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

IN RE:

PLAN PRIORITARIO PARA LA ESTABILIZACIÓN DE LA RED ELÉCTRICA

CASE NO. NEPR-MI-2024-0005

SUBJECT: Submittal of Updated Preliminary Plan

MOTION SUBMITTING UPDATED PRELIMINARY PLAN

TO THE PUERTO RICO ENERGY BUREAU:

COME NOW LUMA Energy ServCo, LLC and **LUMA Energy, LLC** (collectively "LUMA") through their undersigned legal representatives and respectfully submit and request the following:

I. Background and Procedural History

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") ordering LUMA, Genera PR, LLC ("Genera") and the Puerto Rico Electric Power Authority ("PREPA") to each develop and submit to the Energy Bureau within twenty (20) days an "aggressive preliminary plan of improvements to the electric system" ("Preliminary Plan") with the information specified in the June 13th Order[1] and having a maximum implementation period of two (2) years. *See id*. at pages

[1] The Energy Bureau required that this plan include "a comprehensive analysis of the electric system 'as is' (as it is currently)"; that it "detail factors such as the need to upgrade protection schemes, the need for redundant lines and/or equipment, vegetation management, lack of reliable generation, the need for frequency and inertia control and persistent load shedding"; that it "include an estimate detailing the costs necessary to repair and conduct such upgrades to the electric system and identify whether they are to be covered by federal, state or budget funds and/or the rate itself"; that it "include a detailed timeline with specific and measurable goals (expectation of reduction in the frequency and duration of interruptions, availability of reliable generation and reduction of forced outages of generation unites) for the execution of the necessary repairs and implementations"; and that it contemplate the Genera battery project approved in Case No. NEPR-MI-2021-0002, *In Re: Review of the Puerto Rico Electric Power Authority's 10-Year Infrastructure Plan- December 2020*, and LUMA's proposed batteries concept approved in Case No. NEPR-MI-2024-

1-2. The Energy Bureau also indicated that, once submitted, and after the required evaluation, the Energy Bureau would schedule a public hearing for public expression on the plans. *See id*. at page 2.

2. On June 28, 2024, LUMA filed a *Request for Extension of Time to Submit Preliminary Plan Required by the Resolution and Order of June 13, 2024* ("June 28th Motion") explaining that LUMA had been diligently working on the preparation of the Preliminary Plan and had developed a preliminary working draft. *See* June 28th Motion on page 3. LUMA further explained that, given the extensive scope of the plan and required details in a variety of subjects, as well as the need to coordinate across several LUMA departments, incorporate information on current events and evaluate contingency elements requiring further cross-departmental reviews, LUMA needed additional time to achieve a more thorough, clear, verified, and implementable Preliminary Plan more effectively addressing the requirements of the June 13th Order. *See* June 28th Motion on page 3. Accordingly, LUMA requested until July 19, 2024, to submit the Preliminary Plan. *See id*.

3. On July 1, 2024, Genera filed a request for extension of time to submit its Preliminary Plan until July 19, 2024. *See Solicitud de Extensión de Término para Presentar Plan Preliminar*.

4. On July 2, 2024, PREPA filed a request for extension of time to submit its Preliminary Plan until July 26, 2024. *See Moción para Solicitar Término Adicional Para Cumplir con Resolución y Orden del 13 de Junio de 2024*.

0002, *In Re: LUMA's Accelerated Storage Addition Program*. *See* June 13th Order on pages 1-2 (translation ours). The Energy Bureau also required that this plan prioritize the interventions in the most critical points of the electric system and include contingency and protection measures, in accordance with the reliability standards of the industry, to minimize interruptions during the implementation of the plan. *See id*. at page 2.

5. On July 5, 2024, the Energy Bureau issued a Resolution and Order ("July 5th Order") in which it denied the extension requests submitted by LUMA, PREPA and Genera and ordered each to show cause, on or before July 10, 2024, why the Energy Bureau should not impose an administrative fine of twenty-five thousand dollars ($25,000) for each day of delay in submitting their respective Preliminary Plan. *See* July 5th Order on pages 2-3.

6. On July 8, 2024, Genera submitted its Preliminary Plan and requested the Energy Bureau to vacate the determination to impose fines. *See Moción en Cumplimiento de Orden y Sometiendo Plan Preliminar de Estabilización del Sistema Eléctrico*.

7. On July 10, 2024, PREPA submitted a *Motion in Compliance with the Resolution and Order dated June 13, 2024*, indicating that it was not required to submit a Preliminary Plan because it was no longer held responsible for the operation and maintenance of Puerto Rico's electric system and the obligation to provide the Preliminary Plan rested with LUMA and Genera.

8. On July 10, 2024, LUMA filed a *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") in which LUMA submitted, as an *Exhibit 1*, the Preliminary Plan in the form of a draft ("Preliminary Plan Draft") in attention to the July 5th Order. LUMA clarified that this plan was as responsive to the requirements of the June 13th Order as it could be at that stage and that it was being issued in draft form because it had not benefitted from the various additional layers of iterative interdepartmental reviews described in the June 28th Motion needed to achieve a final, accurate and implementable plan. LUMA further explained that the Preliminary Plan Draft would continue to undergo internal review by LUMA from a perspective of system

criticality and funding,[2] as well as for calculating the expected reliability benefits of the actions proposed under the Preliminary Plan Draft,[3] and that it would require further refinement. *See* July 10th Motion on page 12. To this end, LUMA informed that it would continue its rigorous review of the Preliminary Plan and would be submitting a more refined version of the Preliminary Plan Draft on or before July 19, 2024, which version would place the Energy Bureau in position to assess the information contained therein and rely on such information when making any future determinations. *See id*.

9. In the July 10th Motion, LUMA also provided reasons as to why the extension requested in the June 28th Motion was reasonable and why the imposition of a fine was not warranted, in compliance with the order to show cause in the July 5th Order and requested this honorable Energy Bureau to vacate the July 5th Order.

10. On July 11, 2024, the Energy Bureau issued a Resolution and Order (the "July 11th Order") denying PREPA's request for exemption from submitting a Preliminary Plan (referred to as a "Priority Plan" in the July 11th Order) and noting that, under the June 13th and July 5th Orders, the three operators of the system- LUMA, Genera and PREPA- were required to submit the Priority Plan, each with respect to their area of jurisdiction. *See* July 11th Order on pages 1-2. In that context, the Energy Bureau emphasized that LUMA and Genera had met with these basic expectations. *See id.* at page 2.

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[2] LUMA explained that it had identified proposed projects as part of the longer-term System Remediation Plan proposed in docket NEPR-MI-2020-0019, *In re: Review of the Puerto Rico Electric Power Authority's System Remediation Plan*, which sets forth initiatives to remediate the vulnerabilities in the electric system existing prior to LUMA commencing operations and which, given the extensive nature thereof, is anticipated to take multiple years to implement. See *id*. at page 8. LUMA also explained that in order to improve the alignment of priorities, LUMA was conducting a second review of these projects to identify actions relating to critical assets that may be accelerated or need additional funding to provide a higher level of resiliency. *See id*. at page 9.

[3] LUMA explained that this effort would take significant time because each of the initiatives needs to be evaluated independently and historical trends need to be reviewed to assess potential reliability benefits and improvements. *See id*. at page 9.

II. Submittal of Updated Preliminary Plan

11. In accordance with the July 10th Motion, LUMA submits herein, as *Exhibit 1*, an updated Preliminary Plan. This version of the Preliminary Plan was revised to include information regarding the metering infrastructure (Section 6), system improvements benefits (Section 7) and a map with planned substation and transmission projects (Annex A). In addition, the Preliminary Plan provides updated and refined information of the system overview (Section 2), the system critical contingency equipment (Section 3), the system improvements (Section 4) and the vegetation program (Section 5), as well as in the introduction (Section 1). Revisions in other areas were also made for more clarity or precision. LUMA respectfully requests that the Energy Bureau use Exhibit 1 as the Preliminary Plan to be subject to evaluation in this proceeding, instead of the Preliminary Plan Draft.

WHEREFORE, LUMA respectfully requests the Energy Bureau to **take notice** of the aforementioned; **accept** the Preliminary Plan submitted herein in *Exhibit 1*; and **use** the Preliminary Plan in *Exhibit 1* herein for purposes of the evaluation to be conducted in this proceeding.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, on this 19th day of July 2024.

We hereby certify that I filed this Motion using the electronic filing system of this Energy Bureau. I will send an electronic copy of this Motion to counsel for PREPA Alexis G. Rivera Medina, arivera@gmlex.net, and to Genera PR LLC, alopez@sbgblaw.com, jfr@sbgblaw.com, and regulatory@genera-pr.com.

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Exhibit 1

Preliminary Plan (Updated)

System Improvements Preliminary Plan

July 19, 2024

System Improvements Preliminary Plan

INFORMATIONAL USE DISCLAIMER

The content in this document is furnished for informational use only and is subject to change without notice. The document should not be construed as a final commitment by LUMA to execute all the initiatives listed herein or as a limitation to include additional initiatives. This is designed as a dynamic plan borne of an iterative process and subject to changes to adjust and recognize situations where change is warranted. The initiatives listed here are also complementary and work in conjunction with additional initiatives that LUMA would seek to execute in due time.

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Tables & Figures

1.0 Introduction

On June 1, 2021, LUMA assumed operation and maintenance responsibility for the Puerto Rico Electric Power Authority's (PREPA) Transmission and Distribution System (T&D System) as specified in the Puerto Rico Transmission and Distribution Operating and Maintenance Agreement (T&D OMA) between PREPA, the Puerto Rico Public-Private Partnerships Authority (P3A), and LUMA. Upon commencement of operations, LUMA has executed multiple federally and non-federally funded initiatives in the transmission, distribution, substations, IT/telecom, buildings, and environmental asset categories (T&D Projects).

In accordance with the Resolution and Order dated June 13, 2024, the Puerto Rico Energy Bureau (PREB) required LUMA to develop an aggressive preliminary plan for system improvements to affect the reliability of electric service. This document provides a current analysis of the electrical system, programs and initiatives identified to repair and make these improvements, including cost estimates necessary and forecasted funding sources. Additionally, the Plan includes a timeline with reliability improvement projections, Vegetation Management and Vegetation Clearing initiatives and the Accelerated Storage Addition Program (ASAP).

