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

IN RE: PRIORITY PLAN FOR THE STABILIZATION OF THE ELECTRIC GRID	**CASE NO. NEPR-MI-2024-0005** **SUBJECT: LUMA's Submission of Responses to Energy Bureau's Requirement of Information in Compliance with Resolution and Order of December 5, 2024**

LUMA'S MOTION SUBMITTING RESPONSES TO ENERGY BUREAU'S REQUIREMENT OF INFORMATION IN COMPLIANCE WITH RESOLUTION AND ORDER OF DECEMBER 5, 2024

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

COME NOW LUMA Energy, LLC ("ManagementCo"), and **LUMA Energy Servco, LLC** ("ServCo") (jointly referred to as the "Operator" or "LUMA"), through the undersigned counsel, and respectfully state and request the following:

I. Relevant Procedural History and Background

1. On June 13, 2024, the Puerto Rico Energy Bureau of the Public Service Regulatory Board ("Energy Bureau") issued a Resolution and Order ("June 13th Order") initiating this proceeding and ordering LUMA, Genera PR, LLC ("Genera") and the Puerto Rico Electric Power Authority ("PREPA") to each develop and submit to the Energy Bureau an "aggressive preliminary plan of improvements to the electric system" ("Preliminary Plan") with the information specified in the June 13th Order and having a maximum implementation period of two (2) years. *See Id*. at pages 1-2.

2. On July 8, 2024, Genera filed a document titled *Moción en Cumplimiento de Orden y Sometiendo Plan Preliminar de Estabilización del Sistem Eléctrico* ("July 8 Motion"), in which Genera filed its Preliminary Plan.

3. On July 10, 2024, LUMA submitted to the Energy Bureau LUMA's Preliminary Plan in the form of a draft ("Preliminary Plan Draft"). *See Motion in Compliance with Order to Show Cause of July 5, 2024 and Submitting Preliminary Plan Draft Required by the Resolution and Order of June 13, 2024* ("July 10th Motion) on pages 3, 8, 9 and 12.

4. On July 19, 2024, PREPA filed a document titled *Moción en Cumplimiento* ("June 19 Motion"), in which PREPA filed its Preliminary Plan.

5. On July 19, 2024, LUMA filed a *Motion Submitting Updated Preliminary Plan*, in which LUMA submitted a revised Preliminary Plan Draft and requested the Energy Bureau to use it as LUMA's Preliminary Plan to be subject to evaluation in this proceeding, instead of the Preliminary Plan Draft filed on July 10, 2024.

6. On August 9, 2024, the Energy Bureau issued a Resolution and Order indicating that LUMA, Genera and PREPA had submitted their Preliminary Plans and establishing a procedural calendar for the analysis of these Preliminary Plans, including scheduling a Virtual Technical Workshop with LUMA, Genera, PREPA and stakeholders for September 11, 2024 at 10:00am, to, among others, present the Preliminary Plans.

7. On September 11, 2024, the Energy Bureau held the Virtual Technical Workshop.

8. After other procedural events, on December 5, 2024, the Energy Bureau issued a Resolution and Order ("December 5th Order), in which the Energy Bureau determined that additional information was required to conduct a thorough evaluation of the Preliminary Plans submitted and ordered LUMA, Genera, and PREPA to, on or before December 23, 2024, file a response to the pertinent portion of the Requirement of Information ("ROI") set forth in Attachment A of the December 5th Order.

II. Submittal of Responses to ROIs in the December 5th Order

9. In compliance with the December 5th Order, LUMA hereby respectfully submits in *Exhibit 1* herein the responses to the ROIs directed at LUMA in Attachment A of the December 5th Order.

WHEREFORE, LUMA respectfully requests the Energy Bureau to **take notice** of the aforementioned and **accept** *Exhibit 1* herein in compliance with the December 5th Order with respect to LUMA's responses to the ROIs directed to LUMA in Attachment A of the December 5th Order.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 23rd day of December 2024.

I hereby certify that I filed this notice and request using the electronic filing system of this Energy Bureau. I will send an electronic copy of this Motion to counsel for PREPA, arivera@gmlex.net, and mvalle@gmlex.net; and to Genera PR LLC, lrn@roman-negron.com, legal@genera-pr.com, regulatory@genera-pr.com.

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Exhibit 1
Responses to December 5, 2024, Requests

System Improvement Plan.

Responses to December 5, 2024, Requests

December 23, 2024

List of Responses and Attachments

Response ID	Document Type	Response Subject
ROI-LUMA-MI-2024-0005-20241205-PREB-001	Response in PDF	Maintenance and Testing Practice
ROI-LUMA-MI-2024-0005-20241205-PREB-002	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-003	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-004	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-005	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-006	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-007	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-008	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-009	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-010	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-011	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-012	Response in PDF	Grid Reliability
ROI-LUMA-MI-2024-0005-20241205-PREB-013	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-014	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-015	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-016	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-017	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-018	Response in PDF	Protection Coordination and Testing
ROI-LUMA-MI-2024-0005-20241205-PREB-019	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-020	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-021	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-022	Response in PDF	Ride-Through Requirements
ROI-LUMA-MI-2024-0005-20241205-PREB-023	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-024	Response in PDF	Budgets
ROI-LUMA-MI-2024-0005-20241205-PREB-025	Response in PDF	Integrated Resource Plan
ROI-LUMA-MI-2024-0005-20241205-PREB-026	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-027	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-028	Response in PDF	
ROI-LUMA-MI-2024-0005-20241205-PREB-029	Response in PDF	Federal Funding

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-001

SUBJECT

Maintenance and Testing Practice

REQUEST

Is it LUMA's professional opinion that their existing circuit breaker maintenance and testing and training practices are fully in line with industry best practice? Which specific changes, if any, will be applied to their CB maintenance and test and training practices will be adopted as a consequence of the Santa Isabel event?

