5114	8446	7299	7061	7165
Fuel Oil	3490922	617404	203321	9699	112809	38902	10239	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG	4766380	5852281	5699618	4913535	4686289	4648570	4566903	4371773	5456634	5362661	5269500	5146287	5074523	4930212	4565901	4312859	3895922	3476482	3118351	2769837
Biodiesel	-	-	-	-	-	-	-	-	-	-	6234	1350	4549	42637	500605	734519	1133121	1436399	1704563	2004660

Annual Fuel Consumption by Fuel Type

Table 8 shows the annual fuel consumption by fuel type. The table does not show hydro, landfill, solar PV, demand response, wind and batteries, as there is no fuel consumption associated with them. In addition, the table does not show CHP fuel consumption as these systems are located behind the meter, acting as load modifiers. As such, they do not generate electricity for the electric grid, and its fuel consumption would be out of scope for this study.

Table 8: Scenario 13 Annual Fuel consumption by Fuel Type (BBtu)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	[redacted]																			
Diesel	20258	955	159	7	98	313	72	44	83	158	154	87	101	56	481	926	1174	1123	896	520
Fuel Oil	41797	7095	1814	61	1063	489	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG	81848	100090	97539	83355	79827	78577	85368	78954	94716	92954	89169	87111	86080	81485	77246	69575	62731	58580	52254	46328
Biodiesel	-	-	-	-	-	-	-	-	-	-	217	38	73	35	3698	8190	12915	16419	20095	23170

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Cash- Flow Table (PVRR)

In addition to achieving adopted targets for RPS and system reliability, minimizing costs is an important consideration for the recommended expansion planning scenario. Table 9 shows the cost components of Scenario 13 each year during the planning period, and it indicates the total PVRR needed to recover the costs of Scenario 13. Table 9 includes the production costs of the system each year, including fuel costs, fixed O&M costs, variable O&M costs, and costs associated with unit starts and shutdowns. Also listed are the fixed costs associated with the program costs for demand response programs, distributed BESS programs, and other unit additions. For each year, the total system cost in Table 9 is equal to the sum of the production costs and the fixed costs.

Table 9: Scenario 13 System Costs and PVRR

Cost($M)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Variable Production Costs	2365	1794	1698	1489	1495	1495	1490	1471	1565	1586	1564	1526	1509	1485	1549	1658	1772	1835	1887	1926
Total Production Cost	3074	2790	2918	2956	2950	2956	2986	3005	2907	2927	2922	2886	2862	2892	2935	3078	3219	3288	3373	3448
Total System Costs	3281	3148	3492	3701	3778	3804	4192	4229	4148	4159	4174	4122	4123	4371	4449	4630	5030	4951	5074	5178
PVRR	2813	5312	7879	10398	12778	14998	17263	19378	21300	23084	24742	26257	27661	29039	30337	31589	32848	33995	35083	36112
Total Production Cost, $/kWh*	0.166	0.153	0.161	0.164	0.165	0.166	0.170	0.173	0.169	0.171	0.173	0.173	0.174	0.178	0.182	0.193	0.202	0.209	0.216	0.222
Total System Cost, $/kWh*	0.177	0.173	0.193	0.206	0.211	0.214	0.238	0.243	0.241	0.244	0.247	0.247	0.250	0.269	0.276	0.290	0.316	0.315	0.325	0.334

*Total system costs are not equivalent to tariffs.

3.2 Scenario 14 – No 460 MW NGCC Plant in San Juan

Table 10 and Table 11 present information about the MW of generator and battery resource additions and retirements that occur under Scenario 14. Combined, the information on the tables shows significant activity with additions and retirements over the planning period. This activity is primarily driven by the ramping up of renewable energy resources to meet the RPS targets and the targeted reduction of Expected Unserved Energy levels.

Table 10: Capacity Addition Summary (MW) for Scenario 14

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
CHP	47	22	13	13	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**100**
DPV	146	44	16	20	23	29	33	40	44	42	37	37	42	50	60	70	80	89	99	108	**1109**
DBESS-Controlled	-	-	3	5	5	6	2	3	3	3	3	4	4	5	6	6	3	4	4	4	**73**
DR	-	-	-	1	14	22	37	31	21	17	13	19	26	41	56	58	75	91	91	48	**661**
Hydro	-	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**38**
Emergency Generator	198	594	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**792**
New Genera Units (Thermal)	-	-	244	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**244**
New Genera Units (BESS)	131	141	158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**430**
Tranche 1, 2 and 4 BESS	-	435	210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**645**
Tranche 1 & 2 Solar	160	579	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**805**
Solar	90	50	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**200**

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
ASAP BESS, Phase 1 and 2	-	615	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**615**
New Biodiesel	-	-	-	-	-	-	-	-	-	-	-	-	226	452	-	-	-	-	-	-	**678**
Biodiesel Conversions	-	-	-	-	-	-	-	-	-	-	226	226	-	-	373	-	-	373	-	-	**1198**
BESS,4HR	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	**20**
New Gas Gen*	-	-	-	-	-	930	-	-	-	-	-	373	-	443	-	-	-	-	-	-	**1746**
Total	**772**	**2518**	**770**	**39**	**47**	**987**	**72**	**74**	**68**	**62**	**279**	**659**	**318**	**991**	**495**	**134**	**158**	**557**	**194**	**160**	**9354**

* Includes LNG SJ, CS, EcoEléctrica and Trucked

Table 11: Scenario 14 Resource Capacity Retirements (MW)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
Coal	-	-	-	-	-	-	-	-	454	-	-	-	-	-	-	-	-	-	-	-	**454**
Diesel	-	63	84	-	-	-	165	-	-	100	-	-	-	-	-	-	-	-	-	-	**412**
Fuel Oil	-	-	-	-	-	300	280	-	-	-	-	-	-	-	-	-	-	-	-	-	**580**
Landfill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	**4**
Emergency Generator	-	-	-	-	792	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**792**
LNG Retirements*	-	-	-	-	-	-	-	-	-	-	226	226	-	360	753	-	-	373	-	-	**1938**
UPV	-	-	-	-	-	-	-	2	20	-	-	30	55	-	-	-	-	-	-	-	**107**
Total	**0**	**63**	**84**	**0**	**792**	**300**	**445**	**2**	**474**	**100**	**226**	**256**	**55**	**360**	**753**	**0**	**2**	**375**	**0**	**0**	**4287**

*Include LNG SJ, EcoEléctrica and Trucked. These retirements include conversions to biodiesel. Units converted to biodiesel are listed in the Addition Summary table under the Biodiesel Conversions category.

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Energy Production by Fuel or Resource

Table 12 provides details on the source of energy production by fuel type and resource for Scenario 14.

Table 12: Scenario 14 Energy Production by Fuel or Resource (GWh)

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	3119	3386	3144	3138	3163	2631	2805	3038	-	-	-	-	-	-	-	-	-	-	-	-
Diesel	1755	81	13	3	54	11	4	12	18	7	6	10	4	3	2	4	5	6	6	3
Fuel Oil	2320	512	152	84	443	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG–EcoElec and CS	5197	3958	3964	3965	4534	4630	4569	4399	5055	5046	4431	4472	4428	5233	4123	3731	3209	3857	3625	3270
LNG-SJ	3845	3848	3411	3251	3632	6113	5838	5413	7268	7110	7286	6962	6919	6211	6518	6033	5662	4085	3505	3150
Hydro	24	67	149	149	149	177	178	178	177	177	177	178	177	176	178	178	175	177	177	178
UPV	398	740	854	946	945	944	944	943	898	900	899	844	725	726	725	728	725	725	726	726
Land Ba sed Wind	269	268	269	269	269	268	268	268	268	268	268	270	269	269	268	269	269	268	269	269
Landfill	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	11	-	-	-
LNG-Trucked	605	232	709	575	1918	111	82	76	331	298	548	555	501	154	158	51	46	54	49	32
Biodiesel	-	-	-	-	-	-	-	-	-	-	5	24	19	2	530	1219	1898	2432	2913	3304
Solar-Tranche 1	38	940	1263	1266	1264	1263	1264	1267	1264	1264	1263	1266	1262	1263	1263	1267	1263	1261	1262	1265
Solar-Tranche 2	-	-	45	107	107	107	107	107	107	107	106	107	107	107	107	107	107	107	107	107
CHP	346	426	511	668	752	729	698	742	803	788	757	727	699	677	661	653	652	654	653	653
DPV	546	652	687	731	780	841	915	1005	1097	1189	1268	1351	1440	1551	1683	1842	2010	2207	2424	2667
Emergency Generator	223	3100	3031	2927	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DR	-	-	-	-	1	0	3	4	5	6	6	7	8	8	1	14	17	21	25	27
BESS-4HR	6	121	155	189	241	171	162	174	215	216	229	242	248	258	262	273	273	269	278	300
BESS-Tranche1	-	153	273	252	365	244	238	260	297	300	349	365	350	338	403	404	399	395	411	441
BESS-Tranche2	-	-	16	43	49	34	33	36	45	46	48	50	47	55	50	56	58	51	54	63
BESS-Tranche4	-	0	17	44	50	33	32	33	47	48	48	52	50	58	52	57	62	53	58	66

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
ASAP BESS	-	101	359	351	409	300	290	317	391	384	403	412	396	423	413	432	438	428	442	467
DBESS	-	-	5	12	19	28	31	35	39	44	49	55	61	68	76	85	89	94	100	106

Annual Emissions by Resource

Table 13 below showcases the annual emissions by resource. The table does not show hydro, solar PV, demand response, wind, and batteries, as there are no emissions associated with energy generation by these resources.

Table 13: Scenario 14 Annual Emissions by resource (tonCO2eq)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	[redacted]																			
Diesel	1708184	82922	21415	669	17273	25422	22191	10084	16172	8270	8158	14178	9624	15591	4075	5114	8446	7299	7061	7165
Fuel Oil	3490922	617404	203321	9699	112809	38902	10239	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG	4766380	5852281	5699618	4913535	4686289	4648570	4566903	4371773	5456634	5362661	5269500	5146287	5074523	4930212	4565901	4312859	3895922	3476482	3118351	2769837
Biodiesel	-	-	-	-	-	-	-	-	-	-	6234	1350	4549	42637	500605	734519	1133121	1436399	1704563	2004660

Annual Fuel Consumption by Fuel Type

Table 14 shows the annual fuel consumption by fuel type. The table does not show hydro, landfill, solar PV, demand response, wind, or batteries, as there is no fuel consumption associated with them. In addition, the table does not show CHP fuel consumption, as these systems are located behind the meter and act as load modifiers. As such, they do not generate electricity for the electric grid, and their fuel consumption would be out of scope for this study.

Table 14: Scenario 14 Annual Fuel consumption by Fuel Type (BBtu)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	[redacted]																			
Diesel	20788	947	144	33	613	132	47	136	194	82	77	159	82	35	469	986	1223	1120	909	510
Fuel Oil	42087	7336	1811	1042	5991	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG	81537	99998	97500	93476	84319	87694	84335	78652	103902	102048	98860	92008	90628	85254	81251	73214	66315	60112	53911	48297
Biodiesel	-	-	-	-	-	-	-	-	-	-	45	225	181	27	3633	8450	13381	16486	20128	23255

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Cash- Flow Table (PVRR)

In addition to achieving adopted targets for RPS and system reliability, minimizing costs is an important consideration for the recommended expansion planning scenario. Table 15 shows the cost components of Scenario 14 each year during the planning period, and it indicates the total PVRR needed to recover the costs of Scenario 14. Table 15 includes the production costs of the system each year, including fuel costs, fixed O&M costs, variable O&M costs, and costs associated with unit starts and shutdowns. Also listed are the fixed costs associated with the program costs for demand response programs, distributed BESS programs, and other unit additions. For each year, the total system cost in Table 15 is equal to the sum of the production costs and the fixed costs.

Table 15: Scenario 14 System Costs and PVRR

Cost($M)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Variable Production Costs	2376	1797	1696	1640	1652	1573	1575	1560	1714	1726	1709	1614	1588	1553	1620	1733	1853	1875	1927	1971
Total Production Cost	3085	2793	2917	2911	2905	2863	2852	2868	2823	2838	2843	2776	2747	2733	2777	2920	3066	3092	3173	3250
Total System Costs	3287	3146	3486	3644	3713	3977	3975	4001	3965	3960	3973	3980	4031	4283	4347	4512	4907	4771	4876	4968
PVRR	2818	5316	7878	10358	12699	15019	17167	19168	21005	22703	24281	25744	27116	28466	29735	30955	32183	33288	34334	35321
Total Production Cost, $/kWh*	0.166	0.154	0.161	0.162	0.162	0.161	0.162	0.165	0.164	0.166	0.168	0.166	0.167	0.168	0.172	0.183	0.193	0.197	0.203	0.210
Total System Cost, $/kWh*	0.177	0.173	0.192	0.202	0.207	0.224	0.226	0.230	0.230	0.232	0.235	0.239	0.245	0.263	0.270	0.282	0.308	0.303	0.312	0.320

*Total system costs are not equivalent to tariffs.