LUMA's Historic Progress

When LUMA began operation of the electric system about three years ago, the effects of decades of under-investment and neglect were apparent. LUMA conducted a system-wide gap assessment that resulted in the identification of over 1,000 gaps which determined that the majority of system assets were in poor health. These deficiencies in physical assets correspond with negative effects on system performance and reliability which would require significant improvement, resources and capital. As recognized in the OMA, LUMA began operating an electrical system which could not meet Prudent Utility Practice and could not meet the T&D OMA Contract Standards. LUMA created the System Remediation Plan (SRP) to provide an appropriate transition from the initial state of the system and utility processes at commencement to one where conditions are met for Prudent Utility Practice and compliance with Contract Standards. Since then, LUMA has been implementing multiple improvement programs that focus on improvements to the T&D System and we have made tremendous progress across all facets of Puerto Rico's electric grid. Examples of the significant progress made over the last three years include:

- **Strengthening the energy system against storms and hurricanes**: by replacing more than 12,500 utility poles with new poles able to withstand 160+ mph winds,
- **Reducing size and the impact of outages:** by installing over 8,200 grid automation devices, which has saved our customers over 120 million service interruption minutes,
- **Addressing the largest cause of outages:** by clearing vegetation from over 4,500 miles of powerlines and electric infrastructure,
- **Improving community safety and energy efficiency:** by replacing over 106,000 streetlights as part of LUMA's Community Streetlight Initiative,
- **Empowering the adoption of solar energy:** by connecting over 91,000 customers to rooftop solar, representing 585 megawatts of clean, renewable energy for Puerto Rico, and,

- **Improving reliability during generation shortfalls:** by launching the Customer Battery Energy Sharing (CBES) initiative.

While there is clearly much more work to do, customers are already seeing results. In fact, an analysis of LUMA's daily reliability determined that more than 95% of LUMA's 1.5 million customers have had concurrent service for more than 98% of the year when generation is available.

Advancing FEMA Projects

Much of this progress has been made possible through collaboration and support from the Central Office for Recovery, Reconstruction and Resiliency (COR3) and Federal Emergency Management Agency (FEMA). Before LUMA commenced services, the previous operator had submitted only 37 projects to COR3 and FEMA for their consideration. In the three years since, **LUMA has worked closely and cooperatively with both agencies to submit 423 projects for consideration of federal funding – a record pace for Puerto Rico.** These 423 projects represent $13+ billion in federal funds and are critical to allowing for the short- and long-term investments necessary to transform and modernize the electric system and significantly improve service for customers across the island. Of those projects, 164 projects have received obligation, representing over $2 billion of project investments, as well as $2 billion incremental in available spend to procure long-lead materials and the engineering services needed to execute additional work. Already, of the 164 projects that are obligated, 142 are currently under construction and 29 have been energized. This work currently being executed in the field or already contributing to a more reliable and robust electrical system includes critical transmission priority pole replacement, distribution pole replacement projects, as well as critical substation projects, including a substation in Manatí.

Much more, however, remains to be done to allow the grid to reach the levels of reliability and resilience that Puerto Ricans expect and deserve. Other key programs that are planned or underway to improve service reliability and build system resiliency, including:

- The **Vegetation Safety and Reliability Initiative**, an island-wide initiative that will target overgrown vegetation from over 16,000 miles of powerlines to dramatically reduce outages for all customers by up to 45% once complete, the first portion of which has been obligated.

- The **Smart Meter Initiative** will install 1.5 million electric meters across Puerto Rico that will help modernize electric service across the island by helping to restore service more quickly, and improving customer service, and,

- The deployment of a modern **Energy Management System (EMS)** and a new **Primary Control Center Secondary Data Center & Control Room** will provide advanced operational capabilities.

In addition, LUMA continues to work with COR3 and FEMA on more than 250 projects that have initiated the approval process. These include allowing for the large-scale deployment of distribution automation, the rebuilding of critical transmission lines, and the deployment of a cutting-edge networked microgrid project serving Vieques and Culebra. LUMA also continues to complete the interconnection of 729 MW of utility-scale solar and 350 MW of utility-scale battery energy storage awarded through a competitive solicitation to independent power developers. Furthermore, LUMA continues to work with COR3, FEMA and other stakeholders to enable fulfillment of the island's energy needs and complete the transformation and modernization of the grid to allow for the integration of 100% renewable generation reliably.

In the next sections of this report, LUMA provides a high-level system overview, including the challenges and expected impacts of these investments, and then further detail the system improvement plan that is being executed over the next two years, including associated budgets and planned execution. The next sections also provide details of the following planned actions:

- Near-term restoration of out-of-service equipment, like substation transformers, circuit breakers and transmission lines, to stabilize the grid, and,
- Planned long-term capital projects that include substation rebuilds, new substations, transmission line pole replacements, and transmission line rebuilds,
- The hardening of poorly performing assets and equipment.

2.0 System Overview

The Puerto Rico electrical grid is a highly complex, interconnected system. To provide power to any one individual can require dozens of complex pieces of equipment to work perfectly in concert. To provide reliable, resilient power to 1.5 million customers living across Puerto Rico entails substations, transmission lines, and distribution feeders, as well as the control capabilities operating them, to work effectively together.

As has been well documented, Puerto Rico has suffered from decades of system-wide neglect under the prior operator; neglect which has been exacerbated by historic damage caused by natural disasters (earthquakes) and hurricanes. Since 1989, for example, the island's power grid has been severely impacted by six hurricanes, or more than one hurricane every six years. This includes Hurricane Hugo (1989) that knocked out power for 75% of the island's residents, Hurricane Hortense (1996) that caused approximately 40% of island residents to lose power, and Hurricane Georges (1998) that left approximately 96% of the island population without power.

In September 2017, the island was again struck by a major hurricane – Hurricane Irma – that significantly damaged the power grid and led to over one million residents losing power. Just weeks later, the island was struck by Hurricane Maria, which crippled the island's power grid and required more than a year just to restore power to all customers. In addition to large numbers of equipment out of service, even more equipment was vulnerable due to being required to operate for decades longer than the equipment lifetime designed by the manufacturer. After 2017, continued stress from events including Hurricane Fiona, a Category 1 storm in September 2022 which produced an island-wide blackout that required 12 days to restore 90% of customers, placed additional stress and damage on the already weakened and outdated infrastructure.

To mitigate these challenges, LUMA is executing a series of aggressive programs to rebuild the system in alignment with industry standards. LUMA utilizes industry best practices and established standards to model and assess the system. We then create long-term capital plans to harden the grid, improve reliability performance—by incorporating modern industry best-practices such as NERC CIP standards—and integrate renewable generation. For example, LUMA is designing in redundancy at substations by requiring reliable bus configurations like breaker-and-a-half and ring-bus which allow for the continuous operation of the substation even with an outage of a breaker, or other substation equipment.

Furthermore, since commencement LUMA has assessed, repaired and replaced many substation and transmission assets. These proactive activities have prevented outages by identifying priority items that

can be serviced or maintained before equipment failure that can cause an outage. For substations, LUMA has replaced 5 large substation transformers, and replaced over 42 transmission substation circuit breakers, as well as 25 distribution substation circuit breakers. These circuit breakers provide the essential service of quickly detecting and isolating disturbances, and protecting equipment, and are the essential device to maintain public safety by isolating and de-energizing faulted equipment on the grid. LUMA has also replaced more than 100 damaged transmission poles and structures to harden the grid. In addition, during FY2024 LUMA completed over 1160 insulator replacement projects, more than 600 hot spot repairs, and over 275 switch repairs on the transmission system. Combined, these transmission investments have provided hardening and reduced the likelihood of critical equipment failures causing customer interruption.

The grid's present state includes out-of-service assets described in Section 3. These include substation transformers that are currently out of service due to equipment failure and must be placed in service to reduce the likelihood and consequence of widespread outages. Similarly, out of service transmission lines cause power flows to increase on adjacent lines, which can increase the likelihood of failure and the number of customers affected when an unexpected failure occurs. These out-of-service transmission facilities are discussed in Section 3 and must be restored to service to reduce reliability impacts to the grid.

Future improvement plans, projects and programs are detailed in Section 4. In the next two years, the focus will be on near-term restoration of out-of-service equipment like substation transformers, circuit breakers and transmission lines to stabilize the grid. Planned long-term capital projects that include substation rebuilds, new substations, transmission line pole replacements, and transmission line rebuilds, and hardening of poor performing assets and equipment are currently in progress with COR3 and FEMA.

This document focuses on part of a larger plan to deploy significant funds to transform the grid. In the next five years, LUMA expects to have deployed close to $10 B of federal funds, which will serve as a major step towards increasing the system’s operational flexibility, reliability, and resilience while also improving customer service and allowing integration of distributed and clean energy sources towards the existing public policy goals. For example, these investments over the next five years will:

- Harden and upgrade the transmission system which will improve reliability, capacity, and resiliency, including bringing nine transmission circuit segments into compliance with North American Electric Reliability Corporation (NERC) reliability criteria violations.
- Rebuild distribution feeders with poor reliability performance and those that serve critical power facilities, targeting the worst-performing feeders first.
- Improve reliability by strategically clearing hazardous vegetation from more than 16,000 miles of power lines and substations over the next three years.
- Strengthen the overall resiliency of the electric grid by (1) hardening and modernizing substations, (2) making upgrades to conform to the latest codes, industry standards, and practices, (3) replacing electromechanical and electronic relays, (4) relocating or mitigating substations in flood-prone areas, and (5) deploying new substations to meet industry standards.
- Increase system reliability and resiliency through the installation of grid automation devices, which are smart switches that are used to reduce the impact and duration of outages and install grid communication equipment to improve service restoration times for customers.

- Strengthen grid resiliency to better withstand severe weather by replacing damaged or old distribution poles and transmission towers, along with their associated hardware and conductors, with hardened equipment that can withstand at least 160 mph winds.

3.0 System Critical Contingency Equipment

LUMA continues to regularly analyze the grid using industry-standard, rigorous planning processes and tools to identify weak points of the grid. This analysis evolves over time as conditions change. Factors than can affect the system include new loads associated with businesses and residences; new generation, including renewable deployments; and loss of critical substation and transmission equipment. LUMA has addressed many areas of the grid where a critical contingency could have caused system issues since commencement. Below we identify some of the remaining critical weak points in the grid and the planned efforts to mitigate them. These projects will be funded with a mixture of federal capital, non-federal capital, and operations and maintenance (O&M) expenditures. Over the next two years the funding source for a specific project may be modified based on guidance and rulings from FEMA, COR3, and PREB.

3.1 Prioritized Substation Equipment

Table 1-1 identifies prioritized substation equipment, including their “as-is” grid condition, plans to mitigate, potential permanent solution funding option, and estimated completion date. Should this equipment not be able to function, it can pose threats to the reliability and resilience of the grid.

Substation transformers are perhaps some of the most critical components in the electric grid. Reliable design therefore includes redundancy for any one transformer. However, for example, when one transformer fails, it requires putting additional load on the remaining functioning transformers, which can often put that transformer in a more vulnerable state. Should a second contingency transformer fail, it can often lead to connected transmission and distribution lines not being able to transmit power to serve customers. In the table below, we identify not only the prioritized transformers, but the associated transformers that are in a more vulnerable state, and the transmission or distribution lines that can be affected should an additional piece of equipment fail.

