

**COMMONWEALTH OF PUERTO RICO  
PUBLIC SERVICE REGULATORY BOARD  
PUERTO RICO ENERGY BUREAU**

**NEPR**

**Received:**

**Aug 26, 2024**

**9:40 PM**

IN RE: REVIEW OF PUERTO RICO  
ELECTRIC POWER AUTHORITY'S  
COMPREHENSIVE VEGETATION  
MANAGEMENT PROGRAM

**CASE NO. NEPR-MI-2019-0005**

**SUBJECT: Motion in Compliance with  
Directives of Resolution and Order of June 26,  
2024 regarding Vegetation Management and  
Fire Mitigation**

**MOTION IN COMPLIANCE WITH DIRECTIVES OF RESOLUTION AND ORDER OF  
JUNE 26, 2024 REGARDING VEGETATION MANAGEMENT AND FIRE  
MITIGATION**

**TO THE HONORABLE PUERTO RICO ENERGY BUREAU:**

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

**I. Introduction and Procedural Background**

1. On May 24, 2024, LUMA submitted to the Puerto Rico Energy Bureau (“Energy Bureau”), the proposed budget for the Transmission and Distribution System (“T&D Budget”), developed by LUMA. *See Request for Approval of T&D Budgets and Submission of GenCo Budgets for FY2025 and Budget Allocations for the Electric Power System*, filed by LUMA (“FY2025 Budget Submission”). The FY2025 Budget Submission also included the budget proposal for the legacy thermal generation units (the “GenCo Budget”), developed by Genera, and the budget allocation approved by the Puerto Rico Public-Private Partnerships Authority (“P3A”) for the hydroelectric generating units and the public irrigation facilities (“HydroCo Budget”), and the allocation for the Puerto Rico Electric Power Authority (“PREPA”) and its subsidiaries (“HoldCo Budget”).

2. On June 26, 2024, this Energy Bureau issued a Resolution and Order with the subject *Determination on the FY25 Annual Budgets for the electric utility* (“June 26<sup>th</sup> Order”). Through the June 26<sup>th</sup> Order, this Energy Bureau approved LUMA’s \$692 million T&D Budget petition, albeit with several modifications. Among the modifications, this Energy Bureau directed an increase in the non-federally funded budget allocation for Vegetation Management from \$50 million to \$63.507 million, including an increase of \$1.9 million for the Fire Mitigation Program, and fully de-prioritized the Billing Accuracy and Back Office program for FY2025.

3. Together with its determination on the FY2025 Annual Budgets, this Energy Bureau also issued a series of reporting directives to LUMA regarding fire mitigation, vegetation management and third-party attachments, to be satisfied within sixty (60) days of notification of the June 26<sup>th</sup> Order; to wit, on or before August 26, 2024.

4. With regards to third party attachments, this Energy Bureau ordered LUMA to “[s]ubmit to the Energy Bureau, within 60 days of notification of this Resolution and Order, all existing TPA contracts in its possession.” *See* June 26<sup>th</sup> Order, p. 9. LUMA hereby informs that a separate motion, in compliance with this directive, has been filed today in Case No. NEPR-MI-2021-0004, *In Re: LUMA Initial Budgets and Related Terms of Service*.

5. Moreover, in what is pertinent to the present Motion, this Energy Bureau emphasized “the critical importance of effective VM as a key transmission and distribution (“T&D”) activity with significant positive impact on system performance and reliability.” *See* June 26<sup>th</sup> Order, p. 5. Even though it “recognizes that LUMA [has] made some progress in this critical area of VM”, the Energy Bureau questioned “whether LUMA is effectively using all available resources to expedite the VM program.” *See* June 26<sup>th</sup> Order, p. 6, 7.