3.3 Scenario 15 – Marine Cable to Dominican Republic with 500 MW NGCC

3.3.1. Additional Assumptions for Scenario 15

Scenario 15 assumes the construction of a marine cable connecting the eastern coast of the Dominican Republic to Mayagüez, Puerto Rico, with a planned commercial operation date in 2031. The project description and costs are based on Project Hostos. LUMA assumed the marine cable would provide 500 MW of energy operating at 90% capacity factor.

Table 16: Capacity Addition Summary (MW) for Scenario 15

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
CHP	47	22	13	13	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**100**
DPV	146	44	16	20	23	29	33	40	44	42	37	37	42	50	60	70	80	89	99	108	**1109**
DBESS- Controlled	-	-	3	5	5	6	2	3	3	3	3	4	4	5	6	6	3	4	4	4	**73**
DR*	-	-	-	1	14	22	37	31	21	17	13	19	26	41	56	58	75	91	91	48	**661**
Hydro	-	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**38**
Emergency Generator	198	594	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**792**
New Genera Units (Thermal)	-	-	244	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**244**
New Genera Units (BESS)	131	141	158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**430**
Tranche 1, 2 and 4 BESS	-	435	210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**645**
Tranche 1 & 2 Solar	160	579	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**805**
Solar	90	50	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**200**
ASAP BESS, Phase1 and 2	-	615	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**615**
New Biodiesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**
Biodiesel Conversions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	172	210	-	-	478	-	**860**
BESS,4HR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	**20**
New Gas Gen**	-	-	-	478	-	-	500	-	-	-	35	-	-	-	-	35	-	-	-	-	**1048**
Total	**772**	**2518**	**770**	**517**	**47**	**57**	**572**	**74**	**68**	**62**	**88**	**60**	**72**	**96**	**294**	**399**	**158**	**184**	**672**	**160**	**7640**

* Consistent with the format of the other tables, 'DR' refers to Demand Response. In this specific case, the new gas-fired generation capacity installed in the Dominican Republic is incorporated under the 'New Gas Generation' category.
** Includes LNG SJ, CS, EcoEléctrica, Trucked and Dominican Republic generation.

Table 17: Scenario 15 Resource Capacity Retirements (MW)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
Coal	-	-	-	-	-	-	-	-	454	-	-	-	-	-	-	-	-	-	-	-	454
Diesel	-	63	84	-	-	-	-	-	-	-	-	265	-	-	-	-	231	-	75	-	718
Fuel Oil	-	-	-	-	-	300	280	-	-	-	-	-	-	-	-	-	-	-	-	-	580
Landfill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	4
Emergency Generator	-	-	-	-	792	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	792
LNG Retirements*	-	-	-	-	-	-	740	-	-	-	-	-	-	-	172	210	-	20	813	-	1955
UPV	-	-	-	-	-	-	-	2	20	-	-	30	55	-	-	-	-	-	-	-	107
Total	**0**	**63**	**84**	**0**	**792**	**300**	**1020**	**2**	**474**	**0**	**0**	**295**	**55**	**0**	**172**	**210**	**233**	**22**	**888**	**0**	**4610**

*Includes LNG SJ, EcoEléctrica and Trucked. These retirements include conversions to biodiesel. Units converted to biodiesel are listed in the Addition Summary table under the Biodiesel Conversions category.

Energy Production by Fuel or Resource

Table 18 provides details on the source of energy production by fuel type and resource for Scenario 15.

Table 18: Scenario 15 Energy Production by Fuel or Resource (GWh)

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	3119	3381	3144	3109	3132	3067	1195	1394	-	-	-	-	-	-	-	-	-	-	-	-
Diesel	1758	78	17	1	11	13	6	7	17	11	21	8	7	17	2	2	3	2	1	2
Heavy Fuel Oil	2314	520	182	3	70	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG - EcoElec and CS	5185	3964	3975	4035	4147	4251	3785	3685	4026	3857	3808	3837	3788	3666	3234	2350	1595	754	3046	2481
LNG – SJ	3861	3836	3393	5739	5812	5742	4302	3896	4527	4503	4389	4140	4049	3910	3628	3523	3398	3426	233	59
DR gas generation	-	-	-	-	-	-	3942	3952	3942	3942	3941	3951	3942	3941	3940	3949	3940	3933	3942	3953
Hydro	24	67	149	149	149	177	178	178	177	177	177	177	177	177	177	178	178	177	178	178
Utility Scale Solar	397	740	854	946	945	944	944	942	898	900	899	844	725	726	725	727	725	726	726	727
Land Based Wind	269	268	269	269	269	268	268	268	268	268	268	270	269	269	268	269	269	268	269	269

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Landfill	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	11	-	-	-
LNG – Trucked	606	252	715	78	591	443	96	46	169	162	133	109	109	97	15	25	20	8	5	2
Biodiesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	528	1220	1897	2429	2914	3301
Solar - Tranche 1	38	940	1263	1266	1264	1263	1264	1267	1264	1264	1263	1266	1262	1264	1263	1267	1263	1262	1264	1267
Solar - Tranche 2	0	0	45	107	107	107	107	107	107	107	106	107	107	107	107	107	107	107	107	107
Combined Heat and Power	345	426	511	667	751	729	698	742	803	788	756	727	699	676	660	653	654	654	654	653
Solar – Distributed	546	652	687	731	780	841	915	1005	1097	1189	1268	1351	1440	1551	1683	1841	2011	2207	2424	2668
Emergency Generator	219	3098	3029	994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Demand Response	-	-	-	-	1	2	3	4	5	6	6	7	8	7	2	14	17	21	24	27
Utility Battery Storage - 4hr	5	96	121	132	161	152	132	153	143	149	154	172	165	182	169	203	215	305	223	227
Utility Battery - Tranche 1	-	115	219	194	249	248	207	241	235	235	252	275	261	287	268	302	309	463	337	343
Utility Battery - Tranche 2	-	-	14	26	32	29	25	29	27	28	30	33	31	33	28	37	36	57	39	43
Utility Battery - Tranche 4	-	-	14	29	33	28	24	28	26	27	28	32	31	33	29	35	37	61	39	44
ASAP Utility Battery	-	85	303	244	288	263	230	265	247	258	267	298	285	303	298	329	349	479	348	358
Distributed Battery – Controlled	-	-	1	2	3	5	3	4	5	7	7	12	13	16	19	22	25	49	34	44

Annual Emissions by Resource

Table 19 below displays the annual emissions by resource. The table does not show hydro, solar PV, demand response, wind and batteries, as there are no emissions associated with energy generation by these resources.

Table 19: Scenario 15 Annual Emissions by resource (CO2eq)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	[redacted]																			
Diesel	1701897	75247	15760	934	10781	12407	5277	6848	15859	10213	19340	7864	6110	15786	1525	1892	2612	1864	813	1473
Fuel Oil	3486674	615652	180279	5492	96891	22997	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG	4775732	5857908	5707346	4909740	4699029	4654493	5122759	4869155	5384158	5288264	5198642	5086578	5019862	4892941	4513220	4063281	3648892	3253937	3111562	2767919
Biodiesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	407484	808674	1309389	1724791	1803718	2023131

Annual Fuel Consumption by Fuel Type

Table 20 shows the annual fuel consumption by fuel type. The table does not show hydro, landfill, solar PV, demand response, wind and batteries, as there is no fuel consumption associated with them. In addition, the table does not show CHP fuel consumption as these systems are located behind the meter, acting as load modifiers. As such, they do not generate electricity for the electric grid, and their fuel consumption would be out of scope for this study.

Table 20: Scenario 15 Annual Fuel Consumption by Fuel Type (BBtu)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	[redacted]																			
Diesel	20807	920	193	11	132	152	65	84	194	125	236	96	75	193	569	1016	1318	1293	896	515
Fuel Oil	41982	7413	2171	66	1167	277	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG	81569	100052	97480	83857	80259	79498	87496	83164	91960	90323	88792	86878	85738	83571	77085	69400	62322	55577	53145	47276
Biodiesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4452	8934	14788	19903	21257	24339

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Cash- Flow Table (PVRR)

In addition to achieving adopted targets for RPS and system reliability, minimizing costs is an important consideration for the recommended expansion planning scenario. Table 21 shows the cost components of Scenario 15 each year during the planning period, and it indicates the total PVRR needed to recover the costs of Scenario 15. Table 21 includes the production costs of the system each year, including fuel costs, fixed O&M costs, variable O&M costs, and costs associated with unit starts and shutdowns. Also listed are the fixed costs associated with the program costs for demand response programs, distributed BESS programs, and other unit additions. For each year, the total system cost in Table 21 is equal to the sum of production costs and the fixed costs.

Table 21: Scenario 15 System Costs and PVRR

Cost($M)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Variable Production Costs	2375	1799	1706	1495	1503	1496	1141	1127	1161	1164	1166	1132	1104	1095	1175	1283	1438	1552	1537	1578
Total Production Cost	3084	2795	2926	2963	2957	3127	3202	3240	3093	3135	3188	3156	3135	3162	3289	3453	3595	3748	3909	4017
Total System Costs	3287	3148	3495	3696	3766	3948	4032	4080	3942	3963	4036	3979	3971	4015	4163	4370	4760	4752	5008	5060
PVRR	2818	5317	7886	10402	12775	15078	17257	19298	21123	22823	24426	25889	27240	28506	29721	30902	32094	33195	34269	35275
Total Production Cost, $/kWh*	0.166	0.154	0.161	0.165	0.165	0.176	0.182	0.186	0.180	0.184	0.188	0.189	0.190	0.194	0.204	0.216	0.226	0.238	0.250	0.259
Total System Cost, $/kWh*	0.177	0.173	0.193	0.205	0.210	0.222	0.229	0.235	0.229	0.232	0.238	0.239	0.241	0.247	0.258	0.273	0.299	0.302	0.321	0.326

*Total system costs are not equivalent to tariffs.

3.4 Scenario 16 – Alternative RPS 1

Table 22: Capacity Addition Summary (MW) for Scenario 16

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
CHP	47	22	13	13	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**100**
DPV	146	44	16	20	23	29	33	40	44	42	37	37	42	50	60	70	80	89	99	108	**1109**
DBESS-Controlled	-	-	3	5	5	6	2	3	3	3	3	4	4	5	6	6	3	4	4	4	**73**
DR	-	-	-	1	14	22	37	31	21	17	13	19	26	41	56	58	75	91	91	48	**661**
Hydro	-	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**38**
Emergency Generator	198	594	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**792**
New Genera Units (Thermal)	-	-	244	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**244**
New Genera Units (BESS)	131	141	158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**430**
Tranche 1, 2 and 4 BESS	-	435	210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**645**
Tranche 1 & 2 Solar	160	579	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**805**
Solar	90	50	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**200**
ASAP BESS, Phase1 and 2	-	615	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**615**
New Biodiesel	-	-	-	-	-	-	-	-	226	226	-	-	-	226	678	-	-	-	-	-	**1356**
Biodiesel Conversions	-	-	-	-	-	-	285	-	150	373	-	-	-	-	-	373	-	-	-	-	**1181**

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Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
New Gas Gen*	-	-	-	478	-	-	-	-	373	-	-	-	-	-	373	-	-	-	-	-	**1224**
Total	**772**	**2518**	**770**	**517**	**47**	**57**	**357**	**74**	**817**	**661**	**53**	**60**	**72**	**322**	**1173**	**507**	**158**	**184**	**194**	**160**	**9473**

* Includes LNG SJ, CS, EcoEléctrica and Trucked

Table 23: Scenario 16 Resource Capacity Retirements (MW)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
Coal	-	-	-	-	-	-	-	-	454	-	-	-	-	-	-	-	-	-	-	-	**454**
Diesel	-	63	84	-	-	-	210	-	50	-	100	165	-	-	-	256	-	-	-	-	**928**
Fuel Oil	-	-	-	-	-	100	-	200	-	280	-	-	-	-	-	-	-	-	-	-	**580**
Landfill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	**4**
Emergency Generator	-	-	-	-	792	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**792**
LNG Retirements*	-	-	-	-	-	-	75	-	100	373	-	360	-	36	405	513	-	-	-	-	**1862**
UPV	-	-	-	-	-	-	-	2	20	-	-	30	55	-	-	-	-	-	-	-	**107**
Total	**0**	**63**	**84**	**0**	**792**	**100**	**285**	**202**	**624**	**653**	**100**	**555**	**55**	**36**	**405**	**769**	**2**	**2**	**0**	**0**	**4727**

*Includes LNG SJ, EcoEléctrica and Trucked. These retirements include conversions to biodiesel. Units converted to biodiesel are listed in the Addition Summary table under the Biodiesel Conversions category.

Energy Production by Fuel or Resource

Table 24 provides details on the source of energy production by fuel type and resource for Scenario 16.