3.2 Prioritized Transmission Substation Transformers

Substation	Caguas TC
Prioritized Out-of-Service Equipment	Transformer 115/38/13 kV
Risk[1]	High
Contingency Component	Caguas TC - Bank 1 Transformer
Potential Affected Equipment	L-9300 Juncos - G Benitez
Load Impact	180 MW
Operational Mitigation	Rotational load shedding. Emergency switching and mobile generators to reduce impact
Permanent Solution	Replace transformer bank #2 with available unit; Relocate TC
Potential Permanent Solution Funding	FEMA
Est. Completion Date	Q2 FY2028
Substation	Monacillos TC
Out-of-Service Equipment	Transformer Bank 1 - 115/38 kV
Risk	High
Critical Contingency Component	Monacillos TC Bank 2 -115/38 Kv
Potential Affected Equipment	L-3500 Monacillos - Caparra

[1] High Risk refers to either the increased likelihood of the failure of additional equipment due to significantly exceeding the maximum emergency rating of the equipment, or the increased likelihood of disruptive impacts including area load-sheds and/or cascading outages. Medium risk refers to either a moderate likelihood of the failure of additional equipment due to exceeding the maximum emergency rating of the equipment, of the moderate likelihood of disruptive impacts including localized load-sheds.

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Load Impact	180 MW
Operational Mitigation	Rotational load shedding. Emergency switching and mobile generators to reduce impact
Permanent Solution	Replace transformer bank #3
Potential Permanent Solution Funding	FEMA
Est. Completion Date	Q1 FY2025
Substation	Monacillos TC
Out-of-Service Equipment	Transformer Bank 1 & 3 -115/38 kV
Risk	High
Critical Contingency Component	Monacillos TC breaker
Potential Affected Equipment	L-1000 Venezuela-Capuchino
Load Impact	10 MW
Operational Mitigation	Emergency switching and repair or replace affected breaker
Permanent Solution	Replace transformer bank #3
Potential Permanent Solution Funding	FEMA
Est. Completion Date	Q1 FY2025
Substation	Sabana Llana TC
Out-of-Service Equipment	Autotransformer 2 - 230/115 kV

System Improvements Preliminary Plan

Risk	High
Critical Contingency Component	Sabana Llana TC Auto 1 (230 kV / 115 kV)
Potential Affected Equipment	L-41400 Juncos-Humacao
Load Impact	270 MW
Operational Mitigation	Rotation load shedding. Emergency switching and mobile generators to reduce impact.
Permanent Solution	Replace Sabana Llana autotransformer #2 and replace Bayamon transformer
Potential Permanent Solution Funding	FEMA
Est. Completion Date	Q2 FY2027
Substation	Bayamon TC Auto
Out-of-Service Equipment	Transformer 115/38 kV
Risk	High
Critical Contingency Component	Manati TC 230/115 kV Autotransformer
Potential Affected Equipment	L- 39000 Ponce - Juana Diaz L-1000 Venezuela - Capuchino Cambalache & Sabana Llana 230/115 kV Transformers.
Load Impact	10 MW
Operational Mitigation	Emergency switching
Permanent Solution	Replace Bayamon transformer

System Improvements Preliminary Plan

Potential Permanent Solution Funding	FEMA
Est. Completion Date	Q2 FY2026
Substation	Bayamon TC
Out-of-Service Equipment	Autotransformer 230/115 kV
Risk	Medium
Critical Contingency Component	Cambalache 230/115 kV Autotransformer
Potential Affected Equipment	L-37400 Vega Baja-Manati
Load Impact	<10MW
Operational Mitigation	Emergency switching
Permanent Solution	Replace Bayamon TC Transformer
Potential Permanent Solution Funding	FEMA
Est. Completion Date	Q1 FY2025
Substation	Costa Sur Power Plant TC
Out-of-Service Equipment	Auto 1 230/115 kV
Risk	Medium
Critical Contingency Component	Costa Sur Power Plant TC Auto 2 (230/115 kV)
Potential Affected Equipment	Ponce TC 230/115 Auto #1
Load Impact	<10MW
Operational Mitigation	Emergency switching

System Improvements Preliminary Plan

Permanent Solution	Replace Costa Sur 230/115 kV auto-transformer
Potential Permanent Solution Funding	FEMA
Est. Completion Date	Q4 FY2027
Substation	Llorens Torres
Out-of-Service Equipment	38/13.2 kV
Risk	Medium / High
Critical Contingency Component	Loss of mobile substation 15
Potential Affected Equipment	Multiple distribution feeders from same substation.
Customer Impact	~ 9000 customers
Operational Mitigation	Emergency load switching and installation of temporary breakers
Permanent Solution	Repair of metal-clad equipment
Potential Permanent Solution Funding	FEMA
Est. Completion Date	FY2025
Substation	Hato Rey TC
Out-of-Service Equipment	115/13.2 kV
Risk	Medium / High
Critical Contingency Component	Loss of adjacent circuit 1419-00
Potential Affected Equipment	Multiple distribution feeders from same substation.

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Customer Impact	~ 3000 customers
Operational Mitigation	Mobile generators and/or mobile substation
Permanent Solution	Replacing transformer
Potential Permanent Solution Funding	FEMA
Est. Completion Date	Q2 FY2025
Substation	Covadonga GIS
Out-of-Service Equipment	38/4.16 kV
Risk	Medium
Critical Contingency Component	Loss of adjacent substation 1011
Potential Affected Equipment	Multiple distribution feeders from substation 1011.
Customer Impact	~ 5000 customers
Operational Mitigation	Install mobile substation
Permanent Solution	Perform permanent repairs to Covadonga GIS equipment
Potential Permanent Solution Funding	NFC
Est. Completion Date	Q1 FY2026
Substation	Factor Sectionalizer
Out-of-Service Equipment	38/13.2 kV

Risk	Medium
Critical Contingency Component	Loss of mobile substation 10
Potential Affected Equipment	Multiple distribution feeders from Factor Sectionalizer
Customer Impact	~ 3500 customers
Operational Mitigation	Mobile generation and/or mobile substation
Permanent Solution	Transformer replacement
Potential Permanent Solution Funding	FEMA
Est. Completion Date	TBD

Table 1-1. Prioritized Transmission Substation Transformers

3.3 Prioritized Transmission Equipment

LUMA also continues to regularly analyze transmission lines using industry-standard rigorous planning processes and tools to identify weak points of the grid. Power flow models are updated to represent the status of each out-of-service transmission line, identify the alternate paths for power flows that compensate for the out-of-service equipment, and then contingency scenarios are run to determine the potential risks and customer impacts. Table 1-2 identifies critical line outages and resulting contingencies, and their customer impact, as well as solutions which were identified to stabilize system conditions.

3.4 Prioritized Transmission Lines

T-line Out-of-Service Equipment	L-8700 Costa Sur SP-Garzas 1 HP
Risk	High
Critical Contingency Component	BKR 9060 at Garzas HP 1
Potential Affected Equipment	Load shed at Garzas 5403 and Peñuelas 5401
Potential Customers Impacted	~ 9000 customers
Operational Mitigation	Enable tie between lines 500 and 9000.

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T-line Out-of-Service Equipment	L-8700 Costa Sur SP-Garzas 1 HP
Permanent Solution	Replace breaker 9060.
Potential Permanent Solution Funding	TBD
Est. Complete date	TBD
T-line Out-of-Service Equipment	L- 4800 Santa Isabel TC-Toro Negro 1 HP
Risk	High
Critical Contingency Component	BKR 4850 at Santa Isabel TC
Potential Affected Equipment	Load shed at Useras 4601, Santa Isabel 4401 & Private Customers
Potential customers Impacted	~ 9000 customers
Operational Mitigation	Temporary onsite generation. Deploying in-kind replacement transformer in Q1 FY2025
Permanent Solution	Upgraded Santa Isabel 115/38 kV transformer replacement
Potential Permanent Solution Funding Source	FEMA
Est. Complete date	Q4 2026
T-line Out-of-Service Equipment	L-2100 Dos Bocas HP-Hatillo TC
Risk	High
Critical Contingency Component	BKR 2170 at Hatillo TC

T-line Out-of-Service Equipment	L-8700 Costa Sur SP-Garzas 1 HP
Potential Affected Equipment	Load shed at Dominguito 8010
Potential customers Impacted	~ 10,000 customers
Operational Mitigation	Transferring load between distribution circuits.
Permanent Solution	Replace Breaker 2170 at Hatillo TC
Potential Permanent Solution Funding	TBD
Est. Complete date	Q3 2027

Table 1-2. Prioritized Transmission Lines

4.0 System Improvements Preliminary Plan

Following Hurricanes Maria and Irma, leveraging Section 428 of the Stafford Act, FEMA aligned with COR3 and PREPA on a FEMA Accelerated Awards Strategy (FAASt) settlement, setting aside $10.7B, of which $9.7B would be used to make repairs on the transmission and distribution system. Additionally, FEMA conducted an island-wide benefit cost analysis, which estimated the value of hazard mitigation investments on the energy system, in line with Section 406 of the Stafford Act, to be $7.6B. Under the assumption that these $7.6B would be allocated using a similar breakdown to how the $10.7B of 428 funds were allocated, LUMA has developed an estimate that the overall amount of FEMA has set aside funds for permanent T&D repairs comes to above $16 billion. In addition, LUMA is also leveraging non-federal capital and O&M funds to improve reliability and service.

LUMA's Improvement Programs cover critical asset categories and utility processes. Below is a high-level view of the Improvement Programs LUMA is prioritizing for the next two fiscal years that will directly improve system stability and reliability.

4.1 Transmission Line Rebuilds Overview

The Transmission Line Rebuild program increases resilience by reconstructing transmission lines so they will withstand high wind loads, become floodproof by elevation or relocation, and reduce concerns related to contingency security violations. As part of the Transmission Line Rebuild program, LUMA performs comprehensive modeling and analysis on the transmission lines to verify criteria such as equipment loading, voltage profile, automation device placement, and coordination of protective devices. This program includes 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.

LUMA will combine these activities with field assessments to identify assets in need of repair or replacement. The goal is to bring these transmission lines up to industry codes and standards and mitigate other issues identified during the analysis, to allow for improved reliable and sustainable service for the people of Puerto Rico.

Because of the significance of these transmission lines, LUMA is aiming to leverage a significant amount of federal funds to rebuild them. The transmission system helps relay large quantities of power, including utility-scale renewable generation that is being deployed in alignment with Act 17-2019. Additionally, the proper functioning of the transmission system is necessary to reduce the risk of cascading events including blackouts, as well as to allow for the re-energization of the system, including through the black start process, when necessary.

Currently, LUMA is working with COR3 and FEMA on the review of critical transmission lines, including backbone 115 and 230 kV transmission lines, as well as sub-transmission 38 kV lines which play a critical role in providing reliable power to communities across the island.