6. Consequently, this Energy Bureau ordered LUMA to provide “a detailed implementation plan . . . to complete the VM Remediation Phase,” including the following elements:

- a. A revised timeline and milestones, acknowledging the delays in federal funding but showing how LUMA will accelerate efforts to achieve a fully remediated state as close to the originally ordered H1 2026 date as possible;
- b. Strategies for maximizing the use of both federal and O&M funds to expedite VM activities;
- c. Contingency plans for addressing potential further delays in federal funding obligations.

*See* June 26<sup>th</sup> Order, p. 8.

7. Furthermore, explaining that “interrelation between vegetation management (“VM”) and fire mitigation is clear and well-established in utility best practices”, this Energy Bureau ordered LUMA to “integrate fire mitigation efforts into the VM program” and requested that the implementation plan “clearly outline how VM activities will contribute to overall fire risk reduction.” *See* June 26<sup>th</sup> Order, p. 4, 8. Accordingly, this Energy Bureau ordered LUMA to submit “a detailed plan outlining how fire mitigation efforts will be incorporated into its vegetation management and other relevant programs.” *See* June 26<sup>th</sup> Order, p. 5.

8. Firstly, LUMA notes that on July 16, 2024, LUMA filed a *Motion for Partial Reconsideration of Resolution and Order of June 26, 2024 on FY2025 System Budget* (“July 16th Motion for Partial Reconsideration”), whereby it requested the Energy Bureau maintain the \$50 million budget allocation for Vegetation Management and re-prioritize the Billing Accuracy and Back Office Program. Moreover, upon considering this Energy Bureau’s concerns regarding fire mitigation, LUMA agreed to reallocate \$1 million from Operations and \$0.9 million from Support Services operating expenditures into the Compliance and Studies program, thereby funding fire

mitigation activities and ensuring a balanced resource allocation.<sup>1</sup> LUMA's July 16<sup>th</sup> Motion for Partial Reconsideration is pending adjudication by this Energy Bureau.

9. As asserted in the July 16<sup>th</sup> Motion for Partial Reconsideration, LUMA reiterates that an effective Fire Mitigation program requires comprehensive identification of risks at a granular geographic level across the system. Solutions to manage and mitigate wildfire risk include, but are not limited to: technologies to provide measurement and visibility of weather, humidity and environmental conditions, technologies and systems to quickly sense abnormal conditions on the grid, technologies and systems to remotely energize and de-energize high-risk sections of the grid, planning and design solutions that may include covered conductor and strategic undergrounding to minimize the probability of vegetation contact, and comprehensive vegetation management targeted to minimizing fire initiation risk.

10. Although interrelated with vegetation management activities, the scope of the Fire Mitigation program must be comprehensive as its outputs will inform aspects not only of Vegetation Management, but also of T&D Line Rebuild, Distribution Automation, Microgrid, Phasor Measurement Units (PMU), Battery Energy Storage Installations and Integration and IT/OT Technology Deployment programs. *See Exhibit 1, R&O-LUMA-MI-2021-0004-20240626-PREB-002*. Due to the scope of the activities intended for fire mitigation being broader than just Vegetation Management, LUMA hereby respectfully submits an updated version of the Compliance and Studies improvement program which includes the associated description, activities, timeline, milestones, and funding for fire mitigation. *See R&O-LUMA-MI-2021-0004-20240626-PREB-002\_Attachment 1*. In compliance with the June 26<sup>th</sup> Order, within the updated

---

<sup>1</sup> In the July 16th Motion for Partial Reconsideration, LUMA acknowledged the Energy Bureau's concerns regarding Fire Mitigation and stressed its commitment to ensuring system safety and reliability. However, LUMA explained that reallocating funds from the Billing and Back Office budget to benefit the Fire Mitigation program was not feasible.

version of the Compliance and Studies improvement program, LUMA also details how fire mitigation efforts are interrelated with vegetation management initiatives.