Table 24: Scenario 16 Energy Production by Fuel or Resource (GWh)

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	3115	3379	3144	3110	3140	3075	3096	3100	-	-	-	-	-	-	-	-	-	-	-	-
Diesel	1760	78	15	-	10	15	12	18	6	8	5	4	7	9	5	6	4	3	3	2
Fuel Oil	2316	518	153	2	62	35	33	8	7	-	-	-	-	-	-	-	-	-	-	-
LNG–EcoElec and CS	5190	3951	3961	4078	4165	4176	4395	4222	4026	4440	4250	4207	4045	3857	3741	3134	2748	2304	1959	1597
LNG-SJ	3853	3854	3407	5769	5779	5736	4664	4208	6783	4788	4691	4403	4075	3780	3415	3545	3486	3489	3423	3427
Hydro	24	67	149	149	149	177	177	178	177	177	177	178	177	177	177	178	177	177	177	178
UPV	398	740	854	946	945	944	944	943	897	900	899	844	725	726	724	725	720	724	724	725
Land Based Wind	269	268	269	269	269	268	268	268	268	268	268	270	269	269	268	269	269	268	269	269
Landfill	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	11	-	-	-
LNG-Trucked	606	232	707	69	564	468	574	287	138	1019	660	318	167	80	19	27	42	12	10	2
Biodiesel	-	-	-	-	-	-	525	1092	1690	2184	2643	3068	3555	3850	4098	4298	4535	4625	4703	4732
Solar-Tranche 1	38	940	1263	1266	1264	1263	1264	1267	1264	1264	1263	1266	1262	1263	1262	1265	1258	1256	1255	1260
Solar-Tranche 2	-	-	45	107	107	107	107	107	107	107	106	107	107	107	107	107	107	107	107	107
CHP	346	426	511	667	751	729	698	742	802	788	757	727	699	677	660	653	649	654	652	653
DPV	546	652	687	731	780	841	915	1005	1097	1189	1268	1351	1440	1550	1682	1841	2011	2207	2424	2668
Emergency generator	221	3107	3039	906	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DR	-	-	-	-	1	2	3	4	0	6	6	7	8	2	6	14	14	21	25	27
BESS-4HR	7	122	153	167	181	179	170	164	156	168	179	198	180	178	144	202	224	239	252	276
BESS-Tranche1	-	154	276	248	279	287	267	268	245	270	279	304	284	282	203	296	326	358	389	436
BESS-Tranche2	-	-	17	33	35	34	32	32	32	32	32	38	35	34	27	39	43	46	51	57
BESS-Tranche4	-	-	17	36	36	33	33	34	30	34	34	39	34	33	26	38	43	47	50	61

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
ASAP BESS	-	102	357	296	321	304	293	291	275	294	315	336	312	309	255	353	385	410	430	458
DBESS	-	-	5	12	19	28	31	35	39	44	49	55	60	68	76	85	89	95	100	106

Annual Emissions by Resource

Table 25 below displays the annual emissions by resource. The table does not show hydro, solar PV, demand response, wind and batteries, as there are no emissions associated with energy generation by these resources.

Table 25: Scenario 16 Annual Emissions by resource (CO2eq)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	[redacted]																			
Diesel	1708184	82922	21415	669	17273	25422	22191	10084	16172	8270	8158	14178	9624	15591	4075	5114	8446	7299	7061	7165
Fuel Oil	3495608	616136	202091	9702	107271	38902	10239	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG	4769683	5851387	5697017	4913540	4674577	4601147	4608788	4408109	5442831	5460290	5320472	5152178	5038048	4918667	4565901	4312859	3895922	3476482	3118351	2769837
Biodiesel	-	-	-	-	-	-	-	-	-	-	6234	1350	4549	42637	500605	734519	1133121	1436399	1704563	2004660

Annual Fuel Consumption by Fuel Type

Table 26 shows the annual fuel consumption by fuel type. The table does not show hydro, landfill, solar PV, demand response, wind and batteries, as there is no fuel consumption associated with them. In addition, the table does not show CHP fuel consumption as these systems are located behind the meter, acting as load modifiers. As such, they do not generate electricity for the electric grid, and their fuel consumption would be out of scope for this study.

Table 26: Scenario 16 Annual Fuel consumption by Fuel Type (BBtu)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	[redacted]																			
Diesel	20,838	915	166	-	113	171	1,283	2,425	3,801	3,402	3,695	3,826	4,049	3,871	3,512	3,162	2,643	2,025	1,375	701
FuelOil	41,990	7,355	1,824	64	1,084	411	394	90	86	-	-	-	-	-	-	-	-	-	-	-
LNG	81,548	100,084	97,487	83,432	79,840	78,951	73,403	65,679	79,182	78,687	72,919	67,072	61,627	57,062	50,194	48,785	45,452	41,624	38,375	35,449
Biodiesel	-	-	-	-	-	-	3,122	6,639	12,508	12,454	15,501	18,474	22,524	25,264	27,994	27,863	29,915	31,230	32,302	33,093

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Cash- Flow Table (PVRR)

In addition to achieving adopted targets for RPS and system reliability, minimizing costs is an important consideration for the recommended expansion planning scenario. Table 27 shows the cost components of Scenario 16 each year during the planning period, and it indicates the total PVRR needed to recover the costs of Scenario 16. Table 27 includes the production costs of the system each year, including fuel costs, fixed O&M costs, variable O&M costs, and costs associated with unit starts and shutdowns. Also listed are the fixed costs associated with the program costs for demand response programs, distributed BESS programs, and other unit additions. For each year, the total system cost in Table 27 is equal to the sum of the production costs and the fixed costs.

Table 27: Scenario 16 System Costs and PVRR

Cost($M)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Variable Production Costs	2376	1798	1697	1489	1495	1494	1575	1651	1851	1861	1930	1967	2042	2107	2143	2120	2174	2173	2177	2172
Total Production Cost	3085	2794	2917	2957	2950	2975	3092	3186	3215	3209	3297	3303	3370	3459	3525	3444	3522	3541	3573	3599
Total System Costs	3287	3146	3487	3690	3759	3795	3926	4029	4239	4274	4370	4351	4431	4599	4976	4918	5244	5102	5157	5199
PVRR	2818	5316	7879	10390	12759	14974	17094	19110	21073	22907	24642	26242	27750	29200	30653	31982	33294	34476	35582	36615
Total Production Cost, $/kWh*	0.166	0.154	0.161	0.164	0.165	0.167	0.176	0.183	0.187	0.188	0.195	0.198	0.205	0.213	0.219	0.215	0.221	0.225	0.229	0.232
Total System Cost, $/kWh*	0.177	0.173	0.192	0.205	0.210	0.214	0.223	0.232	0.246	0.250	0.258	0.261	0.269	0.283	0.309	0.308	0.329	0.324	0.330	0.335

*Total system costs are not equivalent to tariffs.

3.5 Scenario 17 – Alternative RPS 2

Table 28: Capacity Addition Summary (MW) for Scenario 17

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
CHP	47	22	13	13	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**100**
DPV	146	44	16	20	23	29	33	40	44	42	37	37	42	50	60	70	80	89	99	108	**1109**
DBESS-Controlled	-	-	3	5	5	6	2	3	3	3	3	4	4	5	6	6	3	4	4	4	**73**
DR	-	-	-	1	14	22	37	31	21	17	13	19	26	41	56	58	75	91	91	48	**661**
Hydro	-	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**38**
Emergency Generator	198	594	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**792**
New Genera Units (Thermal)	-	-	244	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**244**
New Genera Units (BESS)	131	141	158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**430**
Tranche 1, 2 and 4 BESS	-	435	210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**645**
Tranche 1 & 2 Solar	160	579	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**805**
Solar	90	50	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**200**
ASAP BESS, Phase1 and 2	-	615	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**615**
New Biodiesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**
Biodiesel Conversions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,808	**1808**

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
New Gas Gen*	-	-	-	478	-	-	669	-	-	-	35	-	-	226	2,286	-	-	-	-	-	**3694**
Total	**772**	**2518**	**770**	**517**	**47**	**57**	**741**	**74**	**68**	**62**	**88**	**60**	**72**	**322**	**2408**	**134**	**158**	**184**	**194**	**1968**	**11214**

* Includes LNG SJ, CS, EcoEléctrica and Trucked

Table 29: Scenario 17 Resource Capacity Retirements (MW)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
Coal	-	-	-	-	-	-	-	-	454	-	-	-	-	-	-	-	-	-	-	-	**454**
Diesel	-	63	84	-	-	-	165	-	-	-	-	100	-	-	-	306	-	-	-	-	**718**
Fuel Oil	-	-	-	-	-	300	100	180	-	-	-	-	-	-	-	-	-	-	-	-	**580**
Landfill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.	2	-	-	**4**
Emergency Generator	-	-	-	-	792	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**792**
LNG Retirements*	-	-	-	-	-	300	100	180	-	-	-	360	-	-	380	-	-	-	-	1,808	**3,128**
UPV	-	-	-	-	-	-	-	2	20	-	-	30	55	-	-	-	-	-	-	-	**107**
Total	**0**	**63**	**84**	**0**	**792**	**600**	**365**	**362**	**474**	**0**	**0**	**490**	**55**	**0**	**380**	**306**	**2**	**2**	**0**	**1808**	**5783**

* Includes LNG SJ, EcoEléctrica and Trucked. These retirements include conversions to biodiesel. Units converted to biodiesel are listed in the Addition Summary table under the Biodiesel Conversions category.

Energy Production by Fuel or Resource

Table 30 provides details on the source of energy production by fuel type and resource for Scenario 17.

Table 30:Scenario 17 Energy Production by Fuel or Resource (GWh)

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	3117	3378	3143	3111	3140	3076	1740	2095	-	-	-	-	-	-	-	-	-	-	-	-
Diesel	1757	80	14	-	10	17	9	7	7	7	10	5	8	10	2	1	2	1	2	3
Fuel Oil	2323	511	152	3	63	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG–EcoElec and CS	5197	3957	3963	4078	4162	4180	3934	3827	4194	3899	3955	4118	4022	3948	5127	4961	4823	4519	4255	4067
LNG-SJ	3848	3853	3412	5770	5786	5731	7551	6988	8354	8460	8203	7823	7783	7519	6148	6044	5973	5895	5809	5666
Hydro	24	67	149	149	149	177	177	177	177	177	177	178	177	177	173	174	172	171	174	171
UPV	398	739	854	946	945	944	944	942	898	900	899	843	724	726	720	720	717	722	721	721
Land Ba sed Wind	269	268	269	269	269	268	268	268	268	268	268	270	269	269	268	269	269	268	269	269
Landfill	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	10	-	-	-
LNG-Trucked	603	231	707	68	559	464	63	20	95	65	74	51	37	95	22	2	4	2	6	1
Biodiesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Solar-Tranche 1	38	940	1263	1266	1264	1263	1264	1267	1264	1264	1263	1266	1261	1263	1256	1260	1253	1249	1252	1252
Solar-Tranche 2	-	-	45	107	107	107	107	107	107	107	106	107	107	107	107	107	107	107	107	107
CHP	346	426	511	667	751	729	697	742	803	788	757	727	699	677	658	650	651	652	650	648
DPV	546	652	687	731	780	841	915	1005	1097	1189	1268	1351	1440	1551	1683	1842	2011	2207	2424	2668
Emergency Generator	220	3108	3034	902	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DR	-	-	-	-	1	2	3	4	5	6	6	7	8	5	3	13	12	17	25	27
BESS-4HR	6	121	152	165	181	177	164	178	170	161	169	192	184	178	152	159	171	169	178	191
BESS-Tranche1	-	153	272	247	277	288	254	278	265	242	263	299	291	276	217	228	254	251	266	287
BESS-Tranche2	-	-	17	33	34	34	29	34	32	28	31	35	34	33	29	29	34	33	33	38
BESS-Tranche4	-	-	17	36	36	33	29	34	30	28	29	35	33	32	31	31	37	32	34	37
ASAP BESS	-	101	365	299	321	306	281	300	294	281	293	320	314	308	273	279	303	294	309	330
DBESS	-	-	5	12	19	28	31	35	39	44	49	55	59	68	76	84	89	95	101	106

Annual Emissions by Resource

Table 31 below displays the annual emissions by resource. The table does not show hydro, solar PV, demand response, wind and batteries, as there are no emissions associated with energy generation by these resources.

Table 31: Scenario 17 Annual Emissions by resource (tonCO2eq)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	[redacted]																			
Diesel	1708184	82922	21415	669	17273	25422	22191	10084	16172	8270	8158	14178	9624	15591	4075	5114	8446	7299	7061	7165
Fuel Oil	3496240	621490	202360	9684	108981	38902	10239	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG	4770129	5855162	5697586	4913503	4678193	4606724	4472738	4297354	5418132	5322716	5238874	5105766	5034342	4906150	4565901	4312859	3895922	3476482	3118351	2769837
Biodiesel	-	-	-	-	-	-	-	-	-	-	6234	1350	4549	42637	500605	734519	1133121	1436399	1704563	2004660

Annual Fuel Consumption by Fuel Type

Table 32 shows the annual fuel consumption by fuel type. The table does not show hydro, landfill, solar PV, demand response, wind and batteries, as there is no fuel consumption associated with them. In addition, the table does not show CHP fuel consumption as these systems are located behind the meter, acting as load modifiers. As such, they do not generate electricity for the electric grid, and their fuel consumption would be out of scope for this study.