4.1.1 Federal Fiscal Year Budgets

Federal Fiscal Year 25-26 Budgets		
Fiscal Year	**FY2025**	**FY2026**
Est. Budget	$67	$163

Table 1-3. Federal Fiscal Year Budgets

4.1.2 Project Execution

Projects Name	Construction		FEMA Obligation Status
	Estimated Start Date	Estimated Completion Date	
Preliminary Network Upgrades	FY2025	FY2026	To be reformulated
3600 – Monacillos TC to Martin Pena	FY2026	FY2028	Pending
2800 – Aguadilla Hospital Distrito Sect to T-Bone TO	FY2026	FY2027	Pending

Table 1-4. Project Execution

4.2 Transmission Reliability Improvement Plan

Project Execution

Part of LUMA's system reliability improvement plan is to conduct yearly evaluation of the system condition and reliability performance. The yearly reliability improvement plan for transmission focuses on specific

System Improvements Preliminary Plan

transmission line segments that have experienced multiple failures resulting in customer outages over the previous fiscal year (12-month performance). From this analysis it was determined that the top 51 line segments on the 38 and 115 kV systems contributed to approximately 75% of all transmission related customer minute interruptions. 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:

Rank	Segment	Line
1	1900-Dos Bocas HP-San Sebastian TC	1900
2	37500-Rio Bayamon Sect-Monacillos TC	37500
3	500-Ponce TC-Costa Sur SP-Canas TC	500
4	13700-Mora TC-Isabela TO	13700
5	3200-Monacillos TC-Venezuela SECT	3200
6	2200-Factor SECT-Barceloneta TC	2200
7	37400-Cambalache TC-Dos Bocas Hydro Plant	37400
8	3000-Monacillos TC-Barioa TO	3000
9	7800-Dorado TC-Vega Alta SECT	7800
10	2700-Aguadilla Hospital Distrito SECT-Mora TC	2700
11	300-Toro Negro 1 HP-Juana Diaz TC	300
12	7200-Baldrich SECT-Escuela Industrial TO	7200
13	2300-Dos Bocas HP-Arecibo SECT	2300
14	7900-Juana Diaz TC-La Rambla SECT	7900
15	13500-Acacias TC-Cabo Rojo TO	13500
16	600-Caguas TC-Gautier Benitez SECT	600
17	100-Jobos TC-Guayama TO	100
18	10300-Canovanas TC-Canovanas SECT	10300
19	2300-Arecibo SECT-Cambalache TC	2300

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Rank	Segment	Line
20	7100-Viaducto TC-Egozcue SECT	7100
21	11400-Barceloneta TC-Florida TO	11400
22	2000-Once de Agosto SECT-San Sebastian TC	2000
23	5900-San Juan SP-Crematorio TO	5900
24	3600-Llorens Torres SECT-Martin Peña TC	3600
25	1000-San Anton TO-Villa Prades SECT	1000
26	1200-San German SECT-San German TC	1200
27	2200-Vega Alta SECT-Dorado TC	2200
28	7400-Hato Rey TC-Tres Monjitas SECT	7400
29	5400-Rio Blanco HP-Daguao TC	5400
30	2600-San Sebastian TC-Quebradillas SECT	2600
31	3500-Monacillos TC-Las Lomas SECT	3500
32	3300-Viaducto TC-Egozcue SECT	3300
33	1000-Villa Prades SECT-Capuchinos SECT	1000
34	8900-Monacillos TC-Centro Médico SECT	8900
35	13400-Acacias TC-San German SECT-LA PARGUERA SEC	13400
36	36200-Monacillos TC-Juncos TC-	36200
37	3100-Monacillos TC-Sabana Llana TC	3100
38	1600-Leon SECT-Acacias TC	1600
39	6500-Toro Negro 1 HP-Barranquitas TC	6500
40	3000-Juncos TC-Rio Blanco HP	3000
41	2200-Barceloneta TC-Manati TC	2200
42	6500-Comerio TC-Aguas Buenas SECT	6500

Rank	Segment	Line
43	5600-Añasco TC-Mayaguez GP	5600
44	3600-Sabana Llana TC-Los Ángeles SECT	3600
45	10000-Bayamon Pueblo SECT-Magnolia TO	10000
46	4700-Canas TC-Adjuntas TO	4700
47	3100-Canovanas SECT-Rio Grande TO	3100
48	3700-Maunabo TC-Humacao TC	3700
49	3600-Monacillos TC-Sabana Llana TC	3600
50	9400-Dorado TC-Toa Alta	9400
51	700-Costa Sur SP-Yauco 2 HP	700

Table 1-5. Transmission Segments

4.3 Substation Rebuilds Overview

The Substation Rebuilds program focuses on improvements to substations to strengthen the electric grid, and covers required high-level assessments, minor substation repairs, and rebuilding of damaged or end-of-life substations. This includes upgrades to the latest codes and industry standards to achieve reliability improvement. The Substation Rebuilds program focuses on the rebuilding of existing substations that are in poor physical condition, the rebuilding of substations with a history of operational deficiencies, the mitigation of flood risk where applicable, and the relocation of substations with a high risk of flooding when flood mitigation alone is not an option. Based on analysis conducted by LUMA, 87 substation sites are located within areas determined to be FEMA as susceptible to flooding.

This program utilizes a foundation of asset prioritization, which means that relevant aspects of reliability, resilience, risk, exposure, impact, and criticality were quantified, and the results ranked such that the highest needs were addressed first, both to maximize the impact of investment and prioritize the remediation of the most critical items. This method introduces industry best practices for reliability and resilience enhancements, such as reliable bus configurations, the adoption of enclosed metal-clad and gas-insulated switchgear, and the modernization of infrastructure to provide operating flexibility. Enhanced bus configurations may include main-and-transfer bus, ring bus, or breaker-and-a-half configurations. Each of these provides enhanced reliability by mitigating the possibility of failure of a single bus or substation element, minimizing the probability and the likelihood of customer outages for these common failure modes, and leveraging advanced technologies including those aligned with IEC 61850. The enclosed metal-clad and gas-insulated switchgear provides additional capacity to resist exposure to extreme weather such as heavy wind and flooding, thereby improving the resiliency of the grid, reducing the risk of outages during disruptive weather events.

Flood mitigation may be accomplished by elevating or relocating equipment to minimize the probability and likelihood of damage. Substations needing relocation to mitigate flood risks are full substation rebuilds that will incorporate reliable configuration, modern technology, and low flood-risk locations. Adoption of technology such as intelligent substation automation and protocols also provides higher reliability, operating flexibility, and manageable costs.

This program focuses on improvements to T&D substations to strengthen the grid. This includes (1) hardening and modernizing substations, (2) making upgrades to conform to the latest codes, industry standards, and practices, (3) replacing electromechanical and electronic relays, (4) relocating or mitigating substations in flood-prone areas and (5) deploying new substations to meet industry standards.

This program will also focus on the demarcation requirements for transmission and generation assets, required under the T&D OMA; specifically, the scope of services as set forth in Annex I. High-accuracy metering is required to accurately measure power generation at major plants and their injection into the network and to facilitate communication with the system operator. This measurement will provide transparency of total net power generation and energy losses to the network, enabling improved system efficiencies and potential associated cost reductions. This demarcation will also be defined in a non-complicated manner to provide LUMA and Generation Company operators sufficient clarity regarding the separation of assets to prevent mis-operation and subsequent damage to equipment and/or system outages. A Demarcation Study identified opportunities to manage these deployments, and the plant retirement projections called for in the IRP are considerations to prioritize the work.

Currently, LUMA, COR3, and FEMA have reached alignment on the obligation of 21 substation rebuild projects. This includes portions or the entirety of the rebuilding of six of the seven most critical substations, as well as other key substation repairs across Puerto Rico.

4.3.1 Federal Fiscal Year Budgets

Federal **Fiscal Year 25-26 Budgets**		
Fiscal Year	FY2025	FY2026
Est. Budget ($M)	$89	$172

Table 1-6. Federal Fiscal Year Budgets

4.3.2 Project Execution

Major Projects	Construction		FEMA Obligation Status
	Estimated Start Date	Estimated Completion Date	
Catano Moder & Hard 1801	9/5/23	FY2026	Obligated
Aguirre BKRS T018	5/3/23	FY2027	Obligated
Costa Sur BKRS P001	5/15/24	FY2026	Obligated
EPC Monacillos TC – Rebuild	FY2026	FY2029	Obligated
Sabana Llana TC	12/19/23	FY2029	Obligated
Centro Medico 1 & 2 1327 & 1	FY2026	FY2027	Obligated
San Juan SP TC	FY2026	FY2029	Obligated
Rio Grande Estates – CH - 2306	9/7/23	FY2026	Obligated
Cambalache TC Relocation	FY2026	FY2027	Pending
Tapia GIS Rebuild - 1102	FY2025	FY2027	Obligated

Table 1-7. Projects Execution

4.4 Substation Reliability Overview

This federally funded program reinforces and upgrades the existing and aging system infrastructure to improve system reliability. This includes the replacement of transformers, oil circuit breakers, distribution circuit breakers, other high voltage equipment, Alternating Current / Direct Current (AC/DC) systems, standby generators, relays, Remote Terminal Units (RTUs) and auxiliary systems, along with Protection, Automation, and Control (PAC) upgrades, as well as procurement of emergency spares. At the end of the program, LUMA will have achieved the following: Restoration of substation design capacity to industry standards, rehabilitation, emergency replacements, and continual renewal of high voltage equipment in substations, modernized PAC and Supervisory Control and Data Acquisition (SCADA) systems for data collection and use based on the latest industry standard.

Upon LUMA commencing service in 2021, much high voltage infrastructure was found to be aging, with a large quantity operating past its expected useful life. The vast majority of substations still have transformers and circuit breakers in operation that PREPA installed more than 40 years ago and have experienced electrical faults and system disturbances far in excess of other typical utilities. All this equipment is being subjected to more rigorous and frequent assessment and testing to maximize

longevity, as well as to prioritize their replacements. Replacement will be based on condition assessments, including but not limited to, oil sampling on power transformers, breaker timing tests, and contactor resistance checks for high-voltage breakers.

Additionally, in some cases, transmission substations either lack an installed emergency generator or have one that is not in good working condition. Industry standards call for emergency generators to act as backup AC/DC power supply for all 230 kV substations. Moreover, deficient AC/DC systems with cabling issues, broken panels, and defective battery banks have been identified and must be addressed to improve system restoration time in cases of emergency.

The prevalence of obsolete PAC and SCADA systems adds to our maintenance costs, reduces the possibility of implementing asset monitoring to support the Asset Management process and compromises our ability to supervise and operate the system remotely.

After evaluating maintenance records, conducting significant testing and assessments, and analyzing the results, it was determined that a considerable amount of equipment was out of cycle with respect to its maintenance intervals. The high number of operations required to be executed by the equipment represents significant wear and tear above what a normal utility would experience.

These are significant needs that have been identified and have driven the effort to initiate and execute planned program-level equipment replacement programs, including oil circuit breakers, gas circuit breakers, metal-clad switchgear, power transformers, protection, automation, and control system to ensure LUMA is able to effectively reduce power outages and respond and restore power to customers when necessary.