RESPONSE

Existing circuit breaker maintenance and testing practices are designed in line with industry standards, as is the training of resources to perform these activities. Due to the degraded condition of the system's infrastructure, the product of substantial periods of inadequate maintenance prior to LUMA commencing operations, and existing funding constraints, the maintenance programs are constrained from being executed to LUMA's full design in accordance with industry best practices. The total maintenance requirements across the degraded assets exceed current resources, and the extent of out-of-service equipment limits the ability to switch out the equipment required to perform testing and maintenance without adverse impact to customers. No material changes to the design of these practices are anticipated at this time; however, LUMA will focus on continued adherence to industry best practices, the maximum extent funding allows, as well as quality assurance and resource competency programs.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-002

SUBJECT

Maintenance and Testing Practice

REQUEST

Are LUMA's test plans and procedures (e.g. testing compliant with IEEE 57-152) self certified as being compliant or approved by asset manufacturers or other entities?

RESPONSE

LUMA's test plans and procedures are self-certified as appropriate based on industry knowledge and experience. While there are no specific manufacturer approvals of these plans, practices are designed to comply with manufacturer recommended maintenance practices and warranty requirements.

Please refer to ROI-LUMA-MI-2024-0005-20241205-PREB-003 for further information.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-003

SUBJECT

Maintenance and Testing Practice

REQUEST

Are LUMA test plans created in compliance with asset manufacturer recommendations? For example, are manufacturer-specific recommendations for normal/abnormal measurement thresholds stated in the test plans and recommended actions adhered to.

RESPONSE

LUMA test plans are created based on alignment with industry standards. Internal standards for measurement thresholds are established based on a number of resources including industry practices, internal experience and expertise, as well as manufacturer's recommendations. Manufacturer recommended actions are adhered to when possible; however, asset health and system operating conditions resulting from decades of neglect encumber how many assets can be removed from service at any point in time without compromising system stability and reliability. Moreover, funding and supply chain factors limit the rate of asset repair and replacement.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-004

SUBJECT

Maintenance and Testing Practice

REQUEST

Do the test plans have clear criteria to distinguish when an asset should not be returned to service or permitted to returned to service under caution (e.g. a specific moisture level above which the CB is not considered fit for service)?

RESPONSE

LUMA has criteria that are based on industry standards and manufacturer recommendations; however, due to current system conditions and operational constraints, it is not possible to maintain strict adherence to these criteria and maintain system stability and full provision of service in all cases. LUMA leverages a combination of those internal standards along with operational and subject matter expertise to make judgments on whether assets may be returned to service. All efforts are made to utilize this information to appropriately balance asset performance risk with system conditions and public impact when making return-to-service decisions.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-005

SUBJECT

Maintenance and Testing Practice

REQUEST

If a test has measurement results (e.g. moisture levels) exceeding manufacturer recommendations, but the asset is returned to service anyway, is a risk-assessment performed to consider the elevated risk of failure on system operations, nearby asset protection, and substation safety?

RESPONSE

Please refer to the response to ROI-LUMA-MI-2024-0005-20241205-PREB-004.

Yes, risk assessments are performed to determine potential impact on safety and operations when these assets are to be placed in service and balanced against the risks of not returning the asset to service.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-006

SUBJECT

Maintenance and Testing Practice

REQUEST

When were the CB and transformer test plans last reviewed and updated prior to Santa Isabel event?

RESPONSE

The maintenance plans receive ongoing reviews and considerations are continuously challenged based on evolving system circumstances and needs. The last review of the overall maintenance plans prior to the Santa Isabel event was in May 2024.Currently, a review is underway.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-007

SUBJECT

Maintenance and Testing Practice

REQUEST

For each item of test equipment used to test the transformer and circuit breakers, please confirm the date when the manufacturer last provided a certificate to show that the device was successfully serviced and calibrated. Please confirm if any of the test devices used to test the Santa Isabel transformers or circuit breakers are overdue a scheduled service or recalibration.

RESPONSE

Test equipment used for the Santa Isabel event have the following dates for when the manufacturer last provided calibration. None were overdue for calibration when utilized.

- Omicron CPC100 -NC268T Cal: July 9, 2024: Exp July 9, 2026 (transformer and breakers)
- Omicron TD12-DN023K Cal: Oct 12, 2022: Exp Oct 12, 2024 (transformer tests)
- Megger CT- FM445A – Sep 19, 2023: Exp Sep 19, 2025 (Breakers and Transformer tests)
- Megger – 101182581 Cal: Sep 16, 2023: Sep 16, 2025 (breakers tests)
- Dilo – 2000018083 Cal: Jan 1, 2024: Exp Jan 1, 2025 (breakers tests)
- Omicron Cibano – KF137K – Cal: Aug 15, 2024: Exp Aug 15, 2026 (breakers tests)
- Omicron TD1 -KK466S Cal: Sep 19, 2023: Exp Sep 19, 2025 (breakers tests)

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-008

SUBJECT

Maintenance and Testing Practice

REQUEST

Were all of the test equipment serviced and calibrated periodically in compliance with manufacturer recommendations?

RESPONSE

Yes. Test equipment utilized by LUMA have a managed calibration program in which the unit is returned to the manufacturer to be serviced and calibrated. Both the test set, and the unit's generated test reports record the date of this calibration.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-009

SUBJECT

Maintenance and Testing Practice

REQUEST

Are test equipment service, test and calibration histories centrally recorded by LUMA?

RESPONSE

Test equipment utilized by LUMA have a managed calibration program in which the unit is returned to the manufacturer to be serviced and calibrated. The date that this is performed is recorded on the test set, as well as on the test reports generated by the unit. LUMA is in the process of centrally recording this information in a common repository.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-010

SUBJECT

Maintenance and Testing Practice

REQUEST

Do test personnel receive periodic training from test equipment suppliers or other certified entities?

RESPONSE

Yes. LUMA personnel receive training on test theory, work practices, and equipment use in order to develop and maintain competency. This is accomplished utilizing a mixed approach of structured learning through the apprenticeship program, manufacturer-led training, and internal work method trainings taught by subject matter experts.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-011

SUBJECT

Maintenance and Testing Practice

REQUEST

Are personnel training logs maintained to ensure all personnel receive periodic training on best practices?

RESPONSE

Yes, training logs are maintained.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-012

SUBJECT

Grid Reliability

REQUEST

How many substations have single-points of failure such as a single transformer 115/38 kV transformers?

RESPONSE

LUMA has reviewed all transmission transformers with low-voltage transmission windings of 38kV or higher.