Table 32: Scenario 17 Annual Fuel consumption by Fuel Type (BBtu)

Resources	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Coal	[redacted]																			
Diesel	20,806	947	151	3	114	201	107	83	83	83	111	54	91	115	27	12	24	10	25	34
Fuel Oil	42,072	7,333	1,823	72	1,111	406	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LNG	81,522	100,078	97,544	83,400	79,838	78,924	84,842	78,582	94,532	92,912	91,104	88,356	87,061	84,940	79,579	77,396	75,840	72,898	70,396	67,753
Biodiesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54

Cash- Flow Table (PVRR)

In addition to achieving adopted targets for RPS and system reliability, minimizing costs is an important consideration for the recommended expansion planning scenario. Table 33 shows the cost components of Scenario 17 each year during the planning period, and it indicates the total PVRR needed to recover the costs of Scenario 17. Table 33 includes the production costs of the system each year, including fuel costs, fixed O&M

costs, variable O&M costs, and costs associated with unit starts and shutdowns. Also listed are the fixed costs associated with the program costs for demand response programs, distributed BESS programs, and other unit additions. For each year, the total system cost in Table 33 is equal to the sum of the production costs and the fixed costs.

Table 33: Scenario 17 System Costs and PVRR

Cost($M)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Variable Production Costs	2376	1797	1697	1489	1496	1494	1486	1471	1558	1578	1584	1544	1523	1525	1453	1459	1463	1426	1395	1364
Total Production Cost	3084	2793	2918	2957	2951	2954	2990	2990	2883	2928	2971	2901	2873	2908	2958	2905	2940	2929	2933	2861
Total System Costs	3287	3146	3487	3690	3760	3774	4024	4034	3936	3962	4024	3929	3914	4027	4739	4708	4990	4818	4845	4790
PVRR	2818	5316	7879	10390	12759	14962	17136	19154	20977	22676	24274	25719	27051	28321	29704	30976	32225	33342	34381	35333
Total Production Cost, $/kWh*	0.166	0.154	0.161	0.164	0.165	0.166	0.170	0.172	0.168	0.172	0.176	0.174	0.175	0.179	0.184	0.182	0.185	0.186	0.188	0.185
Total System Cost, $/kWh*	0.177	0.173	0.192	0.205	0.210	0.212	0.229	0.232	0.229	0.232	0.238	0.236	0.238	0.247	0.294	0.295	0.314	0.306	0.310	0.309

*Total system costs are not equivalent to tariffs.

Exhibit 2- CONFIDENTIAL

(to be submitted via email)

Exhibit 3

GOVERNMENT OF PUERTO RICO
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

Direct Testimony of

Dr. Ajit Kulkarni

Senior Technical Expert and Grid Modernization Manager, LUMA Energy ServCo LLC

December 19, 2025

Summary of Prepared Direct Testimony of
AJIT KULKARNI
ON BEHALF OF
LUMA ENERGY LLC AND LUMA ENERGY SERVCO, LLC

Dr. Ajit Kulkarni ("Dr. Kulkarni") is the Senior Technical Expert and Grid Modernization Manager at LUMA Energy ServCo, LLC. The purpose of Dr. Kulkarni's prepared direct testimony in this proceeding is to sponsor the Assumptions and Forecasts, Resource Plan Development, Caveats and Limitations, and Action Plan sections of LUMA's Integrated Resource Plan, along with the Transmission and Distribution Implications of the Preferred Resource Plan and a description of the Supplemental Scenarios LUMA performed.

Table of Contents

I. INTRODUCTION

A. Witness Identification

Q.1 Please state your name, business address, title, and employer.

A. My name is Ajit Kulkarni. My business address is LUMA Energy, PO Box 363508, San Juan, Puerto Rico 00936-3508. I am the Grid Modernization Manager for LUMA Energy LLC and LUMA Energy ServCo, LLC (together "LUMA" or "LUMA Energy").

Q.2 On whose behalf are you testifying before the Puerto Rico Energy Bureau ("Energy Bureau" or "PREB")?

A. My testimony is on behalf of LUMA as part of the Energy Bureau's Case No. NEPR-AP-2023-0004, *In re: Review of the Puerto Rico Electric Power Authority Integrated Resource Plan*.

B. Qualifications and Professional Background

Q.3 What is your educational background?

A. I received a Bachelor of Science Degree in Electrical and Computer Engineering from Arizona State University in 1988 and a Master of Science Degree in Electrical and Computer Engineering from the University of Illinois, Urbana-Champaign in 1990. In addition, I received a Doctor of Philosophy Degree in Electrical and Computer Engineering from the University of Illinois, Urbana-Champaign in 1996.

Q.4 What is your professional experience?

A. I have over 25 years of technical and managerial experience in the electricity sector with a strong emphasis on IRPs, system master plans/studies, renewable integration studies, congestion/curtailment studies, security-constrained economic dispatch

(“SCED”), security-constrained unit commitment (“SCUC”), optimal power flow (“OPF”), generator and load interconnection and grid codes. Technologies have included onshore and offshore wind, solar, storage, hydro electric, Electric Vehicle (“EV”) charging infrastructure, transmission projects, industrial facilities, data centers, distributed energy resources (“DER”), smart grid, and demand response (“DR”)/ dual-layer capacitor (“DLC”)/ demand side management (“DSM”). In addition, I lead the Resource Planning and Grid Resilience Areas within the Transmission and Regulatory Compliance team.

Q.5 Have you previously testified in adjudicated proceedings before the Energy Bureau?

A. No.

II. SUMMARY OF DIRECT TESTIMONY

Q.6 What is the purpose of your Direct Testimony?

A. The purpose of my testimony in this proceeding is to summarize and sponsor the Assumptions and Forecasts (Section 7), Resource Plan Development (Section 8), Caveats and Limitations (Section 9), and Action Plan (Section 10) sections of LUMA’s 2025 IRP. I am also sponsoring a portion of the Transmission & Distribution Planning Section of the 2025 IRP and the Supplemental Scenarios (Appendix 7).

Q.7 Are you sponsoring any statements, schedules, or exhibits in conjunction with your testimony?

A. No.

Q.8 Are there any documents you relied on for your testimony that have not already been produced in this proceeding?

A. No.

Q.9 Are any of the materials you are sponsoring confidential?

A. Yes. Some of the information contained in the sections of the 2025 IRP Report and workpapers that I am sponsoring contains commercially sensitive or trade secret information and Critical Energy/Electric Infrastructure Information (CEII).

III. ASSUMPTIONS AND FORECASTS

Q.10 Are there any legal requirements for LUMA to submit its 2025 IRP?

A. Yes. LUMA is required to develop its IRP in accordance with the requirements set forth in the Regulation on Integrated Resource Plan for the Puerto Rico Electric Power Authority, Regulation No. 9021 of the Energy Bureau, dated April 20, 2018 ("Regulation 9021"). With respect to the Assumptions and Forecasts section of the 2025 IRP, LUMA followed the requirements set forth in Section 2.03(G) of Regulation 9021, which requires the IRP to describe the modeling assumptions and inputs incorporated into LUMA's forecasting model, and the requirements in the May 13, 2025 Resolution and Order in this proceeding ("May 13th Order"), which specified certain assumptions.

Q.11 Are there other assumptions and forecasts that go into the modeling?

A. Yes, there are many. Load forecasts and assumptions regarding existing and new resources are also incorporated into the modeling. The forecasts and assumptions are discussed in other sections of the 2025 IRP Report and by different witnesses, as shown in Table 1 below.

Table 1: Summary of 2025 IRP Sections Discussing Assumptions and Forecasts and Their Respective Witnesses

Topic	IRP Section	Sponsoring LUMA Witness
Base Load Forecast	Section 3	Joseline Estrada Rivera
High and Low Load and Load Modifier Forecasts	Section 3	Michael Mount
Existing Resources	Section 4	Raphael Gignac
New Resource Options	Section 6	Michael Mount
Fuel & Other General Assumptions and Forecasts	Section 7	Ajit Kulkarni

Q.12 Please describe the fuel price forecasts that LUMA used in the 2025 IRP.

A. The fuel price forecast was developed by LUMA's Technical Consultant, Black & Veatch ("LUMA Technical Consultant"). That forecast includes existing fuels, coal, heavy fuel oil, diesel, and Liquefied Natural Gas ("LNG") as well as forecasts of new fuel options that were included in the modeling, like biodiesel and renewable diesel. For the existing fuels, the LUMA Technical Consultant reviewed historic prices for fuel delivered to Puerto Rico, mainland fuel pricing, and transportation costs. LUMA also held conversations with New Fortress Energy, the company currently delivering LNG to the Island, to better understand their current LNG fuel delivery capabilities, near-term plans, and how they would address delivery to new locations across the island that are remote to their point of delivery in San Juan. The LUMA Technical Consultant researched current production locations and pricing, and spoke with potential suppliers of the two liquid biofuels considered in the 2025 IRP: biodiesel and renewable diesel. Based on this analysis, the LUMA Technical Consultant developed a base, or most likely forecast, for each of the fuels assessed by LUMA in the 2025 IRP. A high-cost version of the LNG fuel was also developed.

Q.13 Please describe how LUMA estimated annual emission pricing for the 2025 IRP.

A. Neither Puerto Rico's nor the U.S.'s federal regulatory agencies have established regulations for greenhouse gas ("GHG") emissions or the pricing and markets of associated credits or offsets. The absence of emission regulations that tax emissions or cap-and-trade-type regulations that support a structured market-based pricing mechanism means that emissions from PREPA operations and the broader range of GHG emitters are not currently being monetized in a structured, generally accepted manner. Consequently, LUMA has not developed or included any pricing related to emissions in its 2025 IRP analysis.

Q.14 Please describe how LUMA addressed the Renewable Portfolio Standard ("RPS") requirement to achieve a 100% renewable electric supply by 2050, particularly in light of the recent enactment of the 2025 Act 1.

A. Before Act 1, it is my understanding that regulations required the Island to meet interim targets on the way to the 100% renewable target by 2050. 2025 Act 1 eliminated those interim targets but maintained the 2050 RPS goal. LUMA believes it is impractical to assume that Puerto Rico can achieve a 100% renewable electric supply by 2050 without starting a transition to renewable resources well before 2050. The time required to solicit, contract, design, study, permit, build, and interconnect renewable resources will take years.

To allow sufficient time to build and begin operating the necessary renewable resources by 2050, LUMA and the Energy Bureau's Consultant discussed and agreed on a 15-year ramp-up of RPS, starting in 2035 and rising with constant annual increases to 100% by 2050 ("Base Case RPS"). Two alternative RPS ramp rate assumptions were also selected for modeling and included in the supplemental scenarios: (1) starting in 2025 and rising with constant annual increases to 100% by 2050 ("Alternate RPS 1"); and (2) starting in 2044 and rising with constant annual increases to 100% by 2050 ("Alternate RPS 2"). The three RPS alternatives were included on May 13th Order and are shown in Table 2.

Table 2: Three RPS Alternatives

Year	Base Case RPS Constraint	Alternate RPS 1 Constraint	Alternate RPS 2 Constraint
2025	-	4.0%	-
2026	-	8.0%	-
2027	-	12.0%	-
2028	-	16.0%	-
2029	-	20.0%	-
2030	-	24.0%	-
2031	-	28.0%	-
2032	-	32.0%	-
2033	-	36.0%	-
2034	-	40.0%	-
2035	6.7%	44.0%	-
2036	13.3%	48.0%	-
2037	20.0%	52.0%	-
2038	26.7%	56.0%	-
2039	33.3%	60.0%	-
2040	40.0%	64.0%	-
2041	46.7%	68.0%	-
2042	53.3%	72.0%	-
2043	60.0%	76.0%	-
2044	66.7%	80.0%	16.7%
2045	73.3%	84.0%	33.3%
2046	80.0%	88.0%	50.0%
2047	86.7%	92.0%	66.7%
2048	93.3%	96.0%	83.3%
2049	100.0%	100.0%	100.0%
2050	100.0%	100.0%	100.0%

Q.15 Please describe what LUMA assumed for the weighted average cost of capital in the 2025 IRP for the PVRR calculations.

A. LUMA's base case value for PREPA's weighted average cost of capital ("WACC") in the 2025 IRP is 8%. However, since PREPA is in a financial situation that makes it difficult to forecast a long-term cost of capital with any confidence, LUMA chose to assess what it believes to be a plausible range of potential WACC for the 2025 IRP. LUMA tested the results of the PVRR using WACC values of 4%, 5%, 6%, 7%, and 8%. The results using different WACC values had no impact on the relative ranking of PVRR values for the different Resource Plans or for the selection of the Preferred Resource Portfolio ("PRP").