4.4.1 Fiscal Year Federal Budgets

Fiscal Year Federal Budgets		
Fiscal Year	**FY2025**	**FY2026**
Est. Budget ($M)	$26	$58

Table 1-8. Fiscal Year Federal Budgets

4.4.2 Project Execution

Major Projects	Construction		FEMA Obligation Status
	Estimated Start Date	Estimated Completion Date	
Humacao TC	FY2024 (site prep only)	FY2026	Pending
Canovanas TC	FY2025	FY2026	Pending
Barceloneta TC	FY2024	FY2025 (38kVs) FY2026 (115kVs)	Pending
SCADA Remote Access and RTU Replacements Group 1	FY2025	FY2026	Pending
SCADA Remote Access and RTU Replacements Group 2	FY2025	FY2026	Pending
SCADA Remote Access and RTU Replacements Group 3	FY2025	FY2027	Pending

Table 1-9. Project Execution

In addition to the above projects which are expected to receive FEMA funding, LUMA is also leveraging its Non-Federally Funded Capital (NFC) and O&M budgets to execute priority repairs on key substations. LUMA's system reliability improvement plan looks at substation reliability performance over prior fiscal year (12-month performance) with a focus of identifying substations with recurring events, multiple breaker operations, customer interruptions and outage duration as requiring additional repairs.

For FY2025 the reliability analysis of the top 24 substations revealed that these substations contributed to over 1/3 of all substations related outages and over 40% of customer minute interruptions from substation related outages. To improve the reliability performance of these substations and help mitigate future outages, LUMA plans to perform assessments and preventative and corrective maintenance on all 24 substations: including infrared thermography, hotspot repairs, minor component repairs, wildlife protection, lighting arrestor repair and installation, as well as performing preventative maintenance on distribution breakers.

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Region	District	Substations	Customers
Ponce	Ponce	Rambla 13 kV	8,700
Caguas	Barranquitas	Cidra	8,500
Arecibo	Arecibo	Pajuil	5,000
Arecibo	Vega Baja	Vega Alta 8 kV	8,000
San Juan	San Juan	Llorens Torres 13 kV	9,000
Ponce	Yauco	Yauco Pueblo II	7,600
Ponce	Guayama	Salinas Urbano	5,600
Ponce	Yauco	Yauco Pueblo 1	5,800
Bayamón	Toa Baja	Dorado PDS 13 kV	1,100
Caguas	Caguas	San Lorenzo	7,000
Caguas	Humacao	Verdemar	3,000
San Juan	Fajardo	Culebra	1,500
Ponce	Yauco	Parguera PDS	3,200
San Juan	Canóvanas	Villamar	4,600
San Juan	San Juan	Tres Monjitas	1,500
Mayaguez	Aguadilla	T – Bone	7,800
Arecibo	Arecibo	Arecibo Hosp. Distr. 13 kV	5,000
San Juan	San Juan	Hato Rey TC #1	2,300
San Juan	San Juan	Reparto Metropolitano	2,400
Mayaguez	Aguadilla	Ramey Field 3	3,000

Region	District	Substations	Customers
Caguas	Caguas	Caguas T.C. 13.2 kV	7,100
Bayamón	Toa Baja	Breñas	3,400
Caguas	Caguas	Caguas T.C.	3,300
Caguas	Barranquitas	Las Cruces	3,100

Table 1-10. Substations

4.5 Distribution Automation Overview

This program focuses on deploying equipment for grid automation. It includes deploying automated switchgear and communicating fault sensors on distribution feeders to improve reliability. The included switchgear consists of three-phase and single-phase reclosers. To further enhance reliability, LUMA will deploy automatic switching distribution feeder automation systems. Communicating fault sensors will be deployed to provide fault location information to Operations to improve service restoration times for customers.

Communication components and system tools are included to enable remote operation and visualization of the field devices. Labor and services are included for reliability analysis, load flow analysis, protection coordination studies, engineering design packages, testing, installation, commissioning, enterprise integration of operational and nonoperational data, training, and maintenance.

The system contains a series of gaps, including:

- The distribution system does not align with regulation/law, specifically Act 17, Subsection 1.15 (o).
- Inadequate or insufficient technology is employed in the distribution system to improve system reliability.
- Feeders do not have in-line automated switchgear to reduce the number of customer interruptions per outage occurrence. Substation breakers and fuses are used for protection, causing unwanted outages and slow, laborious restoration actions.
- Fault locations are unknown by Operations, and the faulted circuits must be manually located by inspecting the feeder network.
- Feeder system loading is not visible to balance loads at a substation on a per feeder and per phase basis, causing poor visibility for planning purposes.
- Reliability performance metrics are currently below industry standards (in the fourth quartile).
- Distribution automation fleet management software applications were not considered during the initial stage of the program. However, given the volume of smart distribution automation devices,

fleet management software is needed to maintain a large fleet of reclosers, fault sensors, and other grid edge devices under the distribution automation program. These software-based solutions allow for system health monitoring at a device level and programmatic maintenance.

- Distribution automation includes two distinctly different functions. One is reliability improvement, addressed in this program, and the other is power quality. The power quality includes voltage management systems that ensure customers receive a quality supply within industry standards.

To mitigate this, the program brief includes a series of steps. First, there will be studies undertaken to plan the location, testing, and installation of new intelligent reclosers, single-phase reclosers, and fuse cutouts. It will also upgrade the communication system components and deploy Fault Location, Isolation, and Service Restoration (FLISR) and Automatic Transfer Switch (ATS) systems, which automate the outage restoration and load re-routing process. This includes the installation of fault indicators on select feeders (including mainline and feeder ties) to reduce the number of customer interruptions per outage.

LUMA has worked with COR3 and FEMA to submit the first detailed scopes of work (SOW) of what will ultimately be a $700M project to deploy grid automation across Puerto Rico.

Figure 1 – Grid Automation Map

4.5.1 Fiscal Year Federal Budgets

Fiscal Year Federal Budgets		
Fiscal Year	FY2025	FY2026
Est. Budget ($M)	$90	$143

Table 1-11. Fiscal Year Federal Budgets

4.5.2 Project Execution

LUMA plans to install more than 11,000 automation devices in the next two years, including three phase reclosers, single phase reclosers, communicating fault current indicators (CFCI) and distribution

protective devices, pending FEMA obligation. The following table provides information regarding the quantity of the devices planned to be installed.

Fiscal Year	Total Devices
FY2025	**5,500+**
FY2026	**5,600+**

Table 1-12. Project Execution

5.0 Vegetation

5.1 Vegetation Clearing Program

5.1.1 Workstream Overview

The Vegetation Clearing workstream includes management of all efforts related to the $1.2B vegetation clearing effort planned to occur over the next four years (between FY2025 and FY2028). The scope covers the San Juan, Arecibo, Bayamón, Caguas, Mayagüez, and Ponce regions for all overhead lines and feeders on the island for full line/feeder clearing across all substations, transmission, distribution and telecom facilities.

Execution is prioritized by region and asset classification as outlined in the following two tables. The alignment of assets into each of the groups identified below was derived from feedback and discussion with FEMA. Obligation of Projects is expected to support this execution strategy; all detailed SOWs for projects were originally submitted by December 19, 2023; FEMA Environmental and Historic Preservation (EHP) review and obligation is pending based on resubmittals (see Obligation Schedule below). The first project, San Juan Group A was obligated in June 2024.

Priority	Region
1	San Juan
2	Caguas
3	Bayamón
4	Mayagüez
5	Arecibo
6	Ponce

Table 1-13. Six Regions in Scope for Island-Wide Vegetation Clearing

Group	Asset Description
A	Distribution Non-Sensitive Vegetation
B	Transmission 38 kV non-sensitive
C	All 38 kV & Distribution EHP Sensitive
D	Transmission 115 kV
E	Substation & Telecom Sites
F	All Regions Transmission 230 kV

Table 1-14. Groups A-F with Asset Description

5.1.2 Obligation Schedule

The remaining Group A and Group B regions have been further divided into High Density Urban Area & Low Density Urban Area subcategories. These were divided, via an agreement between LUMA Environmental and FEMA Environmental, for FEMA to be able to conduct faster environmental reviews. The High Density Urban Area is defined by an area having lower amounts of vegetation which is measured by the level of reflection of infrared light. Lower levels of reflection from vegetation are due to the lower level of vegetation density. The Low Density Urban Area is defined by an area having more vegetation density which is determined by a higher level of reflection of infrared light.

Through the obligation of the first project, LUMA has aligned with COR3 and FEMA on more precise information about what is required for COR3 and FEMA to complete their reviews. LUMA is now re-submitting the detailed SOWs that had been submitted in 2023 to include this information. Table 1-15 below identifies the Group A and B High and Low Density planned re-submittal dates to COR3 and FEMA and obligation status.

In general, for the Distribution projects (Group As and parts of Group C) the FEMA Obligation will take 3 to 6 months from the LUMA re-submittal date based on the current level of engagement with FEMA. The Transmission projects (Groups B, C, D, and F) can take up to 18 months or more depending on the level of environmental concerns during review. LUMA is currently developing a re-submission schedule for the remaining Groups (additional Group B (Low Density), Group C Regions, and remaining Transmission and Substation/Telecom project. Those dates are currently being calculated based on the internal LUMA actions needed to complete the revised mapping.

Group A High Density		
Project Region/FAASt Number	**Planned Re-Submittal Date to COR3 and FEMA**	**Pending Obligation**
Bayamón -727572	Q4 FY2024	Yes
Arecibo - 728827	Q1 FY2025	Yes
Caguas - 727692	Q1 FY2025	Yes
Mayaguez - 728832	Q1 FY2025	Yes
Ponce - 727531	Q1 FY2025	Yes
Group A Low Density		
Bayamón- 750065	Q1 FY2025	Yes
Arecibo - 750066	Q1 FY2025	Yes
Mayaguez - 750068	Q2 FY2025	Yes
Caguas - 750067	Q2 FY2025	Yes
Ponce - 750063	Q2 FY2025	Yes
Group B High Density		
All Group B High Density Region Projects	Q1 FY2025	Yes

Table 1-15. Vegetation Clearing FEMA Re-Submission Schedule for Vegetation Group A (High and Low Density) and Group B (High and Low Density) Projects.

5.1.3 Project Plan

The vegetation clearing program was originally organized into 31 projects over the 6 Groupings, each with its own unique FAASt Number. As discussed above, the Group A's and B's have been further divided into High and Low Density Areas. The High-Density Areas will retain the original Group/Region FAASt number and the Low-Density Areas will be designated as new projects with new FAASt numbers.

The revised vegetation clearing program will have 42 projects over the 6 Groups. Table 1-16 and Figure 2 below display the high-level schedule and Gantt Chart display, with Table 1-17 identified as the estimated construction (vegetation clearing) start dates that were used to build the initial high-level schedule of 31 projects.