- There are five (5) 230/115 kV single-transformer stations
- There are twenty-six (26) 115/38 kV single-transformer stations

There are 341 transformers at the distribution substation with a low-side voltage between 4.8 - 13.2 kV. Of these 341 transformers, 225 are single-transformer stations. Of the substations that are not single-transformer, historical practice across the island implemented transformers with different low-side voltage ratings (e.g. one 13.2 kV device and one 4.16 kV device, providing no redundancy for loss of substation transformer, thus limiting the grid's ability to provide high reliability.

In its substation rebuild program, LUMA has proposed substation rebuild projects to include dual transformers for enhanced redundancy and resilience both at the transmission level, and at the distribution substation levels. When combined with highly reliable designs like breaker-and-a-half and ring-bus configurations, this is expected to improve the overall reliability of the substation asset class.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-013

SUBJECT

Grid Reliability

REQUEST

How many 38 kV distribution feeders with large customer counts (e.g., >10,000 customers) have no alternative route to supply customers should a single critical component fail? By critical component, we specifically mean assets with repair or replacement times exceeding 24-48 hours such as transformers, circuit breakers, current transformers and so on.

RESPONSE

This question is not clear, since the 38 kV system is considered networked transmission, and distribution feeders operate at voltage levels of 13, 8.32, 7.2, 4.8 and 4.16 kV. The response provided is for the 38 kV transmission networked system only. Section 3.3 provides the discussion on prioritized transmission equipment where there is no alternate route to supply customers for single critical component failure. These are documented in Section 3.4 of the System Improvement Plan, submitted on July 19, 2024.

The transmission (38, 115 and/or 230 kV) facilities that resulted in large customer outages were provided in section 3.4. Failure of the critical component in 2 of the 3 cases caused interruption to up to 9,000 customers at peak, and for the third would potentially interrupt up to 10,000 customers. Note that since the original document was submitted, the Santa Isabel 115/38 kV transformer was replaced, so the out-of-service TL4800 no longer leads to customer interruptions for loss of any adjacent critical component.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-014

SUBJECT

Grid Reliability

REQUEST

How many distribution substations serving large numbers of customers (e.g.,>10,000) have 115/38 kV transformers which are outside of their scheduled maintenance periods? If not known, is a plan or project in place to compile such a list to help prioritize maintenance?

RESPONSE

According to current records, in normal configuration, LUMA operates 14 distribution transformers that serve more than 10,000 customers. Of this group, three are currently outside of their recommended maintenance period.

At the substation sites of these same 14 distribution transformers, there are 12 115/38 kV transformers. Of these, five are outside of the recommended maintenance period. This overdue maintenance information is one of the elements used to prioritize maintenance activities, and significant progress has been made to reduce the portion of assets outside of their recommended maintenance cycle. In the Puerto Rico Power Electric Authority (PREPA) 2020-2021 fiscal year, prior to LUMA taking over, only 13% of the transformer and breaker maintenance was completed, and when LUMA completed analysis after taking over operations in May of 2022, it was identified that 67% of all transformers and breakers were outside of their maintenance cycle. LUMA continues to drive improvement on this front, but for reasons noted in ROI-LUMA-MI-2024-0005-20241205-PREB-001, ROI-LUMA-MI-2024-0005-20241205-PREB-003, and ROI-LUMA-MI-2024-0005-20241205-PREB-004, LUMA does not have all equipment in cycle yet.

Note: Distribution transformers here refer to those that transform power from a transmission voltage (115, 38 kV) down to a distribution voltage (13.2 kV and lower). Transmission transformers are those that transform from a high transmission voltage to a lower transmission voltage level, for example, 230 to 115 kV, and 115 kV to 38 kV voltage level.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-015

SUBJECT

Grid Reliability

REQUEST

How many distribution substations and distribution feeders serving large numbers of customers (e.g., >10,000) have 115 or 38 kV circuit breakers which are outside of their scheduled maintenance periods? If not known, is a plan or project in place to compile such a list to help prioritize maintenance?

RESPONSE

According to current records, in normal configuration, LUMA operates 16 transmission breakers that are directly related to the distribution transformers that serve over 10,000 customers. Of these, eight are outside of their recommended maintenance period.

This overdue maintenance information is one of the elements used to prioritize maintenance activities, and significant progress has been made to reduce the portion of assets outside of their recommended maintenance cycle. In PREPA's 2020-2021 fiscal year, prior to LUMA taking over only 13% of the transformer and breaker maintenance was completed, and when LUMA completed analysis after taking over operations in May of 2022, it was identified that 67% of all transformers and breakers were outside of their maintenance cycle. LUMA continues to drive improvement on this front, but for reasons noted in ROI-LUMA-MI-2024-0005-20241205-PREB-001, ROI-LUMA-MI-2024-0005-20241205-PREB-003, and ROI-LUMA-MI-2024-0005-20241205-PREB-004, LUMA does not have all equipment in cycle yet.

Note: Distribution transformers here refer to those that transform power from a transmission voltage (115, 38 kV) down to a distribution voltage (13.2 kV and lower). Transmission breakers are those that operate at the 230 kV, 115 kV, and 38 kV voltage levels.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-016

SUBJECT

Grid Reliability

REQUEST

Describe the status of the 38 kV line that connect the Garzas 2-1 hydroelectric unit to the grid.

RESPONSE

The 38 kV line 1100 connects the Garzas 2-1 hydroelectric unit to the grid. This line has been out of service since Hurricane Maria. An assessment of this line has been performed, and multiple issues have been identified, including structures that require replacement, vegetation clearing, and missing phase conductors. Mitigation of these issues will be a significant challenge due to access constraints and will require significant time and resources. LUMA also performed an assessment of the Garzas 2-1 substation and switchyard and found several deficiencies outside LUMA's control, including testing and maintenance of the circuit breaker and main power transformer. These issues would need to be remedied before being able to reliably reconnect this unit. A protection upgrade is also necessary. LUMA prioritizes transmission and substation line rebuilds based on overall system stability and customer reliability. Given the current condition, LUMA currently considers this line and station component rebuild as a mid-tier priority scheduled for future review after completing high priority system rebuild work.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-017

SUBJECT

Grid Reliability

REQUEST

Describe the status of the lighting surge protectors and any associated system that may help identify where lighting strikes occur and associated amperage characteristics.