Q.16 Please describe what LUMA assumed for the annual debt limitation available to PREPA in the 2025 IRP.

A. LUMA did not include an annual debt limitation as a constraint to the analysis of resources. There was insufficient data available on the resolution of the existing PREPA debt and PREPA's future ability to issue new debt for LUMA to develop a justifiable assumption for a debt limitation.

Q.17 Please describe the assumptions and forecasts that LUMA judged would have a significant impact on the results of the 2025 IRP.

A. Four factors that LUMA judged to have the likelihood of having a significant impact on the 2025 IRP results include:

1. Load Forecast;
2. Forecast of costs of new resources;
3. Forecast of current fuels in use and the forecast of biodiesel fuel; and
4. Assumption of the renewable energy contribution milestones that will be required before 2050.

Q.18 Did LUMA develop a range of possible scenarios based on the factors identified above?

A. Yes. Using information gathered from stakeholder meetings and consultations with the Energy Bureau's consultant, LUMA assessed a range of scenarios for those four factors as well as other factors. May 13^{th} Order delineated a list of 12 primary scenarios that represent the most important combination of future characteristics to assess in the 2025 IRP, and five supplemental scenarios that provide useful but lower- priority analysis. The Energy Bureau ordered testimony and analysis of the 12 scenarios to be produced on October 17^{th} and information regarding the five supplemental scenarios to be produced after the PSS®E filing on November 21, 2025.

LUMA included in the scenario characteristics load forecasts for a high case, base case (or most likely), and low case based on macroeconomic indicator data for the 4^{th} percentile, 50^{th} percentile, and 96^{th} percentile, respectively. To address the impact of the cost variations on new resources and fuel costs, eight of the 12 primary scenarios include variations of capital and fuel costs. To address the renewable energy contributions that will be required, LUMA used the Base Case RPS Constraint, discussed above, for all 12 of the primary scenarios. The two additional RPS milestone assumptions are included in the supplemental scenarios, as described above. The single RPS assumption included in the 12 primary scenarios is viewed as a baseline or reference assumption that falls in the middle of the three RPS alternatives.

Q.19 Were there other assumptions or forecasts that LUMA judged could impact the results of the 2025 IRP?

A. LUMA considers the following five assumptions and forecasts to have a significant impact on the ability to implement the PRP.

1. Ability for the Energy Bureau to negotiate a contract that will extend the operation

of the AES coal plant through 2032;

2. Ability for the Energy Bureau to negotiate a contract with EcoEléctrica that will extend the operation of that plant beyond the current 2032 end date;
3. Forecast of reliability and efficiency of the existing generation resources and their ability to continue operating;
4. Developers' ability to obtain the necessary land, permits, and financing, and to design, construct, and operate the planned new resources and supply them with fuel as needed; and
5. LUMA's ability to obtain the necessary approvals and funding to construct and operate transmission and distribution facilities; network upgrades, and the generator-specific grid upgrades required to enable the interconnection of new resources.

Q.20 Did LUMA include a range of scenarios for these five additional issues?

A. Due to a limitation of time allowed to model alternative scenarios for the 2025 IRP after the approval of the 2025 Act 1, LUMA did not include any variations of these issues in the 17 Scenarios (12 primary scenarios plus the five supplemental scenarios) included in the 2025 IRP.

IV. RESOURCE PLAN DEVELOPMENT

Q.21 What is your understanding of the requirements for the Resource Plan Development section of the 2025 IRP?

A. With respect to the Resource Plan Development section of the 2025 IRP, LUMA followed the requirements set forth in Section 2.03(H) of Regulation 9021. This section requires the 2025 IRP to identify in detail the mechanisms used by LUMA in developing its Resource Plans and an analysis of its Resource Plan development.

Q.22 What methodology did LUMA use to develop the resource plan alternatives?

A. LUMA describes the process used to develop candidate resource plans in Section 8 of the 2025 IRP. In summary, LUMA completed the 2025 IRP using the following major steps:

1. Worked with the stakeholders who participated in the Solutions for the Energy Transformation of Puerto Rico ("SETPR") meetings to establish the scenario characteristics and performance indicators that should form the basis of the 2025 IRP. The scenario characteristics defined during the SETPR meetings contributed to the development of the 12 primary scenarios. The performance indicators that resulted from the SETPR meetings were then used to define the scorecard used by LUMA to compare and assess candidate resource plans.
2. Developed the needed assumptions and forecasts to perform the resource modeling of candidate technologies. This step included LUMA deciding to divide Puerto Rico into eight distinct Transmission Planning Areas ("TPAs") for the 2025 IRP modeling. Each of the eight TPAs comprised geographically contiguous groups of municipalities. Modeling the island as eight TPAs enabled LUMA to incorporate unique characteristics of each TPA relative to its customer load and generation capabilities, wind and solar resource potential, existing transmission transfer capability, and current LNG fuel import capabilities.
3. Refined the scenario development considerations such that seven of the 12 primary scenarios were used to define seven core Resource Plans for which an optimized Resource Plan was developed for each under the conditions of one of the seven

core scenarios. The remaining five scenarios were defined and used to assess the flexibility of the core Resource Plans to perform under a range of future load and cost conditions. LUMA terms this analysis a Flexibility Analysis, and the resulting Resource Plans are called Flex Resource Plans. LUMA considered assessing candidate Resource Plans under a range of future conditions to be a critical element in developing a recommendation for a PRP.

4. Identified a short list of Resource Plans based on the results of the modeling of the 12 primary scenarios.
5. Performed additional sensitivity modeling on two shortlisted scenarios.
6. Incorporated the knowledge gained from the prior resource plan modeling and analysis to define and model a new Hybrid Resource Plan.
7. Based on the assessment of candidate Resource Plans as measured by their respective performance indicators in the scorecard, with the PVRR being the primary performance indicator, LUMA selected the Resource Plan Hybrid A as the PRP.

Q.23 Please describe the capacity expansion methodology LUMA used to develop the Resource Plans.

A. LUMA used the PLEXOS®, energy modeling software created by Energy Exemplar, as a tool to develop its candidate Resource Plans. At a high level, PLEXOS® simulates the operation of the Island's electric system under different forecasted conditions, defined by the characteristics of the scenarios that LUMA inputs into the model. For example, the model takes characteristics of existing resources (e.g., dispatchability, fuel type, size, rate at which it can increase output, forced outage rate and planned outage rate (i.e., the maintenance rate) and characteristics of potential new resources and determines an optimized mix of resources to meet forecasted energy and capacity needs at the lowest cost, considering required constraints (e.g., RPS compliance). The detailed PLEXOS® results allow for the calculation of the present value revenue requirements ("PVRR") for each plan, which then identifies the total costs of that plan over the planning period, which then allows for a cost comparison.

PLEXOS® contains multiple modular components that divide the modeling steps into modules. The results of each module are used as inputs to the next module. A brief description of the four modules of the PLEXOS® model is provided below:

1. Long Term Simulation module ("LT"): Performs a capacity expansion simulation over the long- term horizon. It evaluates the system and its needs over the entire horizon and attempts to minimize all types of costs (capital, fixed, variable, and fuel) while meeting system load, reliability requirements, and constraints, ultimately providing a plan of resource additions and retirements.
2. Projected Assessment of System Adequacy module ("PASA"): Develops schedules for planned outages while simultaneously minimizing the impact on system reliability. It calculates, simplified, high-level estimates of reliability statistics such as Loss of Load Expectation ("LOLE").
3. Middle Term Simulation module ("MT"): The MT horizon is usually set for one year. It performs an initial pass before the most granular module, the ST, to provide a starting point for the solution of battery optimization (e.g., charging and discharging schedules) and coordination of annual limits, such as annual energy limits on generators.

4. Short Term Simulation module (“ST”): The ST is the most granular of the PLEXOS® modules and is commonly known as a production cost model. For the LUMA 2025 IRP, a chronological hourly simulation was used to solve the unit commitment and dispatch problem, simulating actual system commitment and dispatch by LUMA operations.

Q.24 Did you find the PLEXOS® capacity expansion model results acceptable, and did you rely upon the results to determine the PRP?

A. Early in the 2025 IRP development process (i.e., in early 2024), LUMA found that the resource plans produced by the PLEXOS® LT module, using the standard modeling process, did not produce resource plans with acceptable reliability. That is, LUMA found the results of the LT module consistently produced resource plans with unacceptably high expected unserved energy (“EUE”) (i.e., EUE that exceeded the target values for the corresponding years). LUMA worked with its Technical Consultant and Energy Exemplar to investigate the root cause and solution to the unacceptable EUE results being obtained.

LUMA found that the LT module uses a derate method as a simplified approach to estimate the long-term impacts on unit availability due to planned and forced outages. For example, a 100 MW generator with a 10% forced outage rate and a planned outage rate that equates to 5% of the hours in a year, will be treated in the LT module as a perfect 85 MW generator with no planned or forced outage hours (i.e., 100 MW minus a 15% derate attributable to the combined effects of planned and forced outages). This simplified approach proved problematic for LUMA, given the reality of the characteristics of the existing generating resources (i.e., many units experiencing unusually high forced outage rates).

The planned and forced outages calculated in the ST module are based on a more complex and realistic analysis performed in the PASA module. The PASA module schedules a specific time to perform planned maintenance, considering the planned maintenance needs of other units. The PASA module then uses a stochastic simulation to schedule a repeatable pattern of forced outage events. These schedules of planned and forced outages are then fed into the ST module that performs the hourly unit commitment and economic dispatch. Due to the different methods of addressing planned and forced outages, the generation addition and retirement plan provided by the LT module proved insufficient to deliver acceptable EUE results in the ST module in the typical single pass through the PLEXOS® modules.

The LT module's simplified method of deducting the planned and forced outage rates from the unit capacity to model the planned and forced outages did not adequately account for the actual hourly impact of outages, which can remove 100% of the capacity of a unit during an outage, not just the fraction of the capacity equal to the annual forced outage rate. In addition, the very high forced outage rates of the existing PREPA fleet of thermal generators were thought by LUMA's Technical Consultant and Energy Exemplar to be exacerbating the problem. The Puerto Rico thermal fleet of generators is projected in the 2025 IRP to average a 25% forced outage rate (weighted by capacity), which is over three times higher than the NERC 7.8% national average in 2023 (from the NERC State of Reliability report, June 2024).

In addition, LUMA and its Technical Consultant found that the actual outage events, for both planned and forced outages, would shift in time from one modeling run to the next. This underlying shift in timing of outages made it difficult to isolate whether changes in results were due to differences in the scenario characteristics or due to a shifting outage schedule. LUMA and its Technical Consultant determined that it needed to develop a modeling approach that would result in acceptable EUE results and eliminate variations in results that were due to differences in shifting outage schedules.

Q.25 How did LUMA address the model issues to define Resource Plans with acceptable EUE results?

A. To address these issues, a unique iterative feedback methodology was collaboratively developed and agreed to by LUMA, Energy Exemplar, and LUMA's Technical Consultant. The method involves an iterative feedback process that takes resulting post-2029, annual EUE values from a complete modeling run (i.e., through the full LT, PASA, MT, ST modules) and feeds them into subsequent modeling runs as fixed load adders at the specific hour and TPA location of the EUE events. These fixed- load adders artificially increased the load for purposes of expansion planning only, as the initial iteration did not provide sufficient capacity to avoid the EUE event. The feedback process serves to incentivize the capacity expansion planning module (i.e., the LT module) to build sufficient capacity to reduce EUE in the specific hours and locations of EUE events in subsequent iterations.

To reduce the potential impact of variation in outages between runs, the iterative method starts with an initial PLEXOS® run, LT through ST, used to determine the hourly outage schedule for individual generators, reflecting planned and forced outages. As the purpose of this foundational run is strictly to develop the outage schedule for both planned and forced outages, for use in all subsequent simulations, only the schedule of outages is used from this run. The resulting outage schedule is used as an input in all subsequent runs, with corresponding adjustments to the outage modeling across the modules and all runs. By including the specific outage schedule in subsequent runs, the problems associated with the LT module's derate approximation for outages were resolved. Further, by holding the outages constant, there should be no variations in results, for example, across scenarios, due to changes in generator outages.

Q.26 You noted that PLEXOS® develops Resource Plans under different forecasted conditions. Please explain what you mean by that.

A. LUMA calls the different forecasted conditions it uses to evaluate resource plan scenarios. Each scenario varies one or more key assumptions to identify different Resource Plans defined as the least cost mix of resources for the defined conditions. For this filing, LUMA modeled 12 primary scenarios that vary load, cost, and other assumptions described in detail below. Following the results of those 12 scenario analyses, LUMA also performed separate modeling runs to assess the performance of two short-listed Resource Plans emanating from the 12 primary scenarios.