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Region	FAASt Number	Project Name	Estimated Cost	Total Miles/Acres
San Juan	723883	FAASt [Region 1 San Juan Distribution - Non-Sensitive (Vegetation)	$24.8 (M)	688.74
San Juan	740406	FAASt [Region 1 San Juan Transmission 38kV - Non-Sensitive (Vegetation)]	$7.8 (M)	210.03
San Juan	727691	FAASt [Region 1 San Juan Transmission 38kV/Distribution EHP sensitive areas] (Vegetation)	$55.6 (M)	1472.61
San Juan	727608	FAASt [Region 1 San Juan Transmission - 115kV] (Vegetation)	$12.7 (M)	153.47
San Juan	741097	Region 1 San Juan Substation/Telecom	$1.3 (M)	33.95
Caguas	727692	FAASt [Region 4 Caguas Distribution - Non-Sensitive (Vegetation)	$34.3 (M)	929.15
Caguas	740409	FAASt [Region 4 Caguas Transmission 38kV - Non-Sensitive (Vegetation)]	$4.8 (M)	98.49
Caguas	727694	FAASt [Region 4 Caguas Transmission 38kV/Distribution EHP sensitive areas] (Vegetation)	$76.4 (M)	2075.31
Caguas	727606	FAASt [Region 4 Caguas Transmission - 115kV] (Vegetation)	$11.1 (M)	133.97
Caguas	741100	Region 4 Caguas Substation/Telecom	$1.4 (M)	36.03
Caguas	741105	Region 4 230 kV	$9.3 (M)	76.39
Bayamón	727572	FAASt [Region 3 Bayamon Distribution - Non-Sensitive (Vegetation)	$34.6 (M)	957.80
Bayamón	740408	FAASt [Region 3 Bayamon 38kV - Non-Sensitive (Vegetation)]	$1.6 (M)	32.65
Bayamón	727558	FAASt [Region 3 Bayamon Transmission 38kV/Distribution EHP sensitive areas] (Vegetation)	$19.2 (M)	475.03

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Region	FAASt Number	Project Name	Estimated Cost	Total Miles/Acres
Bayamón	727522	FAASt [Region 3 Bayamon Transmission - 115kV] (Vegetation)	$6.9 (M)	83.44
Bayamón	741098	Region 3 Bayamon Substation/Telecom	$961 (K)	24.65
Bayamón	741105	Region 3 230kV	$5.9 (M)	48.98
Mayaguez	728832	FAASt [Region 5 Mayaguez Distribution - Non-Sensitive (Vegetation)	$21.3 (M)	619.40
Mayaguez	740411	FAASt [Region 5 Mayaguez Transmission 38kV - Non-Sensitive (Vegetation)]	$708 (K)	14.35
Mayaguez	727562	FAASt [Region 5 Mayaguez Transmission 38kV/Distribution EHP sensitive areas] (Vegetation)	$84.0 (M)	2220.58
Mayaguez	727657	FAASt [Region 5 Mayaguez Transmission - 115kV] (Vegetation)	$8.8 (M)	106.12
Mayaguez	741102	Region 5 Mayaguez Substation/Telecom	$1.8 (M)	42.39
Arecibo	728827	FAASt [Region 2 Arecibo Distribution - Non-Sensitive (Vegetation)	$21.4 (M)	593.77
Arecibo	740410	FAASt [Region 2 Arecibo Transmission 38kV - Non-Sensitive (Vegetation)]	$1.9 (M)	38.64
Arecibo	727540	FAASt [Region 2 Arecibo Transmission 38kV/Distribution EHP sensitive areas] (Vegetation)	$66.1 (M)	1762.62
Arecibo	727659	FAASt [Region 2 Arecibo Transmission - 115kV] (Vegetation)	$6.0 (M)	73.38
Arecibo	741101	Region 2 Arecibo Substation/Telecom	$1.1 (M)	26.90
Arecibo	741105	Region 2 230kV	$17.2 (M)	141.26
Ponce	727531	FAASt [Region 6 Ponce Distribution - Non-Sensitive (Vegetation)	$23.9 (M)	663.07

Region	FAASt Number	Project Name	Estimated Cost	Total Miles/Acres
Ponce	740414	FAASt [Region 6 Ponce Transmission 38kV - Non-Sensitive (Vegetation)]	$1.3 (M)	26.60
Ponce	727530	FAASt [Region 6 Ponce Transmission 38kV/Distribution EHP sensitive areas] (Vegetation)	$71.1 (M)	1833.44
Ponce	727529	FAASt [Region 6 Ponce Transmission - 115kV] (Vegetation)	$12.1 (M)	146.97
Ponce	741104	Region 6 Ponce Substation/Telecom	$1.9 (M)	48.45
Ponce	741105	Region 6 230kV	$13.8 (M)	113.32

Table **1-16.** Project Plan

Figure 2 illustrates a high-level view of the Vegetation Clearing projects schedule for the next two fiscal years.

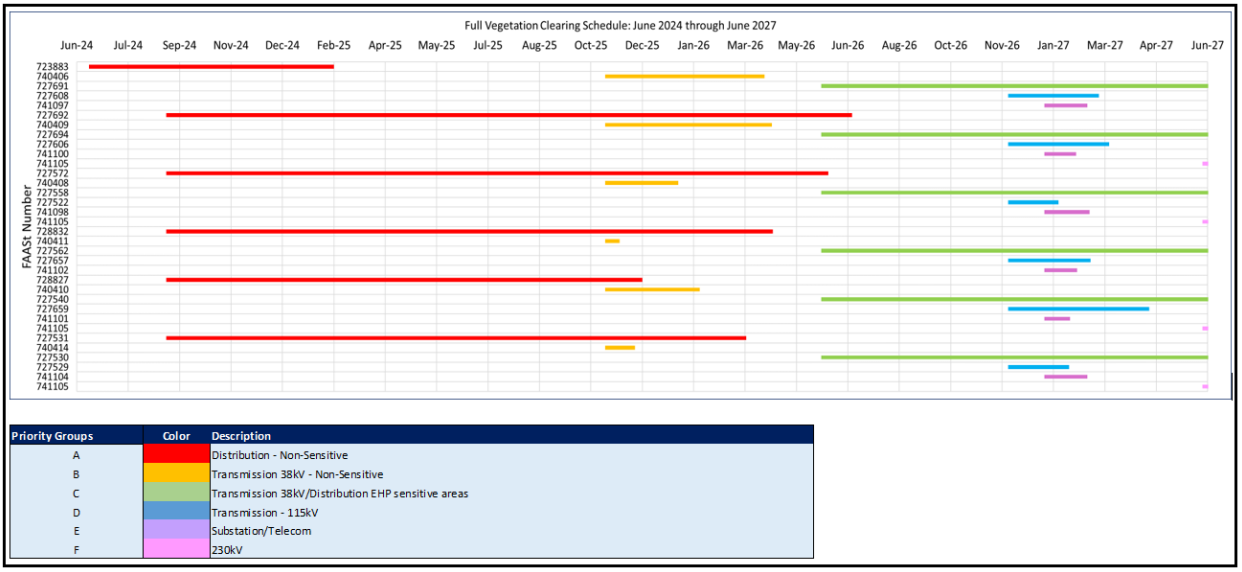


Figure 2 - Gantt Chart View of High-Level Schedule

5.2 Vegetation Maintenance

Operations vegetation management continue to focus on the areas showing outages while the federally funded clearing program focuses on reclamation efforts. All of the vegetation work will have a positive impact on reliability by assisting in reducing the number of outages and helping to reduce the likelihood of

transmission related outages due to vegetation. LUMA's Operations business unit will also provide support during planned outages and any upgrade work where vegetation work will be needed.

The 230 kV system has had reclamation work done on all lines; therefore, preventative (cyclical) maintenance will be performed from the oldest to newest completion dates. Four circuits will be scheduled for this cycle in FY2025 and four will be scheduled in FY2026. This work will be working edge-to-edge of the easement, removing resprouted or new growth trees and using approved herbicide control. Also, the 230 kV will be flown quarterly by the Operations transmission team to identify any potential issues related to vegetation.

LUMA's Operations team will focus then on corrective work on the 115 kV lines with 3 circuits being preventative work. For the corrective work, with the support of helicopters and ground patrols, mid-span vegetation will be identified and mitigated. The first lines in FY2025 will be the lines at risk of line sag due to load transfers during planned outages or emergency outages.

The 38 kV system will have approximately 200 miles cleared in FY2025 and in FY2026. These circuits being worked by operations' vegetation management have been chosen due to past reliability issues and highest contributors to SAIDI/ SAIFI and are not on part of the federally funded project that was obligated by FEMA. The work performed will be corrective in nature as it will not be full reclamation of the ROW.

The distribution work will be performed in parallel with the 38 kV work. Approximately 600 miles will be cleared in FY2025 and LUMA anticipates the same will be completed in FY2026. This work will focus on trees that might be in close contact with a conductor or may contact a line thru growth prior to the Federally Funded project obligation.

FY2025 Vegetation Maintenance Planned Work

- 230 kV system will have quarterly helicopter flights. Cyclical work will be performed on L50300, L51000, L50900, L50700
- 115 kV planned preventative work
    - L37400 Dos Bocas – Cambalache TC segment
    - L37900 Monacillos TC – Sabana Llana TC segment
    - L36400 Ponce TC – Dos Bocas
- Additional 115 kV work will be performed on identified critical lines.
- 38 kV Corrective Work will focus on 33 segments or approximately 237 miles impacting all regions.
- Distribution operation teams will have corrective work completed on 125 circuits across all regions in FY2025.
    - Arecibo – 21 circuits
    - Bayamon – 18 circuits
    - Caguas – 22 circuits
    - Mayaguez – 20 circuits
    - Ponce – 17 circuits
    - San Juan – 27 circuits

For FY2026, a similar scope of work will be performed. A system reliability analysis that considers FY2025 completed work will determine priorities for the fiscal year.

6.0 Advanced Metering Infrastructure

The LUMA Advanced Metering Infrastructure (AMI) implementation will transform how the electrical grid operates in Puerto Rico and how LUMA operates. The AMI system consists of smart meters, communication network and data management system.

AMI meters are equipped with two-way communication that sends information between the meter and LUMA. AMI Meters will provide daily reads to LUMA, supporting reductions on estimated bills, greater visibility over outage and restoration information, voltage information and theft detection. Customers will be able to gain better visibility over their usage to help them better understand their consumption patterns and the effect their usage has on their monthly bills. LUMA will be able to query meters to get real-time information on system operating conditions, assisting in emergency situations to better understand where the issues are occurring.