RESPONSE

LUMA does not presently operate a lightning detection system. Designs decisions for lightning protection assumes worst-case conditions.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-018

SUBJECT

Protection Coordination and Testing

REQUEST

How many distribution feeders with large customer counts (e.g. >10,000 customers) have protection devices (CTs, CBs, or protection relays) which are outside of their scheduled maintenance periods? If not known, is a plan or project in place to compile such a list to help prioritize maintenance?

RESPONSE

As stated in the response to ROI-LUMA-MI-2024-0005-20241205-PREB-014, according to current records, in normal configuration, LUMA operates 14 distribution transformers that serve more than 10,000 customers. Across these there are over 40 electromechanical protection relays, with 37 outside of the current maintenance period. Additionally, there are 25 Microprocessor based protection devices, with 17 currently recorded as outside of their maintenance period.

LUMA presently has 74 distribution breakers directly related to distribution transformers that serve more than 10,000 customers, of which 30 are outside of their maintenance period.

This overdue maintenance information is one of the elements used to help prioritize maintenance activities, and significant progress has been made to reduce the portion of assets outside of their recommended maintenance cycle. In PREPA's 2020-2021 fiscal year, prior to LUMA taking over only 13% of the transformer and breaker maintenance was completed, and when LUMA completed analysis after taking over operations in May of 2022, it was identified that 67% of all transformers and breakers were outside of their maintenance cycle. LUMA continues to drive improvement on this front, but for reasons noted in ROI-LUMA-MI-2024-0005-20241205-PREB-001, ROI-LUMA-MI-2024-0005-20241205-PREB-003, and ROI-LUMA-MI-2024-0005-20241205-PREB-004, LUMA does not have all equipment in cycle yet.

Note: Distribution transformers here refer to those that transform power from a transmission voltage (230, 115, 38 kV) down to a distribution voltage (13.2 kV below). Transmission transformers are those that transform across only 230 kV, 115 kV, and 38 kV voltage levels.

This outside-of-maintenance information is used to help prioritize maintenance activities.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-019

SUBJECT

Protection Coordination and Testing

REQUEST

In LUMA's protection and control standard or policy, at what interval are distribution protection relay and recloser coordination studies required to be performed?

RESPONSE

The distribution feeder settings are checked for coordination whenever there is major system change such as a distribution transformer change or a feeder configuration change. A full distribution feeder protection coordination study has begun as part of the federally funded projects under the Distribution Automation Improvement Program. LUMA is planning to check all feeder protection coordination.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-020

SUBJECT

Protection Coordination and Testing

REQUEST

Do LUMA have a plan in place to collect up to date distribution protection relay settings for all devices into a central repository?

RESPONSE

All distribution feeder relay settings are collected and stored in a centralized relay setting management software. A more advanced settings repository database is in development and will be in service by the first half of 2025.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-021

SUBJECT

Protection Coordination and Testing

REQUEST

Have LUMA reviewed distribution protection relay coordination for today's grid considering that historical protection relay settings may be outdated due to long-term asset outages and grid re-configurations? If no, is there a specific plan in place to perform such a review?

RESPONSE

The distribution feeder relay settings are checked for coordination whenever there is major system change such as a distribution transformer change or a feeder configuration change. A full distribution feeder protection study has begun as part of the federally funded projects under the Distribution Automation Improvement Program. LUMA is planning to check all feeder protection coordination.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-022

SUBJECT

Ride-Through Requirements

REQUEST

Describe the ride-through requirement for the EcoElectrica and AES power plants. Are these ride-through requirements adequate to ensure the stability of the bulk power system? Explain

RESPONSE

The transmission line protection can coordinate with generator protection at EcoElectrica and AES. However, there is no remedial action schemes (RAS) scheme in place for proper risk mitigation in service today. LUMA has an initiative to install RAS schemes in systems to prevent cascading outage events.

Further, neither EcoElectrica nor AES power plants have an executed Interconnection agreement that typically specify Ride-Through requirements. The current power purchase and operating agreements (PPOAs) for the Ecoelectrica and AES power plants were negotiated and executed by PREPA and LUMA had no involvement in either of the current PPOAs or any of their amendments.

Both EcoElectrica and AES have Agreed Operating Procedures (AOPs) that require both parties (System Operator and Generator) to coordinate changes in protection and control between the entities before implementation.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-023

SUBJECT

Ride-Through Requirements

REQUEST

Is the line protection coordination associated with the EcoElectrica and AES power plants adequate? Explain if these plants trip before the T&D can initiate its protection sequence.

RESPONSE

Yes. The transmission line protection coordinates with the generator protection at EcoElectrica and AES. With a transmission system fault, the transmission line would trip in advance of the generator protection.

Most 230 kV and 115 kV transmission lines are equipped with line differential with distance protections as backup, which meet fault clearing requirements and would coordinate with generator protection. Generator control systems should meet fault ride through requirements such as specified in PRC-024. However, Generation Operators in Puerto Rico are not in alignment to this standard.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-024

SUBJECT

Budgets

REQUEST

Describe how the approved budgets for FY 2025 will be affected by the inclusion of the initiatives described in the Priority Stabilization Plan and how the budgets for FY 2026 and FY 2027 are projected to accommodate these expenses.

RESPONSE

While several of the initiatives described in the System Improvements Plan were already contemplated in the approved budget for FY2025, the full extent of the work required represents incremental investments of approximately $55.8M in FY2025.

In anticipation of filing a rate petition in 2025, LUMA is currently conducting its bottoms up business planning activities to assess system needs for the FY2026-28 period. As a part of this assessment, LUMA's preliminary estimate is that activities related to the System Improvements Plan will add an incremental $37.7M to the FY2026 budget.

LUMA has initiated actions to attempt to leverage federal funding for some activities to the extent possible, as well as explored opportunities to identify other funding opportunities for these critical activities. This is an ongoing process and will continue into FY2026 and FY2027 business planning to account for these impacts as well as any additional threats that emerge and require expedited resolution to advance and protect system stability due to any additional failures. Where federal funding is not available to support these critical initiatives, the costs will be contemplated in the non-federally funded budget.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-025

SUBJECT

Integrated Resource Plan

REQUEST

Document Exhibit 1, System Improvements Preliminary Plan, July 19, 2024 at page 5 ("Improving reliability during generation shortfalls: by launching the Customer Battery Energy Sharing (CBES) initiative" and Section 8, ASAP (accelerated battery energy storage program at existing generation customer sites).