11. Furthermore, in compliance with the other pertinent directive contained in the June 26<sup>th</sup> Order, LUMA respectfully submits as *Exhibit 2* of this Motion, *R&O-LUMA-MI-2021-0004-20240626-PREB-001*, an updated version of the Vegetation Management and Capital Clearing Program. Pursuant to the June 26<sup>th</sup> Order, the updated version of the Vegetation Management and Capital Clearing Program includes an updated and expanded section on Program Milestones and Timelines. *See R&O-LUMA-MI-2021-0004-20240626-PREB-001\_Attachment 1*, Section 3.4.

12. Based on the above, a remediated state cannot be achieved prior to the second half of FY2028. Nonetheless, as *Exhibit 2* shows, in FY2025 LUMA will focus on initiating a second maintenance cycle of the 230 kV ROW's, as well as additional clearing and maintenance on other voltage levels, whilst pursuing federal funding obligation with FEMA for vegetation clearance work. *See R&O-LUMA-MI-2021-0004-20240626-PREB-001\_Attachment 1*, Section 2.4.2. Moreover, LUMA will leverage its experience and resources to reach an important milestone in FY2025: the commencement of all Distribution Non-Sensitive Projects, 38 kV Non-Sensitive Projects, and Substation/Telecom Projects. *See R&O-LUMA-MI-2021-0004-20240626-PREB-001\_Attachment 1*, Section 3.4. LUMA continues to prioritize vegetation management activities and will, in due course, file updated timelines to reach remediated state and maximize federal funding.

13. Additionally, as requested by this Energy Bureau in the June 26<sup>th</sup> Order, LUMA is taking a multi-pronged approach to expedite vegetation management activities and maximize the use of federal and O&M funds. *See R&O-LUMA-MI-2021-0004-20240626-PREB-001\_Attachment 1*, Section 2.5, (Objective: Effectively Deploy Federal and Other Funding).

Specifically, LUMA is collaborating closely with COR3 and FEMA to streamline the obligation process for the remaining federally funded vegetation clearance projects, leveraging the successful obligation of the San Juan Region A projects as a blueprint. *Id.* LUMA has also signed contracts with multiple experienced companies who will be providing approximately 400 crews and their equipment over the life of this program. *Id.* Additionally, LUMA remains vigilant in evaluating and adjusting its plans, timelines, and resource allocation based on evolving conditions, enabling continuous optimization and the most effective use of the available federal funds. *Id.*

14. After the successful obligation of the San Juan Group A project, LUMA anticipates that FEMA will approve additional obligations for five metropolitan areas by the end of 2024. LUMA is collaborating closely with COR3, FEMA, and other relevant stakeholders on this effort. In the hypothetical scenario that federal funding does not materialize, an alternative source of funding would need to be identified to support the vegetation clearing work currently being planned to be funded from FEMA. As this moment, no such alternate source of funding has been identified.

**WHEREFORE**, LUMA respectfully requests this Honorable Bureau **take notice** of the aforementioned; and **deem** that LUMA complied with the directives to be satisfied within sixty (60) days of notification of the June 26<sup>th</sup> Order, regarding vegetation management and fire mitigation.

**RESPECTFULLY SUBMITTED.**

In San Juan, Puerto Rico, this 26<sup>th</sup> day of August, 2024.

We hereby certify that this motion was filed using the electronic filing system of this Energy Bureau. We also certify that copy of this motion will be notified to the Puerto Rico Electric Power Authority, through its attorneys of record: Mirelis Valle-Cancel, [mvalle@gmlex.net](mailto:mvalle@gmlex.net), and Alexis G. Rivera Medina, [arivera@gmlex.net](mailto:arivera@gmlex.net); and to Genera PR LLC through: Jorge Fernández-Reboredo, [jfr@sbglaw.com](mailto:jfr@sbglaw.com); Alejandro López Rodríguez, [alopez@sbglaw.com](mailto:alopez@sbglaw.com); [legal@genera-pr.com](mailto:legal@genera-pr.com); and [regulatory@genera-pr.com](mailto:regulatory@genera-pr.com).