Benefits of AMI Smart Meters for customers

- Reduce length of outages through real time power status of each meter (allowing LUMA to pinpoint individual customer outages).
- Reduce frequency of outage through enhanced meter data and analytics to help determine loading on transformers and feeders.
- Improve grid operation intelligence from meters with alarms and notifications.
- Reduce storm restoration costs to customers through improved efficiency by allowing LUMA to diagnose outages more efficiently.
- Help customers to identify wasteful practices by providing usage data in detailed time intervals that are updated daily.
- Potentially enable more rate programs for customers with solar generation through bi-directional, interval billing.

AMI strategy for deployment of meters

- Pre deployment walk downs of all meters at customer’s premises are being executed. This effort began in April of 2024 with the purpose of performing visual inspections of meters and the meter fittings. The tracing of the meter to transformer assists on verifying and correct existing data which helps for seeing and restoring power after an event.
- Pre deployment walk downs are expected to take two years to complete and will run concurrent with meter exchanges once they begin.
- Meter exchanges are expected to start in late Q3 FY2024 or early Q4 FY2024 and will ramp up over 12 months. It is expected to take approximately 3 years to exchange all 1.5 million meters in Puerto Rico including residential and commercial meters. At the height of exchanges, LUMA plans to install approximately 60K meters a month and ramp down as the work is finished. LUMA will be using a contractor and internal workforce to complete these exchanges.
- Network deployment will begin before meter exchanges and stay 2-3 months ahead of meter deployment. LUMA will be installing approximately 4K network devices which the meters will communicate to and send information to over a secure network. Network devices will be installed on poles, streetlights and in LUMA substations. This will be a redundant network providing meters with at least 2 paths to send information back to LUMA.

AMI IT Systems

- The AMI head-end system serves as a hub for incoming data from all installed smart meters. The head-end system verifies the data, performs preliminary processing and then forwards it to the meter data management system (MDMS). The AMI headend will be installed prior to the commencement of meter exchanges and will be integrated into several systems at LUMA. These include the CC&B billing system, geographical interface system (GIS), outage management system (OMS) and customer portal (MiLUMA).
- The MDMS converts the raw data into meaningful information that LUMA can use to make informed decisions regarding load forecasting, demand response, distribution automation and more. The MDMS will be installed approximately 12-15 months after the start of meter exchanges.
- Integration into existing systems including GIS, OMS and MiLUMA will start approximately 6 months after exchanges begin, Customer will have access to their usage data within the first 3 to 4 months after deployment starts. Further enhancements will occur for customers after the full integration into MiLUMA.

7.0 System Improvements Benefits

LUMA is currently implementing a series of initiatives aimed at modernizing the system to meet industry standards. Leveraging industry best practices, LUMA is assessing and upgrading our infrastructure to enhance grid resiliency and improve system reliability. Since commencement, LUMA has prioritized proactive measures such as assessing, repairing, and replacing critical substation, transmission, and distribution assets. These efforts have been instrumental in preempting numerous outages by addressing priority items before they escalate into failures. By swiftly detecting and isolating disturbances, our improvements effectively safeguard equipment, ensuring public safety through prompt isolation and de-energization of faulty grid components.

Presently, the grid faces challenges that involve several assets detailed in Section 3. This includes substation transformers and transmission lines currently out of service due to equipment failures. The reinstatement of these assets is imperative to mitigate the risk and impact of widespread outages.

Future enhancement initiatives for the transmission and distribution system are detailed in Section 4 and will prioritize the near-term restoration of critical equipment such as substation transformers, circuit breakers, and transmission line, these efforts are crucial for stabilizing the grid.

As outlined in section 4.5, LUMA is advancing its automated grid technologies by deploying automated switchgear and fault sensors across distribution feeders to bolster reliability. Additionally, LUMA will implement automatic switching distribution feeder automation systems to further enhance reliability. Over the next two years, LUMA plans to install more than 11,000 automation devices.

Looking ahead to fiscal year 2026, our comprehensive plan for reinstating critical equipment assets aims to reduce large-scale outages by over 65%. In addition, SRP implementation will include extensive efforts during FY2025 and FY2026, including continuous vegetation clearing, critical equipment restoration, and the deployment of automated grid technology. The combined effort on these initiatives will immediately enhance system reliability. The expected outcome of these improvements is a reduction in System Average Interruption Duration Index (SAIDI) by 20% and 50% reduction in System Average Interruption Frequency Index (SAIFI) compared to PREPA baseline by the end of fiscal year 2026. However, providing

an exact improvement timeline is challenging at this point due to potential schedule impacts related to FEMA obligations and environmental considerations.

LUMA remains committed to aggressively executing these initiatives in order to enhance the resilience and reliability of our system, and ensure sustained improvements in service quality for all customers.

8.0 ASAP

8.1 Description and Goal

The ASAP is an opportunity to add Battery Energy Storage Systems (BESS) at existing Independent Power Provider (IPP) locations. This will allow deployment of BESS on an accelerated basis and at a lower cost compared to alternatives. ASAP fits well with Puerto Rico public energy policy goals and is another part of LUMA's commitment to providing cleaner, more reliable and resilient energy service for customers at reasonable prices. These batteries will provide greater operational flexibility (such as frequency regulation and meeting peak demand) at a lower cost to the customer and a much shorter implementation timeframe than current market. ASAP may add up to 360 MW[2] of BESS capacity at the 12 existing IPP facilities (Figure 3) through a "Standard Offer" (SO) for all generators. There has been strong interest in the program from IPPs.

ASAP will be implemented in 2 phases:

- Phase 1 (~185 MW)[1] can begin immediately, does not require network upgrades or interconnection costs, with some IPP facilities claiming they could be commercial in less than 12 months.
- Phase 2 (~175 MW)[1] will begin after Phase 1 with minor interconnection work.

The SO is expected to be made available to all existing generators with operating Points of Interconnection (POIs) and PPOAs. The SO concept is frequently adopted in many jurisdictions as a way to allow all potentially interested generators to pursue a model that utilities know is in the interest of rate payers and priced at a level that offers economic benefits to rate payers. The SO concept is often associated with California, where it was first deployed since the 1980s. Each IPP generator will be responsible for the funding, Engineering, Procurement and Construction of the new BESS facility. The generator's investment costs would be recovered through a capacity payment that would then pass through to the quarterly PPCA process.

[2] The capacity (MW) of ASAP and its Phases is a preliminary estimate based on interested IPPs, this number can change as program develops.

Figure 3 - Existing IPPs with PPOA's eligible to participate in ASAP.

8.2 Impact of ASAP on the grid

Figure 4 lustrates at a high level, how the addition of ASAP could help mitigate load shed events. Approximately 3/4 of load shed events in Calendar Year (CY) 2023 were below 185 MW in size, the estimated capacity of ASAP Phase 1. Only one load shed was above 360 MW, which is the total estimated size of ASAP Phase 1 and 2. It is important to note that ASAP is not guaranteed to eliminate all load shed events, but it is expected to eliminate the majority of load shed events.

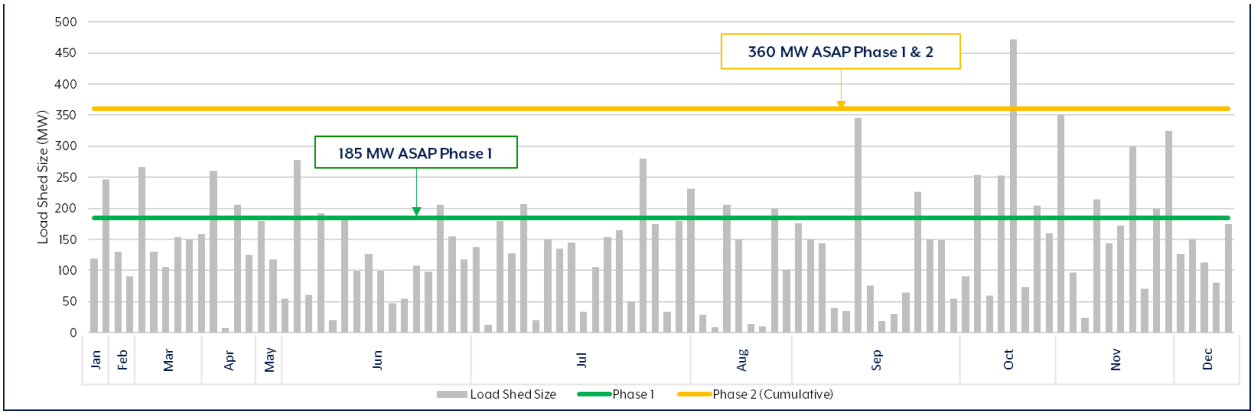
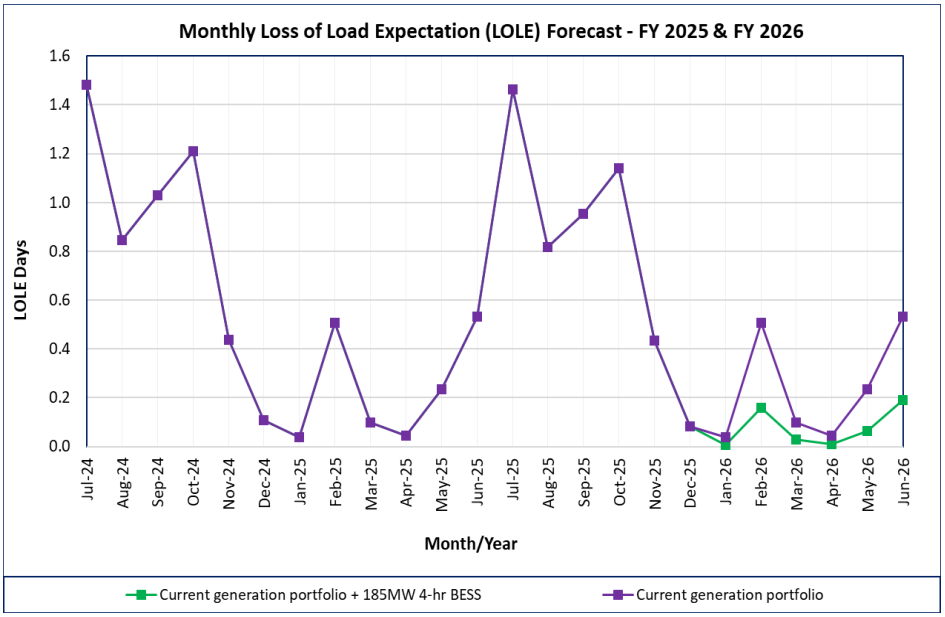


Figure 4 - 2023 CY Historical Load Shed Sizes. Includes under-frequency and manual load sheds.

Figure 5 illustrates how 185 MW of BESS would reduce Loss of Load Expectation (LOLE) of the system from a theoretical, or modeled perspective. This modeled analysis is based upon current planned outage schedules and load forecasts (FY2025). The model compares the expected LOLE of today's generation portfolio against a portfolio that would have 185 MW of Phase I BESS deployed by January 1, 2026. Although it is assumed BESS will be installed by January 1, this timing is uncertain and might vary depending on SO execution date and each IPPs procurement and development timeline.