Figure 4 (page 39) shows the significant impact of ASAP on mitigating load shed events. LUMA states that ASAP resources "could be commercial in less than 12 months" (page 38) and that "timing is uncertain" but Phase 1 of the battery program could be deployed by January 1, 2026 (page 39). Figure 5 (page 40) shows continuing high levels of loss of load events possible for the summer of 2025. Section 6.3 describes potential timelines for implementation/ deployment of the ASAP resources. No information is provided concerning the CBES initiative in the Preliminary Plan, though the Energy Bureau notes that LUMA provided information on the CBES in its June 28, 2024 filing in NEPR-MI-2022-0001.

a. What specific steps can LUMA take to maximally accelerate the deployment of all ASAP program resources, 360 MW?

b. What is required to ensure deployment of at least some of the initial Phase 1 ASAP resources prior to the summer of 2025?

c. What barriers exist to the quickest possible deployment of ASAP resources, and what steps can be taken to remove those barriers?

d. Is LUMA currently exploring any means to better and more fully exploit the potential availability of existing small-scale battery resources (via the CBES initiative), only a small fraction of which are currently enrolled in the CBES program? If so, please explain such exploration and if LUMA has received any feedback that indicates how increases in program participation could be obtained.

e. What is LUMA's recommendation for actions to take between now, and spring of 2025, to incent greater participation by small scale battery resources in the CBES program for deployment by no later than summer 2025?

f. If a larger fraction of the currently installed small-scale battery resources were available to LUMA in the summer of 2025 through third-party dispatch on a daily or at least regular basis, is there

any reason LUMA would *not* expect to see a reduction in likely loss-of-load events for the Puerto Rico system next summer through lowering of evening peak demands?

g. Does LUMA foresee any technical or institutional barriers to utilizing a larger fraction of small-scale battery resources through the CBES initiative (as is, or refined), to lower evening net peak loads? If so, please describe those barriers and provide recommendations for how LUMA or the Energy Bureau could lower them, including any required refinements to the CBES initiative that may be necessary.

RESPONSE

a. ASAP 360 MW was an initial estimate based on ASAP Phase 1 and Phase 2 for a limited group of independent power producers (IPPs). SO1 was recently distributed to all IPPs with a POI currently injecting to the grid, so we expect this capacity to potentially change.

The first critical step is to understand how much storage capacity (MW) can be implemented in SO1 contracts, without requiring network upgrades, since these would be the fastest implementation. To accomplish this, we have scheduled initial meetings with interested IPPs to gather preliminary interest under SO1 and SO2. LUMA will keep PREB updated on how many MW are feasible under ASAP.

LUMA will develop a program plan in January 2025, after we have completed the near-term tasks ordered by PREB such as the SO2 distribution and the finalization of the fourth SO1 contract.

b. The critical path that will determine the success of the schedule objectives will be the approval of all regulatory and permitting requirements including Federal Oversight & Management Board for Puerto Rico (FOMB) and local permitting agencies.

Obtaining permits and complying with regulatory requirements are the responsibility of the generator. LUMA may provide some support for this process. As with any power generation or storage investment, government approvals can significantly impact the final schedule. Anything that the PREB can do to facilitate or expedite these approvals will lower the schedule risk for projects contracted under the SO program.

c. As discussed in question b, the critical steps that will determine the success of the schedule are FOMB approval and local permitting agency approvals. Anything that the PREB can do to facilitate or expedite these approvals will lower the schedule risk for projects contracted under the SO program .

d. LUMA is studying how to further leverage of the available existing small-scale battery resources (via the CBES initiative) through a variety of measurement and verification activities such as customer and aggregator surveys, distribution system impacts analyses (through DOE Technical Assistance grants), along with parallel three-year planning activities to align the potential of these resources against both short and medium term outcomes. To increase participation from these resources we require a base understanding of the above-mentioned activities to be used in a coordinated enrollment campaign with third party partners to increase availability and performance of the resource in emergency dispatch.

e. LUMA's recommendation for actions to take between now, and spring of 2025, to incent greater participation by small scale battery resources in the CBES program will be to align our actions with findings from analyses currently underway to better assuage participation concerns from

both current and potential small scale battery customers. In addition, once any physical limitations (Distribution system impacts) are identified, LUMA will work with its aggregator partners to further publicize the program from multiple channels, including validation of the incentives and impacts achieved by the 1st year Pilot participants as proof of performance.

f. If an aggregator program that covers the dispatch of existing small scale battery resources can be defined, approved, sustainably funded and signed by all parties, this would lower the evening peak demands, which would in turn reduce the Loss of Load Expectation (LOLE). In addition, this program would need to be validated for any unintended operational or distribution system consequences. It is important that demand reduction or energy dispatch activities meet reliability and safety standards.

   A primary driver of enrollment and activation of these resources is the long-term predictability of program activity, which would need to be balanced against parallel central generation, grid and storage improvements aimed at reducing LOLE. The long term need for this specific set of resources will have to be evaluated as part of overall resource planning.

g. LUMA is currently engaged with DOE technical assistance grants and various National Laboratory teams to understand if there are any technical barriers or considerations that need to be considered in potential growth of this Demand Response resource. As is today, the dispatch of these resources is still relatively manual and not coordinated with any utility systems (software) to improve system outcomes or reduce unique constraints that might impact participation. For example, dispatch of batteries must be coordinated with any load shedding). Deployment of fully integrated systems including Energy Management System (EMS), Advanced Distribution Management Systems (ADMS), and Distributed Energy Resource Management Systems (DERMS) and associated controls and logic can drastically improve technical barriers which exist today.