**DLA Piper (Puerto Rico) LLC**

500 Calle de la Tanca, Suite 401

San Juan, PR 00901-1969

Tel. 787-945-9122 / 9103

Fax 939-697-6092 / 6063

*/s/ Margarita Mercado Echegaray*

Margarita Mercado Echegaray

PR Bar No. 16,266

[margarita.mercado@us.dlapiper.com](mailto:margarita.mercado@us.dlapiper.com)

*/s/ Jan M. Albino López*

Jan M. Albino López

PR Bar No. 22,891

[jan.albinolopez@us.dlapiper.com](mailto:jan.albinolopez@us.dlapiper.com)

*Exhibit 1*



# PREB Determination on FY2025 Annual Budget

## NEPR-MI-2021-0004

### Response: R&O-LUMA-MI-2021-0004-20240626-PREB-002

---

#### SUBJECT

Fire Mitigation

#### REQUEST

The Energy Bureau ORDERS LUMA to submit, within 60 days of the notification of this Resolution and Order, a detailed plan outlining how fire mitigation efforts will be incorporated into its vegetation management and other relevant programs.

#### RESPONSE

An effective Fire Mitigation program requires comprehensive identification of risks at a granular geographic level across the system. Solutions to manage and mitigate wildfire risk include, but are not limited to: technologies to provide measurement and visibility of weather, humidity and environmental conditions, technologies and systems to quickly sense abnormal conditions on the grid, technologies and systems to remotely energize and de-energize high-risk sections of the grid, planning and design solutions that may include covered conductor and strategic undergrounding to minimize the probability of vegetation contact, and comprehensive vegetation management targeted to minimizing fire initiation risk.

As the Fire Mitigation scope must be comprehensive, its outputs will inform aspects of T&D Line Rebuild, Distribution Automation, Vegetation Management, Microgrid, Phasor Measurement Units (PMU), and Battery Energy Storage Installations and Integration and IT/OT Technology Deployment programs. Due to the scope of the activities intended for fire mitigation being broader than Vegetation Management, LUMA will include the associated description, activities, timeline, milestones, and funding for fire mitigation as part of the Compliance and Studies improvement program. Please refer to R&O-LUMA-MI-2021-0004-20240626-PREB-002\_Attachment 1 for the updated FY2025 Compliance & Studies improvement program.

## Compliance & Studies

# Compliance & Studies

## 1.0 Program Description

The Compliance & Studies program is divided into four sections, each with its own specific scope, objectives, and set of activities as follows:

1. Transmission and Distribution (T&D) System studies
2. Renewable and distributed energy resource (DER) interconnection studies
3. T&D System safety studies
4. Wildfire Mitigation

The following subsections describe each of these four sections.

### 1.1 Transmission and Distribution (T&D) System Studies

T&D System Studies consist of computer simulations that include power flow, short circuits, transient stability, and other technical assessments using digital models of the physical grid. The ideal digital model perfectly matches the characteristics of the physical grid, where every electrical device is modeled with its electrical characteristics, maximum capacity, and all connected elements accurately represented.

Therefore, in the ideal model, the power flow, short circuit, transient stability or other technical assessment matches values observed in the real world with minimal error.

Studies verify that the expected performance of the transmission line, substation, and distribution line equipment adheres to codes, standards, and industry best practices for load forecasts, equipment capabilities and settings, generation dispatch, and system configurations under various conditions. These digital models allow for simulations of expected conditions –like summer peak, or minimum load– and enable system planners and operators to run scenarios to predict how the grid will behave. When a constraint is identified, mitigation options are investigated, and upgrades are first simulated to ensure the safe, reliable, and efficient operation of grid assets.

The program activities involve establishing and implementing study standards and procedures for Puerto Rico by adapting national and international standards, and industry best practices. The North American Electric Reliability Corporation (NERC) planning criteria inform transmission planning studies with standards informed by NERC planning criteria that include facility ratings, modeling, voltage and reactive power, transmission planning (TPL), and critical infrastructure protection (CIP) standards. Distribution “Area Plans” are being performed where power flow models allow simulation and planning solutions to ensure distribution circuits operate within the thermal limits of the distribution transformers and line conductors, and that acceptable voltage can be maintained everywhere along the circuit.