Q.27 What did the key assumptions for the scenarios include?

A. The key assumptions included:

1. **Load** –High, Base, and Low versions of load forecasts were incorporated in the modeling. A single version of the forecasts for a number of load modifiers was also incorporated. The detailed discussion of the load and load modifier assumptions is described in the testimony of LUMA witnesses Joseline Rivera and Michael

Mount.

2. **Solar and Storage Capital Expenditures ("CapEx") –**The modeling included utility-scale solar photovoltaic ("UPV") and utility-scale battery energy storage system ("UBESS") capital expenditures under base assumptions and under a lower-cost forecast. Preliminary modeling results indicated that UPV was not being built with the base level cost forecasts, so both LUMA and the Energy Bureau's Consultant determined there would be no benefit to including a higher UPV-cost variable in the 2025 IRP modeling. The detailed discussion of the UPV and UBESS cost assumptions is described in the testimony of LUMA witness Michael Mount.
3. **Gas Plant CapEx and Biodiesel Conversion Costs –**The modeling also included gas plant and biodiesel conversion costs under both a base cost and a high-cost assumption. LUMA chose to add this range of biodiesel costs in the modeling after preliminary analyses showed that the availability and benefit of the resource in the model vary based on its expected cost. The detailed discussion of the gas plant and biodiesel conversion costs assumptions is described in the testimony of LUMA witness Michael Mount.
4. **Level of Distributed BESS ("DBESS") Control –** LUMA also considered variations on customer programs for controlled DBESS. LUMA's existing Customer Battery Energy Sharing ("CBES") program, intended for use during system emergencies, has shown that LUMA customers are interested in programs that provide incentives in exchange for using customer-owned batteries to benefit the system. Based on this recent experience, LUMA and the Energy Bureau's

Consultant developed two estimates for new DBESS Control programs that would enable the dispatch of customer batteries for normal operations, not just during emergency conditions. The first estimate is a base level forecast, which was used in all but one scenario, and the second is a high-controlled DBESS forecast, which will be included in the supplemental scenarios to be filed later in this process. The detailed discussion of the controlled DBESS program assumptions is described in the testimony of LUMA witness Michael Mount.

5. **Natural Gas Fuel Cost** - Fuel costs represent a significant portion of a utility's overall costs, and natural gas represents a significant component of the fuel powering existing and potential new resources. As such, LUMA, with the assistance of its Technical Consultant, developed base and high natural gas fuel cost assumptions for two existing LNG import locations in Puerto Rico, as well as the costs of trucking LNG from one of the two imported locations.
6. **Biodiesel Availability –** The results of preliminary modeling filed with the Energy Bureau on November 25, 2024, in LUMA's Motion to Submit First Interim 2025 IRP Filing, indicated that biodiesel may be a viable renewable fuel option for Puerto Rico's future energy supply. As such, LUMA and the Energy Bureau's Consultant determined that biodiesel should be included as a potential fuel choice, and one Scenario was defined to test the exclusion of biodiesel as a fuel option.
7. **Fixed Decisions –** There are a number of decisions that have been made by the Energy Bureau and through legislation to add and retire generation capacity and to add BESS capacity to Puerto Rico in the near future. LUMA considered these decisions as "Fixed Decisions" and used them as common assumptions across each

of the 12 primary scenarios and 4 of the 5 Supplemental Scenarios. The Fixed Decisions included 4,355 MW of generation additions listed in Table 3 below, and 1,401 MW of retirements lists in Table 4.

Table 3: Fixed Decision Additions

Energy Resource Technology	Total Additions 2025 to 2044 (MW)
Fixed Decision Generation	
PREPA HydroCo	38
Natural Gas Emergency Generators[1]	800
Energiza	478
New Genera Units	244
Solar	200
Tranche 1 Solar	739
Tranche 2 Solar	66
Fixed Decision Batteries	
ASAP Phase 1 BESS	190
ASAP Phase 2 BESS	425
New Genera Units	430
Regulation 4x25 BESS	100
Tranche 1 BESS	535
Tranche 2 BESS	60
Tranche 4 BESS	50
Total Fixed Decision Additions	**4,355**

Table 4: Fixed Decision Retirements

Energy Resource Technology	Total Retirements 2025 to 2044 (MW)
Fixed Decision Retirements	
Coal Units	454
Diesel Peaking Units	147
Natural Gas Emergency Generators	800
Total Fixed Decision Additions	**1,401**

8. **RPS –As noted above, LUMA modeled three alternatives for RPS**

[1] The 800 MW of Emergency Generators are forecasted to be installed in 2025 and 2026 and then removed from the system by 2029 following the commercial operation of the Energiza combined cycle unit. The removal of the Emergency Generators is treated as a retirement in the modeling software.

compliance, consisting of:

i. Base Case RPS - Starting with an RPS of 0% at the beginning of 2035 and ramping to 100% by 2050. This was considered the base case assumption and was included in all 12 primary scenarios.

ii. Alternative RPS 1 - Starting with an RPS of 0% at the beginning of 2025 and ramping to 100% by 2050. This was considered the Alternative RPS 1 - assumption and will be included in a later filing in Supplemental Scenario 16.

iii. Alternative RPS 2 - Starting with an RPS of 0% at the beginning of 2044 and ramping to 100% by 2050. This was considered an Alternative RPS 2 assumption and will be included in a later filing in Supplemental Scenario 17.

Table 5 below identifies the criteria associated with each of the 12 Core scenarios.

Table 5: Twelve Primary Scenarios

Scenario	Scenario Description	Load	PV & UBESS CapEx	Natural Gas Plant CapEx + Bio Conversion Costs[2]	Level of DBESS Control	LNG Fuel Cost	Include Biodiesel	Fixed Decisions	Resulting Resource Plan
1	Base assumptions for all variables	Base	Base	Base	Base	Base	Yes	Base	Core Resource Plan A
2	High load conditions with base assumptions for other variables	High	Base	Base	Base	Base	Yes	Base	Core Resource Plan B
3	Base load with high natural gas plant capital costs	Base	Base	High	Base	Base	Yes	Base	Core Resource Plan C

[2] The costs of Biodiesel conversion were not included in the characteristic of the 12 scenarios in the May 13, 2025, Energy Bureau order. LUMA chose to add the cost of biodiesel conversion to this characteristic since LUMA judged it be consistent with the expressed intent of the Energy Bureau's Consultant's suggestion for this characteristic.

Scenario	Scenario Description	Load	PV & UBESS CapEx	Natural Gas Plant CapEx + Bio Conversion Costs	Level of DBESS Control	LNG Fuel Cost	Include Biodiesel	Fixed Decisions	Resulting Resource Plan
4	Base load with low renewable energy capital costs and high fossil capital costs	Base	Low	High	Base	Base	Yes	Base	Core Resource Plan D
5	Base load with high natural gas fuel costs	Base	Base	Base	Base	High	Yes	Base	Core Resource Plan E
6	Base load with high natural gas fuel costs and high natural gas plant capital costs	Base	Base	High	Base	High	Yes	Base	Core Resource Plan F
7	Flex Run for Resource Plan B run under Scenario 1 conditions	Base	Base	Base	Base	Base	Yes	Base	Flex Resource Plan 1.B
8	Flex Run Resource Plan A run under Scenario 2 conditions	High	Base	Base	Base	Base	Yes	Base	Flex Resource Plan 2.A
9	Flex Run for Resource Plan A run under Low Load conditions	Low	Base	Base	Base	Base	Yes	Base	Flex Resource Plan Low.A
10	Flex Run of Resource Plan A run under Stress conditions	High	Base	High	Base	Base	Yes	Base	Resource Plan Stress.A
11	Flex Run of Resource Plan B run under Stress conditions	High	Base	High	Base	Base	Yes	Base	Resource Plan Stress.B
12	Base assumptions for all variables but biodiesel is unavailable	Base	Base	Base	Base	Base	No	Base	Core Resource Plan H

Q.28 What mechanisms and criteria did LUMA apply in selecting its Preferred Resource Plan from the set of alternatives?

A. As a first step, LUMA used PLEXOS® to develop the following 12 Resource Plans based on the characteristics described by the 12 primary scenarios:

1. Core Resource Plan A based on the optimized results for Scenario 1
2. Core Resource Plan B based on the optimized results for Scenario 2
3. Core Resource Plans C based on the optimized results for Scenario 3
4. Core Resource Plan D based on the optimized results for Scenario 4
5. Core Resource Plan E based on the optimized results for Scenario 5

6. Core Resource Plan F based on the optimized results for Scenario 6
7. Flex Resource Plan 1.B based on a Flexibility Run of Resource Plan B under Scenario 1, base load, and most likely conditions (referred to as Scenario 7)
8. Flex Resource Plan 2.A based on a Flexibility Run of Resource Plan A under Scenario 2, high load conditions (referred to as Scenario 8)
9. Flex Resource Plan Low.A based on a Flexibility Run of Resource Plan A under low load conditions (referred to as Scenario 9)
10. Flex Resource Plan Stress.A based on a Flexibility Run of Resource Plan A under Stress conditions of both high load and high cost (referred to as Scenario 10)
11. Flex Resource Plan Stress.B is based on a Flexibility Run of Resource Plan B run under Stress conditions of both high load and high cost (referred to as Scenario 11)
12. Core Resource Plan H based on the optimized results for Scenario 12

Once the core Resource Plans were developed, with acceptable EUE, RPS, and other reliability targets, the flexibility analysis focused on ascertaining how Resource Plans A, B, and H performed under varying conditions (e.g., different load forecasts, different cost assumptions). Specifically, Resource Plans A and B were assessed under different scenarios, including those that varied load and cost assumptions. Resource Plans A and H were then further assessed using additional sensitivity analysis that changed the ASAP Phase 2 battery additions from fixed to optional additions. The results of Resource Plans C, D, E, and F were developed based upon scenarios that used different capital and fuel costs assumptions than Scenario 1, but were all still modeled under base load conditions. Resource Plans C, D, E and F proved to have higher PVRR costs than Resource Plan A under the same base load conditions, as such, they were not tested under different load and cost assumptions utilized in the Flexibility Analysis since they would have been expected to continue to be higher cost alternatives that Resource Plan A for each Scenarios tested in the Flexibility Analysis. Once the Resource Plans were created to satisfy the RPS, EUE, and other reliability targets, the Resource Plans were assessed by comparing their resulting 20-year PVRRs as well as the other performance indicators in the Scorecard.

Q.29 Which key differences distinguish the Preferred Resource Plan from other resource plan alternatives?

A. The Preferred Resource Plan ("PRP"), also referred to as Resource Plan Hybrid A (or Hybrid A), is based on modifications to Resource Plan A. Hybrid A relies on natural gas-fueled thermal generation in the early years of the study. Once the annual RPS requirements start in 2035, biodiesel is added in increasing amounts over time by converting existing generation to utilize a blend of biodiesel and diesel and adding new generation, which is also fueled by a blend of biodiesel and diesel. The percentage of biodiesel in the fuel blend increases over time as the RPS increases toward the ultimate target of 100% by 2050. Beyond the solar generation included in the Fixed Decisions, no new solar or wind generation is added in the PRP. Resource Plan B is similar to Hybrid A but includes more generation as it is derived from a high load scenario. Resource Plan H was developed under the assumption that biodiesel is not an option, which results in onshore wind (i.e., land-based wind), offshore wind, and solar being added, in part to satisfy the RPS. Resource Plan H also includes LNG- fueled thermal generation additions through the late 2030's, even though there would be no plan for its regular use after 2050, when Puerto Rico's target of 100% RPS is attained.

The results of modeling the 12 primary scenarios showed Resource Plan A and H to be the two lowest cost scenarios under base load conditions and be very close in cost, as measured by their PVRR. As a reminder, Resource Plan A incorporated all the base or most likely assumptions; Resource Plan H used all the same assumptions except that biodiesel was not included as a fuel option. LUMA used a multi-pronged approach to further analyze and compare these two Resource Plans. In the 12 primary scenarios, the accelerated storage addition program ("ASAP") Phase 2 BESS projects had been included as a Fixed Decision. More recent information made available to LUMA indicated that ASAP Phase 2 BESS could be considered as optional, rather than fixed, as the projects are not as advanced as previously anticipated. As such, LUMA chose to perform a sensitivity run for Resource Plans A and H by changing the ASAP Phase 2 BESS projects to optional additions instead of fixed additions. In the results of both A and H, the ASAP Phase 2 battery projects were changed from fixed decisions with a planned installation of 2026, to installation dates and capacity based on need. In addition, LUMA chose to incorporate in this additional modeling a small correction to the battery efficiencies, which had been identified based on review of the modeling results. The combined changes delayed the installations of the ASAP Phase 2 batteries, which resulted in a lower PVRR for both Resource Plans A and H. However, the resulting PVRR savings for the Resource Plan A with the ASAP Phase 2 batteries as optional additions and the battery efficiency correction was greater for Resource Plan A than for H with the same changes, increasing the PVRR gap between the two Resource Plans, in favor of Resource Plan A so that Resource Plan A provided the lower cost alternative and the least cost option of all Resource Plans.