   Institutionally, the barriers to utilizing a larger fraction of small-scale battery resources through the CBES initiative relate primarily to ensuring longer term sustainability of funding and associated resource commitment in support of further corresponding investments made by third party aggregators, individual participants and LUMA across systems integration. Given that longer term view, and expected generation, transmission and distribution improvements, these batteries will also likely need to be flexed to achieve other programmatic objectives that are not always emergency dispatch specific. Future pilot and program designs should take these objectives into account as well as the value to individual customers and to the electrical system overall.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-026

SUBJECT

Integrated Resource Plan

REQUEST

Document Exhibit 1, System Improvements Preliminary Plan, July 19, 2024 at Section 4.1 lists specific transmission line rebuild improvements. The narrative section describes "numerous 230 kV, 115 kV, and 38 kV projects to harden and upgrade the transmission system. The upgrade process also involves undergrounding targeted lines, with a design for accommodating future circuits for reliability and redundancy (e.g., undergrounding) on select transmission lines. In addition to the overhead transmission line upgrade work, this program includes the 115 kV underground cable repair in the San Juan area" (page 17). Section 4.1.2 contains a table with two 38 kV projects, and one entry labeled "Preliminary Network Upgrades".

a. Describe the current plans for "undergrounding targeted lines", including which "select" lines are under consideration for undergrounding.

b. Describe in detail the current status of the "115 kV underground cable repair in the San Juan area" (page 17) and the expected timeline for completion of all segments of the repair project.

c. Describe in detail the specific "Preliminary Network Upgrades" included in Section 4.1.2.

d. Besides the "Preliminary Network Upgrades", and the two 38 kV projects listed in Section 4.1.2, are there any other transmission line rebuilds under consideration with an estimated start date by or prior to the commencement of FY2026?

e. Explain how the process of considering transmission line rebuilds aligns with the specific projects LUMA has provided to the Energy Bureau in its 10-Year Infrastructure Plan filings.

f. Explain how the process of considering transmission line rebuilds noted in Section 4.1.2 "Project Execution" aligns with the Energy Bureau approval of PREPA's plans to spend up to $2 billion for transmission hardening of existing elements and aging infrastructure, as directed in the Energy Bureau IRP Order (August 2020) at paragraph 746. Paragraph 746 references the planned infrastructure improvements listed in Exhibit 10-11 in PREPA's main IRP filing of June 2019 and Exhibits 2-97 and 2-98 of Appendix 1 to PREPA's main IRP filing in June of 2019.

RESPONSE

a. The undergrounding of lines initially proposed as overhead rebuilds is being evaluated. The targeted lines that are being assessed are 115 kV facilities 41200 and 36800 that extend from

Sabana Llana - Canóvanas - Palmer - Fajardo. This area has been a reliability challenged corridor with frequent operation and large customer interruption indexes in prior operating years and is in a hurricane prone impact area, which was impacted by Maria, and even recently by tropical storm Ernesto. Undergrounding facilities in this area would create a highly resilient corridor on the east side of the island that would not be subject to heavy wind-loading and vegetation impacts. The undergrounding of these 115 kV facilities is being explored via feasibility study with an Architecture & Engineering (A&E) design firm.

b. There is currently an Non-Federally Funded Capital (NFC)project for repair of known damaged segments of 40600. A cable testing vendor is being procured to ensure the scope and materials ordering is adequate to cover the need. For the remainder of the Out-Of-Service Underground loop, cables need to be tested, and fidelity of the Underground conduit infrastructure evaluated prior to scope development. Cable testing is planned for Q4 FY2025 - Q1 FY2026.

c. The Preliminary Network Upgrades are the facility upgrades requested to support the Tranche 1 renewables projects in the Ponce, Santa Isabel and Salinas areas. The three projects that made up the Preliminary Network Upgrades were:
    - Upgrade of the Santa Isabel transformer from 56 MVA to a 112 MVA,
    - Rebuild and upgrade of the 38 kV TL700 from Costa Sur to Yauco 2, and
    - Rebuild and upgrade of the 38 kV TL4800 from Santa Isabel - Toro Negro (which is also one of the out-of-service lines presented in Section 3.4).

d. The Federal Emergency Management Agency (FEMA) process for obligation of transmission facilities includes architecture and engineering design development, hazard mitigation eligibility review, environmental reviews, and other critical steps in the process. Projects are in the design development and hazard mitigation eligibility review phase. None of the active transmission line projects are anticipated to start construction before FY2026.

e. The transmission projects remain in the project portfolio, and each has been evaluated. LUMA continues with engineering and design of the critical, high-priority projects, and has also proposed additional projects based on actual system performance conditions, asset health and equipment condition, and responding to repair and restore failed equipment across the grid.

f. LUMA has identified significant gaps in the previous Integrated Resource Plan (IRP), primarily due to transmission planning studies that relied on unverified and incorrect line ratings data, neglected asset condition with unavailable asset record information, and a rebuild strategy centered on microgrid and mini-grid deployments, neither of which have been developed based on the prior IRP documentation. Instead, LUMA has worked diligently to update Transmission and Substation asset information and asset records, to establish the basis for field ratings of transmission and substation equipment in accordance with established industry practices (like NERC Facility Ratings – FAC Standards provide), develop the transmission power flow simulation models (consistent with NERC Modeling MOD standards) and performed steady-state and dynamic performance assessments of the system (consistent with NERC Transmission Planning – TPL standards).

    Starting with a digital simulation model that reflects current system topology, equipment, and ratings, LUMA has identified where additional projects are required, where capacity increases are required, and helped to prioritize the transmission and substation rebuild project portfolios.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-027

SUBJECT

Integrated Resource Plan

REQUEST

Document *Exhibit 1, System Improvements Preliminary Plan, July 19, 2024* at Section 4.1 lists specific transmission line segment reliability improvements, in Table 1-5. LUMA states "To help mitigate future outages and improve overall system reliability, LUMA is inspecting all 51 line segments during FY2025 and performing repairs on all critical components on the 1,000+ structures on the segments listed below" (page 18).

a. Confirm or explain otherwise that no existing 230 kV line segments are included in the Table 1-5 Transmission Segments listing.

b. Does the exclusion of 230 kV line segments in Table 1-5 indicate that LUMA's assessment is that the 230 kV portion of the transmission grid is in reasonably good operating condition?

c. Provide LUMA's overall assessment of the condition of the 230 kV lines portion of the transmission grid.

d. Provide information if any 230 kV lines contributed to the remaining 25% of transmission related customer minute interruptions not included in the lines listed in Table 1-5.

e. LUMA states that is "inspecting" and "performing repairs" on all critical components on the segments listed in Table 1-5. Provide a specific timeline for when those repairs will take place and describe in more detail how and when such repairs will be completed.

f. Explain how the process of considering transmission line reliability improvements aligns with the specific projects LUMA has provided to the Energy Bureau in its 10-Year Infrastructure Plan filings.

g. Explain how the process of considering transmission reliability improvements such as inspection and repair as needed of components on line segments listed in Table 1-5 aligns with the Energy Bureau approval of PREPA's plans to spend up to $2 billion for transmission hardening of existing elements and aging infrastructure, as directed in the Energy Bureau IRP Order (August 2020) at paragraph 746, which references the planned infrastructure improvements listed in Exhibit 10-11 in PREPA's main IRP filing of June 2019, and Exhibits 2-97 and 2- 98 of Appendix 1 to PREPA's main IRP filing in June of 2019.