System Improvements Preliminary Plan



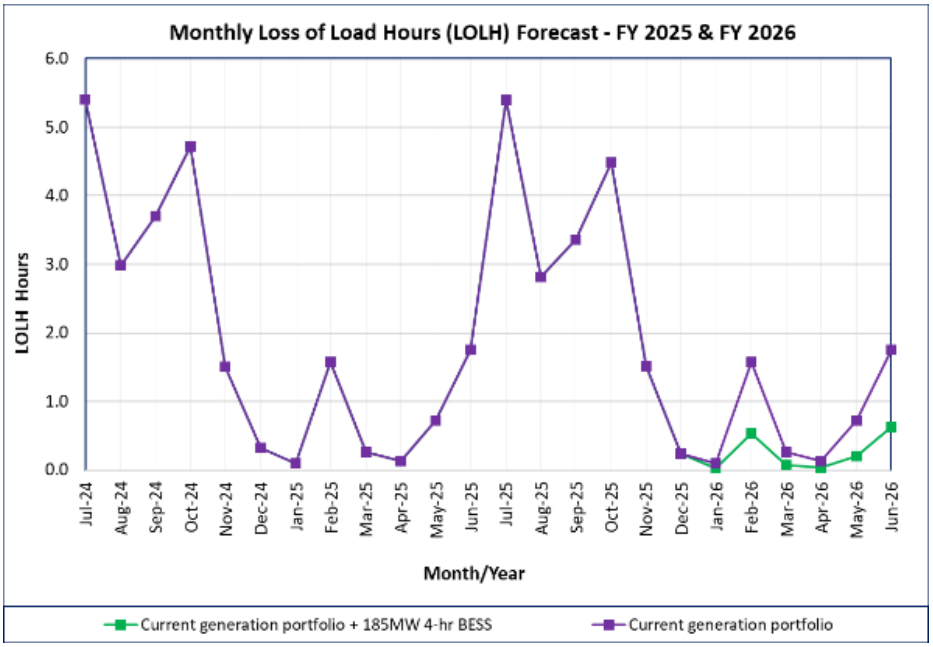


Figure 5 - Impact of ASAP on Monthly LOLE and LOLH.

ASAP will also increase a project's utilization of the point of interconnection. BESS charging and discharging will be scheduled without interfering with existing generation facility current output. BESS can be charged with energy provided by the grid and delivered to the Interconnection Point via the T&D System at the direction of T&D Operator. Additional BESS could conceivably be added in the long term to utilize POI to a greater utilization of potential. In this case study (Figure 6), ASAP would represent approximately an additional 16% utilization of the IPP contracted capacity by allowing the batteries to be charged from the grid and then discharged between 8-11 pm in this example, represented by the green

rectangle. The difference between the light and dark blue monthly average production reflects the difference in solar intensity between winter and summer.

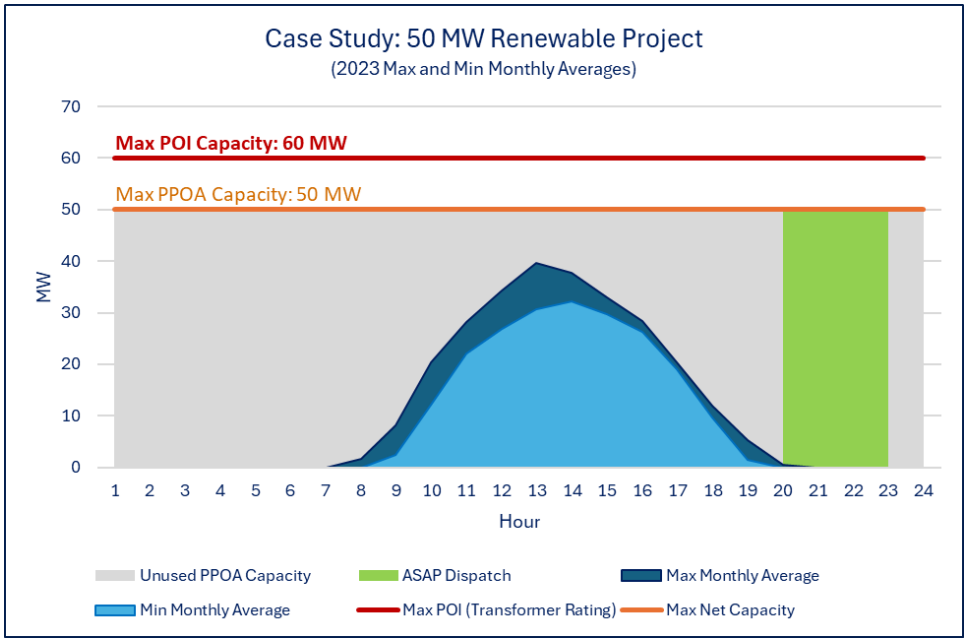


Figure 6 - Illustrative 50 MW Case Study of ASAP installed at a Renewable Project POI.

8.3 Timeline for implementation

Through docket NEPR-MI-2024-0002 on April 26, 2024, PREB determined that the ASAP concept is consistent with the current Integrated Resources Plan and Modified Action Plan (IRP), which considers 1,500MW of BESS as part of the renewable procurement efforts (Tranches). PREB approved LUMA's ASAP concept and authorized LUMA and the IPPs to proceed with the development of the SO (SO) Agreements.

LUMA is currently developing the detailed SO with the IPPs. Once these are finalized and signed, some IPPs have indicated they could potentially have batteries online as soon as 12 months following approval of SO. The global supply chain for batteries is quite dynamic and this assumption will need to be confirmed after the SO are finalized.

System Improvements Preliminary Plan

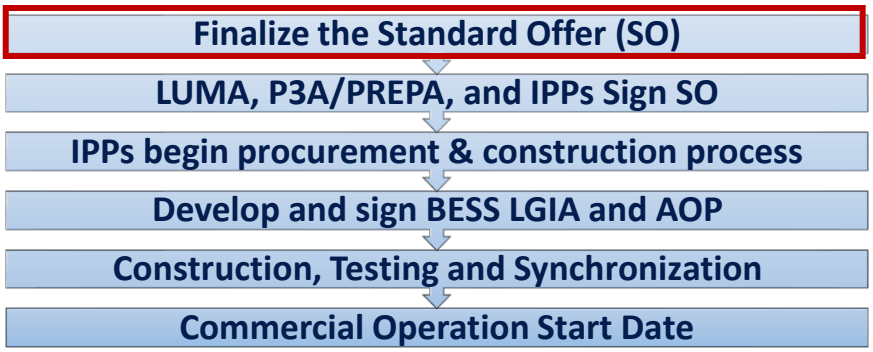
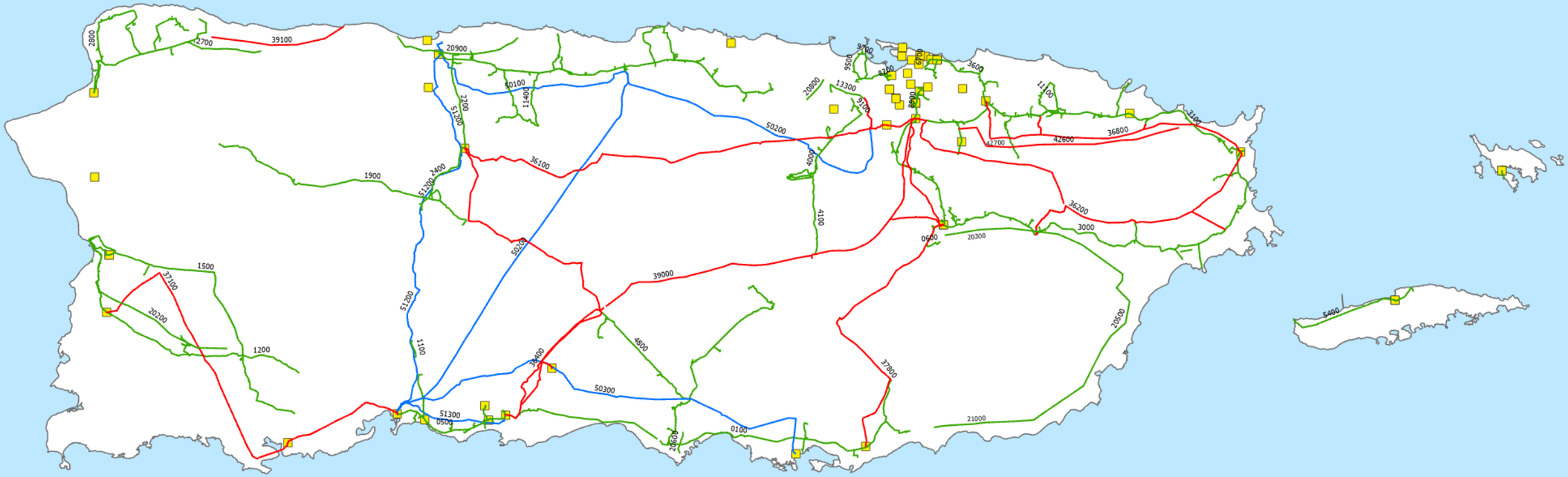


Figure 7 - Next Steps following PREB's ASAP framework approval.

System Improvements Preliminary Plan

Annex A - Planned Substation and Transmission Projects

July 19,2024



Legend

- SUBSTATIONS (53 Projects)

38kV (34 Projects)

- 0100
- 0500
- 0600
- 1100
- 11100
- 11400
- 1200
- 4800
- 13300
- 1500
- 1900
- 2200
- 2400
- 2700
- 2800
- 3000
- 3100
- 3600
- 4000
- 4100
- 5400
- 9700
- 6700
- 8200
- 8900
- 9100
- 9500
- 20200 San German - Once de Agosto
- 20300 Juncos TC - Gautier Benitez
- 20500 Juncos TC - Humacao TC
- 20600 Santa Isabel - Tap Hamilton
- 20800 Canas - Buena Vista
- 20900 Barceloneta - Arecibo
- 21000 Humacao - Arroyo

115kV (11 Projects)

- 36800 PALMER - FAJARDO
- 37800 JOBOS - CAGUAS
- 37800 CAGUAS - MONACILLOS
- 37100 COSTA SUR - ACACIAS
- 36200 MONACILLOS - JUNCOS
- 36100 DOS BOCAS - MONACILLOS
- 36100 DOS BOCAS - PONCE
- 39000 AGUAS BUENAS - CAGUAS
- 39000 HATILLO - MORA
- 42600 SABANA LLANA TC - PALMER TC
- 42700 MONACILLOS - CANOVANAS TC

230kV (6 Projects)

- 50100 CAMBALACHE -MANATI
- 50300 PONCE - COSTA SUR
- 50200 COSTA SUR - MANATI
- 50200 MANATI - BAYAMON
- 51200 COSTA SUR - CAMBALACHE
- 51300 COSTA SUR - AGUIRRE