Building upon the results of the prior modeling, LUMA chose to create a new Resource Plan Hybrid A, with the assumption that the ASAP, Phase 2 Battery additions would be optional decisions, and corrected the battery efficiency, and LUMA selected Resource Plan Hybrid A as the PRP. Since the PRP relies on the transition of generators from natural gas to biodiesel, it offers the flexibility of being able to adjust the timing and pace of transition to renewable fuels as desired. The PRP adds the largest capacity new energy resources to either San Juan or Costa Sur, where there is existing fuel delivery infrastructure and existing transmission interconnections to the legacy generators (i.e., brownfield sites), which LUMA believes provides an efficient use of existing assets and infrastructure.

V. CAVEATS AND LIMITATIONS

Q.30 What is your understanding of the requirements for the Caveats and Limitations section of the 2025 IRP?

A. With respect to the Caveats and Limitations section of the 2025 IRP, LUMA followed the requirements set forth in Section 2.03(I) of Regulation 9021. This section requires the 2025 IRP to include a list of key caveats and limitations of LUMA's analysis for its PRP.

Q.31 Did LUMA provide a list of key caveats and limitations associated with its 2025 IRP analysis?

A. Yes. As described in Section 9 of the report, LUMA has identified a few caveats and limitations in its modeling analyses.

The first caveat relates to the physical placement of LNG-fueled resources. For modeling purposes, LUMA made assumptions regarding the LNG infrastructure in

Puerto Rico, which had implications for the location of potential new combined cycle and simple cycle generation.

The existing generation fleet includes natural gas-fired generation at San Juan and Costa Sur, which is served by LNG import infrastructure. Additional gas-fired generation is located at Palo Seco. Fuel delivery for Palo Seco is handled by trucking LNG from San Juan and storing it onsite at Palo Seco until it is needed. For potential new generation resources, LUMA considered various fuel delivery options. For the new generation located near the existing generation at San Juan and Costa Sur (i.e., in the same TPAs), the existing LNG infrastructure was assumed to be capable of supplying the requisite fuel quantities as is or with limited investment. However, if new combined cycle generation was located elsewhere, the fuel would likely require expanding the existing gas delivery infrastructure (i.e., new pipelines to existing or new ports) or trucking the fuel to an onsite storage facility (like Palo Seco). Given the expected quantity of fuel needed for a combined cycle facility (which are both larger and typically operated at higher capacity factors), and given the uncertainty surrounding the ability to gain regulatory approvals for the costs and construction of new gas pipeline, port and storage facilities, LUMA limited the location of new combined cycle power plants to the San Juan and Costa Sur TPAs that possess existing LNG import facilities.

Peaking, or simple cycle, plants generally operate at lower capacity factors and require lower quantities of fuel per year than combined cycle plants. Therefore, delivering fuel to simple cycle plants by truck is expected to require fewer truck deliveries per year than a combined cycle generator. Hence, in this 2025 IRP, simple cycle plants are allowed to be built in any location (TPA). For those who are not in San Juan or Costa Sur, an additional cost is included in the model to reflect the cost of fuel delivery from San Juan to the generator.

The second caveat relates to the number of hydroelectric generation facilities included in the model. In June 2021, an independent consultant completed a report assessing PREPA's generation facilities entitled "Feasibility Study for Improvements to Hydro Electric System." Based on that report, PREPA HydroCo developed a plan to refurbish some of its hydroelectric facilities, which was approved by the Energy Bureau in Docket NEPR-MI-2021-0002.

The existing hydroelectric generation capacity assumed in the resource modeling model was 4 MW. The refurbishment plan identified the potential for 90 to 120 MW of hydroelectric capacity. To date, the refurbishments have not been completed, and LUMA believes the timing and size of potential refurbishments are uncertain. LUMA conservatively assumed that 38 MW of additional hydroelectric generation would result from the refurbishments, for a total of 42 MW of hydroelectric generation available from 2026 onwards. Given this limit in the model, and the fact that the refurbishments are not yet complete, the actual amount of hydroelectric generation may be more or less than that included in the model.

In August of 2025, as LUMA was reviewing the results of the 12 primary scenarios, an error in the round-trip efficiencies of all the BESS, utility-scale BESS, and DBESS was discovered. The distributed-scale BESS had been set to 100%, and the utility-scale BESS to 90% round-trip efficiency. The intention had been to use an 85% round-trip efficiency assumption for all BESS, consistent with NREL's 2024

Annual Technology Baseline assessment. As there was insufficient time to redo all the analysis with this correction, LUMA performed some tests to measure the impact of this error. The efficiencies were changed to 85% for Scenario 1 Core Resource Plan A (most likely conditions) and for Scenario 12 Resource Plan H (no biodiesel) and simulated again. The difference between the PVRR of the two Resource Plans, A and H, with the battery efficiency correction compared to the difference for both resource plans without the correction was only $1.9M, or 0.005% of the PVRR. As a result, the correction was judged to be immaterial to the PVRR results and the relative ranking of the resource plan performance. Where the correction is included, it is specified as included in the report, for example, in the PRP.

A third caveat relates to the ASAP Phase 2 BESS projects. As noted previously, the modeling for the 12 primary scenarios originally included the ASAP Phase 2 BESS projects as Fixed Decisions with commercial operation dates ("CODs") by the end of 2026. Given that those projects are not as far along as had been previously anticipated, LUMA chose to perform some sensitivities where all of the ASAP Phase 2 BESS projects were included as options available for PLEXOS® to select, instead of fixed decisions. Specifically, LUMA allowed the model to change the CODs or reject the projects entirely, on an individual project-by-project basis. Resource Plan A and Resource Plan H were simulated with this change. The results showed that all of the ASAP Phase 2 BESS projects were ultimately selected by PLEXOS®, but individual projects were typically delayed by five or more years from the original COD. It was found that including the ASAP Phase 2 BESS projects as optional reduces the PVRR for both Resource Plan A and H in comparison to including those projects as fixed. The report specifies which results have ASAP Phase 2 BESS as optional (i.e., for the PRP).

Lastly, LUMA's caveats and limitations include the correction of a small error related to Controlled DBESS. As noted in the discussion of the Assumptions and Forecasts section above, LUMA recently became aware of a small error in the capacity of Controlled DBESS affecting the early years, 2025 to 2027. As the incorrect inputs are in the first three years of the study period, during which time PLEXOS® does not have the flexibility to make changes (e.g., add new generation or transmission, retire generation), the numbers are small relative to the size of the system. The twelve Primary Scenarios were checked to ensure they all had the same issue, and steps were taken to ensure the issue persists (i.e., consistency). This ensures that comparisons between the twelve Scenarios are made correctly. In other words, the relative differences between Scenarios should not be impacted by this issue. As noted above, LUMA corrected this issue in its PRP, Resource Plan Hybrid A.

VI. ACTION PLAN

Q.32 What is your understanding of the requirements for the Action Plan section of the 2025 IRP?

A. Section 2.03(K) of Regulation 9021 addresses the Action Plan for the 2025 IRP. This section requires the 2025 IRP to include an Action Plan specifying implementation actions that need to be performed during the first five years of the Planning Period as a result of the PRP.

Q.33 Please provide a brief overview of LUMA's proposed Action Plan.

A. The Action Plan covers the years 2025 through 2030 and includes recommendations divided into broad categories: (1) energy resource additions and retirements; (2) transmission expansion; and (3) detailed recommendations with respect to distributed generation, Fixed Decisions, customer programs, and new gas generation. Details regarding all of the recommendations are available in Section 10 of the 2025 IRP Report.

VII. TRANSMISSION & DISTRIBUTION IMPLICATIONS OF THE PREFERRED RESOURCE PLAN

Q.34 What is your understanding of the requirements for the portion of the Transmission & Distribution (T&D) System Planning section of the 2025 IRP that you are sponsoring?

A. With respect to the T&D System section of the 2025 IRP Report, LUMA followed the requirements set forth in Section 2.03(J)(2)(e) of Regulation 9021. This section requires the 2025 IRP to document the T&D implications of the PRP, including assessing if the PRP requires incremental T&D mitigation or changes.

Q.35 Are there any other legal requirements for LUMA in submitting its documentation of the implications to the T&D system of the PRP?

A. While there are numerous requirements outlined in Regulation 9021 associated with the description and analysis of the T&D system, requirements associated with the Assumptions and Forecasts section of the 2025 IRP Report are particularly pertinent to the subject of this testimony. LUMA followed the requirements set forth in Section 2.03(G) of Regulation 9021, which requires the 2025 IRP to describe the modeling assumptions and inputs incorporated into LUMA's forecasting model, and the requirements in the May 13, 2025, Resolution and Order in this proceeding ("May 13th Order"), which specified certain assumptions.

Q.36 What assumptions and forecasts go into T&D system modeling of the PRP?

A. The primary assumptions and forecasts include load forecasts, resource and cost assumptions related to the resource modeling results that contributed to the selection of the PRP, and planned modifications to the T&D system unrelated to the PRP. Most of these forecasts and assumptions are discussed in other sections of the 2025 IRP Report, as shown in Table 6 below.

Table 6: Summary of 2025 IRP Report Sections Discussing Assumptions and Forecasts and their Respective Witnesses

Topic	2025 IRP Section	Sponsoring LUMA Witness
Base Load Forecast	Section 3	Joseline Estrada Rivera
High and Low Load and Load Modifier Forecasts	Section 3	Michael Mount
Existing Resources	Section 4	Raphael Gignac
New Resource Options	Section 6	Michael Mount
Fuel & Other General Assumptions and Forecasts	Section 7	Ajit Kulkarni
Resource Plan Development	Section 8	Ajit Kulkarni
Transmission & Distribution System	Appendix 1	Daniel Haughton

Q.37 Please provide an overview of the analysis performed by LUMA related to the PRP implications for the T&D System.

A. In this testimony, I focus on LUMA's analysis of PRP implications on the impacts on the transmission system. LUMA witness, Daniel Haughton, addresses LUMA's analysis of PRP implications to the distribution system. The purpose of my analysis was to define system upgrades that may be needed for the transmission system to enable the planned additions and retirements identified in the PRP.

Q.38 Please describe the modeling methods LUMA uses to assess the implications of the PRP on the transmission system.

A. LUMA assessed the implications of the PRP on the transmission system using two different modeling methods: (1) a high-level assessment of the current capability and future needs of the transmission system's ability to transfer power between the eight transmission planning areas (TPAs) using the PLEXOS® resource model; and (2) a more detailed assessment applying the results of the high-level assessment in PSS®E modeling software.

Q.39 Please describe the high-level assessment LUMA performed.

A. As discussed more fully in Sections 7.3.5 and 8.2.3 of the 2025 IRP report, LUMA chose to perform the resource modeling of Puerto Rico, using PLEXOS®, as a zonal model with eight different geographic regions of the island, which LUMA refers to as TPAs. For the resource modeling, each TPA includes the portion of the island's load residing within the TPA, and the generation located within the geographic boundaries of the TPA. The eight TPAs are connected by thirteen different bidirectional links, each of which has characteristics such as capacity and losses, which can differ in one direction as opposed to the other (e.g., different characteristics northbound compared to southbound). LUMA completed preliminary transmission analyses prior to beginning the resource modeling to develop a high-level estimate of the bidirectional transfer capacity of each of the links, based on the underlying grid. LUMA also developed high-level estimates of costs to upgrade each of the thirteen different links connecting the eight TPAs, based on the addition of 230 kV capacity using the existing right of ways between the TPAs. The cost and capacity estimates included a high-level consideration of the existing routes/right of ways (ROWs) and existing 230kV facilities connecting the TPAs, and are high-level planning estimates designed to represent average configurations and associated costs for only building additional 230 kV line capacity. LUMA did not perform detailed project-level studies (i.e., no survey crews were sent in the field to obtain information), but did consider some possible routes, terrain, and the impact to existing facilities (e.g., consideration of the routes, terrain, and towers between Ponce ES and Ponce OE).

To develop resource plans, the resource modeling software monitors the movement of power from energy resources to loads on an hourly basis, including the power transfer between TPAs and across transmission links, to serve loads. The load within a TPA can be served by generation within the TPA or by power transfers across the transmission links from neighboring TPAs. When transmission links become congested and impact the ability to serve the load, the resource model can then choose the most economic choice between the following options:

1. Change the generation commitment and dispatch to be subject to transmission constraints and serve the load;
2. Build generation within the TPA, or in another TPA that is connected by a link with available capacity to the load;
3. Upgrade the transmission links to increase their transfer capacity; or
4. A combination of the options above.