RESPONSE

a. Confirmed. No 230 kV transmission line segments are listed in Table 1-5.

b. No. The focus of Table 1-5 is to identify key transmission lines that have a direct, near-term impact on system reliability.

c. Due to the criticality of the 230 kV system, LUMA's preventative and corrective maintenance of the transmission lines to date has included activities such as visual and thermal inspections and corresponding repairs, insulator & hardware replacement, and structure replacement on the 230 kV transmission lines. They have been prioritized in that respect for maintenance and in general terms have shown less deficiencies and required less corrections when compared to the 115 kV and 38 kV transmission lines, but still require significant attention and have extensive portions which would not meet updated standards for 160mph wind pressures.

d. The remaining 25% still come in vast majority from the other 115 kV and 38 kV lines. It is just that the 75% comes from the 51 lines listed.

e. In FY2025 to date, 37 of the 51 line segments listed in Table 1-5 have been inspected, where 43 priority deficiencies were identified, and 34 of those deficiencies have already been repaired. The remaining repairs are being planned according to:

    i. The criticality of the findings

    ii. The system’s availability to perform the repairs

    The inspections of the remaining 14 segments are planned to be completed in this fiscal year (FY25), and the subsequent findings will be prioritized and planned for repair according to the criticality of the findings as well as the system’s availability to perform the repairs.

f & g. The process that LUMA follows to evaluate transmission projects and priorities involves understanding of various characteristics, including:

    i. Operational performance of the transmission facility and any potential challenges presented to system operations

    ii. Reliability contribution of the transmission line

    iii. The number and criticality of customers impacted when the line experiences a forced outage

    iv. Asset condition from field evaluations – (note - since record maintenance practices were deficient, inherited PREPA asset records often do not match field conditions, facility ratings, or equipment specifications)

    It is with this context that data in Section 3.4 (information on existing out-of-service facilities and their impacts on the grid) and Section 4 (facilities with an operation performance history indicating corrective maintenance or urgent repairs are necessary) were provided as distinct and different data.

    The content presented in Section 3.4 identify the three "Out Of Service Lines". These are presented in direct response to LUMA's interpretation of the request for system stabilization plan)

since each line being out-of-service concurrently with other equipment has the potential to cause customer outages of 9,000 customers or more. These out-of-service transmission lines exacerbate the potential for load loss upon failure of another critical component; for example, a breaker or a transformer failure at an adjacent substation could result in customer load loss due to the initial out-of-service element.

The content presented in Section 4.0, specifically in Section 4.2 details proactive measures to evaluate and address transmission facilities that have recorded events that have contributed directly to customer interruptions. These facilities are in-service and operational, and may fail due to vegetation contact, equipment failure or weather or storm activity. The purpose of describing these facilities is to provide visibility to LUMA's proactive measures to evaluate actual system performance, and address assets that may lead to customer interruptions in a timely manner. These lines may or may not be targeted for rebuild long-term; however, the focus of the inclusion is that immediate short-term attention, and immediate near-term repairs or fixes are needed because of the history of line operations.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-028

SUBJECT

Integrated Resource Plan

REQUEST

Document Exhibit 1, System Improvements Preliminary Plan, July 19, 2024 at Section 1, Introduction. LUMA states "LUMA also continues to complete the interconnection of 729 MW of utility-scale solar and 350 MW of utility-scale battery energy storage..." The Energy Bureau notes that those resources are from the first tranche of procurement following the 2020 JRP Order.

a. Confirm, or explain otherwise, that LUMA expects the noted battery energy storage resources to support the ability to provide frequency response service and contribute to reducing loss-of-load events due to insufficient resource adequacy.

b. Provide LUMA's current understanding of the status of the interconnection agreements for those battery energy storage resources.

c. When does LUMA expect those battery energy storage resources to be online? Provide a specific timeline differentiating across projects as necessary.

d. What barriers remain to expediting the installation and deployment of those battery energy storage resources, and what remedies are required to remove those barriers?

e. How is LUMA supporting the expediting of deployment of both the noted battery energy storage resources, and the ASAP resources described in Section 6 of the Preliminary Plan?

f. Provide any further information LUMA has, or recommendations LUMA suggests, to maximally accelerate the eventual deployment of the noted battery energy storage resources.

RESPONSE

a. Yes, as stated in section 3.3.3 of LUMA's 2024 Resource Adequacy Report, only considering the 350 MW of utility-scale batteries from Tranche 1, loss-of-load events could be reduced by 75%. The addition of standalone battery energy storage system (BESS) resources promises to significantly improve resource adequacy on the Puerto Rico electricity grid, meaningfully reducing expected loss-of-load events.

b. LUMA has executed two Interconnection Agreements with Clean Flexible Energy and three with Convergent, for the sum of 350 MW of Energy Storage resources.

c. LUMA expects the two Clean Flexible Energy projects to be online in November of 2025, and the Convergent project to be online in May of 2026. These schedules are based on LUMA's biweekly meetings with developers and the Points of Interconnection (POI) construction Engineering, Procurement and Construction (EPC).

d. Some of the Tranche 1 proponents are awaiting Loan Programs Office (LPO) financing closure to provide LUMA with the notice to proceed for the construction of the Points of Interconnection. This milestone is necessary to ensure that LUMA has received sufficient funds, from proponent contributions and Purchased Power Charge Adjustment (PPCA) contributions, to construct the interconnection facilities.

e. For Tranche 1, LUMA has developed alternative interconnection tactics to ensure that back feed power is available for the first of the Tranche 1 projects. LUMA is also supporting LPO-financed projects in documentation and due diligence to ensure financing is closed on time.

   For ASAP, LUMA's land and permits department will help facilitate resolution of permitting issues. We are currently receiving an indicative schedule and are incorporating these into the ASAP timeline. More information can be provided once the complete list of SO1 and SO2 facilities are identified.

f. LUMA conducts several internal activities including meetings and ad-hoc sessions as needed. No further recommendations have been identified at the moment but will be shared if identified in the future.

System Improvements Plan

NEPR-MI-2024-0005

Response: ROI-LUMA-MI-2024-0005-20241205-PREB-029

SUBJECT

Federal Funding

REQUEST

The plan presented prioritized Transmission Substation Transformers. Eleven (11) were described, some to be completed before Q4 2026, others in 2027, one yet to be determined. All to be presented for approvals through FEMA funds. In the 3.4 *Section Prioritized Transmission Lines,* they listed Three "Out of Service Lines", with limited information. In Section 4.0 Systems Improvements Preliminary Plan, listed in 4.2 Transmission Reliability Improvement Plan, 51 Line Segments were identified. These segments/ lines will be inspected and repaired during 2025 and might have associated FEMA approved funding under several SOWs. The same occurred with the Section 4.3 *Substation Rebuilds Overview* where 24 Substations were listed for Inspection and repair, as they were identified as critical. These are initiatives that should be completed in less than two years.

a. Describe the approved FEMA funds for these Line Segments, and for the Substations rebuild plan. There are many approved SOWs associated to Line segments and Substations. The approved SOWs are for groups or for general repairs in lines and substations.

b. Describe the completion timeline for the above initiatives.

c. Are the Three Out of Service Lines included in the listed line segments?

d. Describe if/how acquiring substation facilities that may be preassembled could help expedite needed repairs/upgrades and how these facilities are included in the Priority Stabilization Plan.

RESPONSE

Please refer to the response to f & g of ROI-LUMA-MI-2024-0005-20241205-PREB-027.

a. The 51-line segments indicated are not being worked with FEMA funds, but with Operations and Maintenance budget, and with Non-Federal Capital funds where appropriate in the near term. A subset of the 51 line-sections do have FEMA Funded Scopes of Work, but those projects are presently in engineering and design, with equipment ordering and construction planning activities ongoing.

b. Estimated completion timelines within the next two years were discussed in a meeting held on November 8, 2024, with the FOMB, PREB and other stakeholders. Note that these timelines are dependent on additional Non-Federal-Capital to execute the work (see tables below).

- Substation transformer restoration schedules with additional funding are provided; note that distribution transformers and substation equipment are also included in the graphic.

- Restoration or mitigation of the three out-of-service facilities from Section 3.4 (TL2100, TL4800 and TL8700) are provided, in addition to other out-of-service transmission lines that were identified (parallel underground lines 16800 and 2200).

- The response to item 27 provides details of the inspection and execution of short-term repairs for immediate asset performance improvement on the lines identified in Section 4.2.

- The substations identified in 4.3 are similar in nature to transmission lines identified in section 4.2 in that these are immediate concerns for asset performance considerations. These assets have been actively inspected, thermography scanned, and short-term repairs implemented, and long-term solutions that involve component replacement or station rebuild.

c. The three out-of-service facilities that were provided in Section 3.4 are not included in the list of 51 line-segments that had a direct contribution to customer outages in Section 4.2 (those 51 are determined by lines that tripped and resulted directly in loss of customer load). There are no directly attributed customer outages resulting from the three lines listed as out-of-service in Section 3.4, hence they remain out of service. Additional non-federal funds would be required to restore the listed line segments.

d. LUMA has explored pre-assembled substation elements for small substations but has not evaluated potential for the substations detailed below. LUMA will evaluate expansion of pre-assembled substation equipment applications in Puerto Rico's system restoration.

The following tables outline the estimated execution dates for transformer replacements, transmission line projects, and breaker replacement projects, as per the System Improvements Plan.

System Improvements Plan – Substations	
Project Name	Estimated Timeline
Santa Isabel TC – 56MVA	Transformer Energized – October 12
Bayamon TC – 280MVA	Transformer Energized – July 22nd
Bayamon TC – 112MVA	Flood Zone - Engineering with mitigation 2/15/25 Construction Start 4/22/25 Transformer Arrival 6/30/25 In-Service
Caguas TC – 112MVA	Substation in partial flood zone - Engineering with mitigation 2/22/25 Construction Start 4/24/25 Transformer Arrival 6/30/25 In-Service
Costa Sur – 336MVA	A&E TOSOW assigned 1/21/25 Construction Start 4/12/25 Transformer Arrival 6/22/25 In-Service
Monacillos Bank 1 – 112MVA	Internal Engineering 10/01/24 Construction Start 4/8/25 Transformer Arrival 06/30/25 In-Service
Monacillos Bank 3 – 112MVA	TO assigned 10/01/24 Construction Start 04/21/25 Transformer Arrival 06/30/25 In-Service
Sabana Llana – 544MVA	A&E TOSOW assigned 2/7/25 Construction Start 4/21/25 Transformer Arrival 7/12/25 In-Service
Monacillos 1346 – 44MVA	02/24/23 Delivery 10/24/24 Construction Start 02/24/25 In-Service
Guanica TC - 112MVA	Internal Engineering 4/23/25 Delivery 10/24/24 Construction Start 06/30/25 In-Service
Llorens Torres – (Metal Clad SG)	TBD
Hato Rey	In Service expected 11/16/2024
Covadonga (GIS Repair)	Contract with vendor in process
Factor Sectionalizer	TBD
Fajardo Transformer	TBD
Mayaguez UG Transformer Lead	TBD
Critical Transmission Relays	Will be completed by end of December 2024

System Improvements Plan – Transmission	
Project Name	**Estimated Timeline**
2100 – Line Repairs	Replacing poles and conductors, Construction Start Jan-2025
16800 – UG Line Repair	Refined estimate pending cable testing and conduit proofing. Construction planning and preparing to begin as results are known.
2200 – UG Line Repair	Refined estimate pending cable testing and conduit proofing
8700 – Repairs	2Q 2025 – refining across updated assessments.
9100 - Repairs	Planning is ongoing, Construction to start Feb-2025.
TL100/200 - Ponce to Salinas Urbano	Construction Start Jul-2025
TL3600 – Monacillos to Martin Pena	Construction Start Dec-2025
TL2800 – Aguadilla Hospital Distrito Sect to T-Bone TO	Construction Start Mar-2027