These constraints and options are evaluated at an hourly level, across the 20-plus-year study horizon. Using this simplified representation of the island's transmission capability and power flow, PLEXOS® yields a least cost plan that endeavors to cooptimize energy resources and required transmission upgrades. The output results in a detailed list of resource additions and retirements, hourly loads, system (generation and transmission) unit-specific hourly commitment and dispatch, as well as a list of which transmission links require upgrades to enable the resource plan. While this representation and assessment of the transmission system in the resource modeling software is essential in balancing the economics of resource costs and location versus transmission limitations and costs of upgrades, it was necessarily simplified, from a transmission perspective. This initial analysis of the transmission limitations and needs, using the resource modeling software, provided a simplified assessment of the static transfer capacity between TPAs.

On a transmission network such as Puerto Rico's, power does not flow along a single path, such as the path represented by the transmission links used in the resource modeling software. Physics dictates that power flow under real-world conditions involves multiple paths that may travel through many transmission infrastructure elements that may be geographically and electrically remote from the transmission conductors physically between two TPAs (e.g., parallel flow, loop flow, line impedances, equipment settings). After the PRP was developed, LUMA employed a second methodology to perform a more detailed assessment of transmission impacts.

Q.40 Please provide an overview of the more detailed assessment LUMA performed.

A. LUMA applied the outputs from the high-level assessment to the PSS®E modeling software to perform a steady state assessment of the transmission system for multiple years and multiple load points within each of the years (e.g., snapshots).

Q.41 What does PSS®E modeling software do?

A. PSS®E allows the modeling of the transmission system, which in this study used power flows to check for thermal and voltage violations under base and contingency conditions.

Q.42 Please explain how LUMA conducted the PSS®E modeling analysis.

A. To test the transmission system impacts, LUMA used the high load conditions assumed in Scenario 8 of its resource analysis. LUMA chose to use high load forecast conditions since the high load conditions were judged to be representative of the extreme load conditions used for T&D system planning. For the analysis of the PRP implications, LUMA also studied the transmission system in two separate years: 2026 and 2034, under two load conditions, as these represent likely stress conditions for the transmission system. The first load condition chosen for analysis was the forecasted date and hour of the peak annual solar output for each respective year. This is a distinct condition when, for example, non-solar generation would be backed down to accommodate the solar, and batteries would tend to be charging, which would result in a different set of flows on the grid. The second load condition chosen for analysis was the highest load point for each respective year, which might result in different stress conditions on the transmission grid.

The year 2026 was chosen as an early year in the 2025 IRP study horizon that still needed to enable substantial supply resource additions from the fixed decision projects planned for operation by 2026. The year 2034 was selected since it met both the 10-year transmission planning horizon required by Regulation 9021 and included most of the new utility- scale resource additions identified in the PRP. The analysis utilized the detailed hourly customer loads, generation dispatch, and battery charging and discharging for the four snapshot hours selected (two for 2026 and two for 2034), from the PLEXOS® solution. PSS®E does not perform a chronological simulation, model generation in detail, etc., as PLEXOS® does. The combined use of PLEXOS® and PSS®E provided extensive modeling of the power system (load, transmission, generation).

The PSS®E analysis performed a load flow analysis, driven by physics, that was used to identify thermal and voltage violations for individual transmission infrastructure elements under N-1 and N-1-1,[3] for which mitigation projects were then identified that resolved the violations. Finally, associated cost estimates for the mitigation projects were developed.

LUMA intended for the more detailed transmission analysis resulting from the second method, using PSS®E, to replace the transmission portion of the results from PLEXOS®.

Q.43 Why did LUMA choose to use two different methods to analyze the transmission system?

A. The difference in the time required to complete each of the two methods was the principal reason LUMA chose to employ two different methods. The first method, using the resource modeling software PLEXOS®, enabled the modeling of the transmission impacts of each candidate resource plan simultaneously with modeling the energy resources. This approach evaluates a variety of options in significant detail (hourly for 20+ years with technical characteristics and constraints of load and

[3] "N-1" refers to a hypothetical loss of a single transmission line, generating resource, substation breaker, transformer or busbar and the testing of whether the loss of that element results in consequential load loss. "N-1-1" refers to the loss of a single element followed by the loss of a second element after the system has attempted to stabilize and operators have made adjustments.

generation), which takes days of computer time for a single run. This first method provided a high-level, co-optimized analysis of the energy resources and the transmission system upgrades across the 17 scenarios. The first method is useful to incentivize the resource model software to include the constraints and impacts to the transmission system as part of its definition of energy resource plans. The second method was used to define a refined transmission analysis solely for the PRP, for certain snapshots in time, and provided a more detailed determination of the transmission impact and costs of the PRP.

Q.44 What were the results of the first method employing the resource modeling software?

A. For the PRP, under the high load forecast conditions, the resource modeling software identified the need for transfer capacity upgrades in 2030 and 2033 on the five 230 kV transmission links listed below in Table 7:

Table 7: Transmission Upgrades from Resource Modeling Software

Transmission Link	2030 Addition	2033 Addition
Carolina to San Juan	X	
Mayagüez to Ponce OE	X	
Ponce ES to Caguas	X	
Ponce OE to Arecibo	X	
Bayamón to Arecibo		X

The combined cost of these upgrades was estimated at $312M contribution to the total PVRR of the PRP.

Q.45 What were the results of the second method employing the transmission modeling

software?

A. For the PRP, under the high load forecast conditions, the transmission modeling software identified the need for solutions to address the voltage and thermal violations on the transmission system under N-1 and N-1-1 contingency scenarios that were estimated to cost, in terms of a PVRR, between $599M on the low end to $1.67B on the high end. The lower range costs assume no transmission line structures will need to be rebuilt for the reconducting projects identified in the solutions. The upper range cost estimates assume that the transmission line structures will need to be replaced as part of reconductoring, to their existing condition. These numbers replace the transmission cost numbers from the first method. Hence, the PVRR of the PRP increases from the $34.4B to a range of $34.6B to $35.8B based on the combined PLEXOS® analysis, together with the PSS®E analysis for the transmission implications of the PRP.

VIII. SUPPLEMENTAL SCENARIOS

Q.46 As noted in the Assumptions and Forecast (Section III) and Resource Plan Development (Section IV) sections above, LUMA conducted five supplemental scenarios after it conducted 12 core scenarios. Please describe the five supplemental scenarios LUMA conducted.

A. As specified in the May 13th Order, in the five supplemental scenarios, LUMA examined higher DBESS controls, no new natural gas combined cycle facility at San Juan (Energiza), a marine cable connection to the Dominican Republic to transport power from NGCC generation in the Dominican Republic to Puerto Rico, and different cadences for RPS compliance. Table 8 below summarizes the characteristics of the five supplemental scenarios.

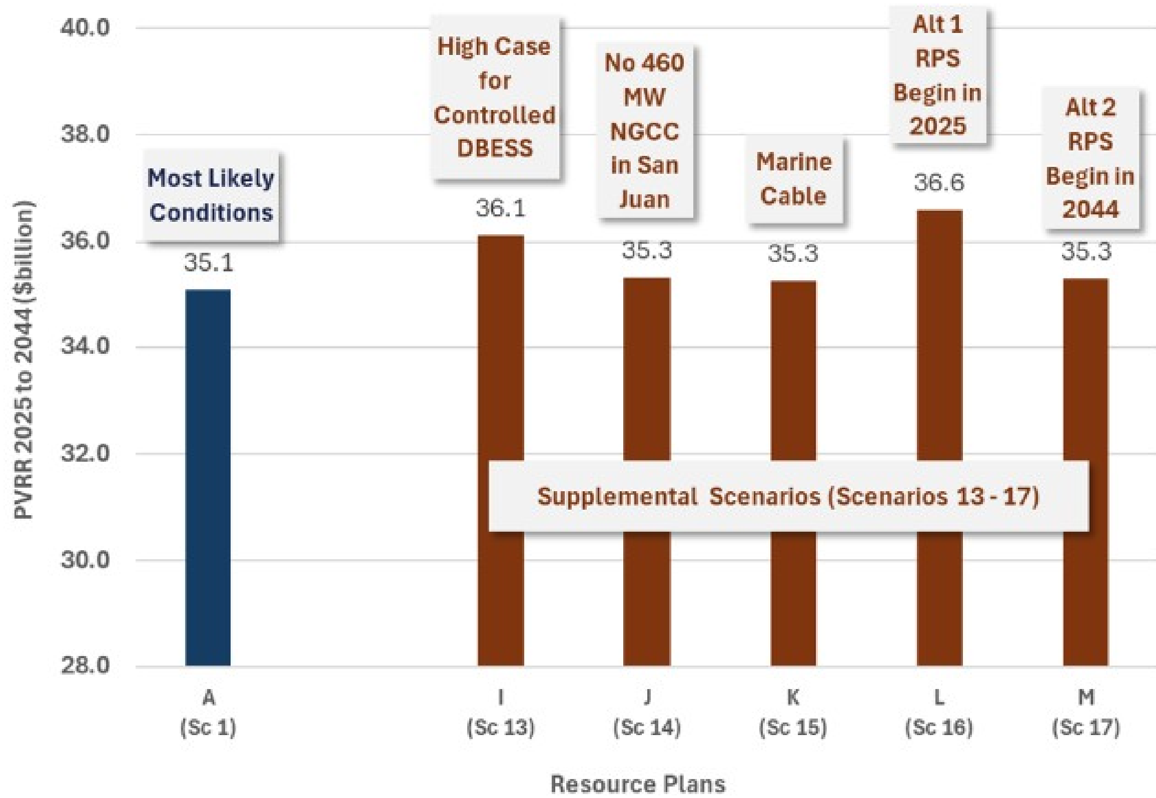
Table 8: Supplemental Scenarios

Scenario	Description	Load	PV & UBESS CapEx	Natural Gas Plant CapEx + Bio Conversion Costs	Level of DBESS Control	LNG Fuel Cost	Include Biodiesel	Fixed Decisions	Resulting Resource Plan
Scenario 13	High DBESS control with base assumptions for other variables	Base	Base	Base	High	Base	Yes	Base	Resource Plan I
Scenario 14	No 460 MW NGCC in San Juan	Base	Base	Base	Base	Base	Yes	No NGCC	Resource Plan J
Scenario 15	Marine Cable to Dominican Republic and 500 MW NGCC	Base	Base	Base	Base	Base	Yes	Base	Resource Plan K
Scenario 16	Alternative RPS 1 – Assumes goal starts in 2025 and then ramps to 100% by 2050.	Base	Base	Base	Base	Base	Yes	Base	Resource Plan L
Scenario 17	Alternative RPS 2 – Initial targets start between 2040 and 2044 and then ramp to 100% by 2050	Base	Base	Base	Base	Base	Yes	Base	Resource Plan M

Q.47 What were the results of these analyses?

A. The PLEXOS® modeling resulted in a new optimized resource plan for each supplemental scenario and PVRR results for each plan. Details regarding Resource Plans I through M are included in Appendix 7 to the 2025 IRP report, and Figure 1 below summarizes the PVRR results of the five Supplemental Scenarios in comparison to Resource Plan A (Scenario 1).

Figure 1: PVRR Results for Five Supplemental Scenarios



The PRP is not included in the graph above since the PRP includes further changes (e.g., changes to fixed decisions) that were not included in the Supplemental Scenarios or Scenario 1

Q.48 What conclusions did LUMA draw from the Supplemental Scenario results?

A. Detailed conclusions regarding each Supplemental Scenario result are included in Appendix 7. In summary, the results of the modeling of the Supplemental Scenarios do not change LUMA's recommended Resource Plan Hybrid A as the PRP for Puerto Rico. The results also demonstrate that a combined cycle facility at San Juan, at a 478 MW capacity, is a lower cost option than replacing that unit with alternative resources of either renewable or fossil generation capacity, or renewable technologies based on current resource technology estimates. In addition, LUMA reaffirms the recommendation in the 2025 IRP that future solicitations should include a diverse mix of technologies, including biodiesel-fueled generation, solar PV, and wind energy technologies.

49. Does this conclude your direct testimony?

A. Yes.

ATTESTATION

Affiant, Ajit Kulkarni, being first duly sworn, states the following:

The prepared Pre-Filed Direct Testimony and the portions of the 2025 IRP filing I am sponsoring constitute my direct testimony in the above-styled case before the Puerto Rico Energy Bureau. I would give the answers set forth in the Direct Testimony if asked the questions that are included in the Pre-Filed Direct Testimony. I further state that the facts and statements provided herein are my direct testimony and, to the best of my knowledge, are true and correct.

Ajit Y. Kulkarni

Ajit Kulkarni

Affidavit No. ___

State of Florida County of Leon

Acknowledged and subscribed before me by Ajit Kulkarni, resident of Davis, California, having appeared by means of online notarization and provided driver's license number MKG B8303079 as means of identification and located in Davis, California this 19th day of December 2025.

In Davis, California, this 19th day of December 2025.

MELISSA K. GARNER
Notary Public - State of Florida
Commission # HH 356421
My Comm. Expires Mar 28, 2027

Completed Via Remote Online Notarization Using 2-way Audio / Video Technology

Notary Public
MELISSA K. GARNER