Both T&D protection and short circuit studies are performed to ensure that circuit breakers, fuses, and protective relays are set appropriately to clear faults at the correct location and that the operation of a protective device impacts the minimum number of customers.

In summary, the studies include, but are not limited to:

## Compliance & Studies

- T&D system power flow, transient stability, and protection coordination studies are performed to assess the performance of the T&D system according to industry best practices and standards-based performance criteria
- T&D system deficiencies can be identified, and projects proposed to address thermal, voltage, system frequency, peaking capacity, and reliability issues, driving the continuous improvement of the T&D infrastructure
- Distribution area plans are being performed to identify thermal, voltage, and reliability performance violations and to propose new projects to mitigate these issues. The new projects are expected to be performed in the Distribution Line Rebuild program scope
- Transmission area plans are being performed to identify thermal, voltage, and NERC TPL criteria violations and to propose new projects to mitigate these issues. The new projects are expected to be performed in the Transmission Line Rebuild program scope
- Short circuit and protection coordination studies are being performed to ensure that transmission protection equipment is adequately designed to detect and isolate faulted transmission network sections while only operating the devices needed and thereby minimizing interruption to unaffected customers
- Distribution short circuit and protection coordination studies are being performed to ensure that feeder breakers coordinate with downstream protective devices like reclosers and fuses to isolate only those faulted sections of the distribution circuit, thereby minimizing interruption to unaffected customers

### 1.2 Renewable and Distributed Energy Resource (DER) Interconnection Studies

Renewable and DER interconnection studies involve a similar scope to the T&D System studies but with a few notable distinctions. Transmission studies are performed specifically for proponents requesting interconnection to the transmission system (for example, renewable tranche request for proposals run by PREB) to determine the scope of interconnection facilities required to integrate the request, as well as system impact studies and facilities studies to determine the scope of grid upgrades required on the nearby transmission system to ensure that the adjacent transmission system facilities can operate within applicable codes and standards like the NERC TPL planning criteria. Distribution renewable integration studies follow applicable codes and standards like Act 17 and others to determine the hosting capacity of distribution feeders and the system impacts from both the individual and aggregate interconnections on a distribution circuit and substation transformer.

Typically, project developers pay for all or a portion of these interconnection studies as detailed in regulations. The net cost of the interconnection studies is reflected in the program budget. Pending changes to regulations can impact how these studies are funded and performed.

In summary, the studies include but are not limited to:

- Analysis of the T&D system with proposed or interconnected generators to evaluate the impact on the thermal, voltage, protection and coordination, and transient stability of the T&D system
- Identification of DER interconnection required safety, system, and reliability upgrades
- Performance of hosting capacity studies and assessments that support publishing of publicly available hosting capacity maps as required by regulation

# Compliance & Studies

## 1.3 T&D System Safety Studies

T&D system safety studies consist of substation grounding and civil site studies to assess the condition and identify necessary mitigations for these critical safety systems. Grounding studies and tests will be conducted to ensure the T&D substations comply with proper grounding requirements for safety purposes, per NESC and Institute of Electrical and Electronics Engineers (IEEE) Std 80-IEEE Guide for Safety in Alternating Current (AC) Substation Grounding. Civil site studies will be conducted to ensure the insulating gravel is adequate.

## 1.4 Wildfire Mitigation

Wildfires are profoundly changing both the landscape and the perception of risk in Puerto Rico, driven by recent fires across the island and the 2023 Hawaii wildfires that impacted Lahaina and surrounding areas. LUMA's initial review of wildfire-related data has identified numerous opportunities to mitigate wildfires. That includes collection and reconciliation of data from various sources comprising grid and environmental (vegetation, climate, weather) data for a more granular wildfire ignition and spread simulation and consequence modeling across LUMA's service territory. The goal is to develop a data-driven, risk-informed, and end-to-end wildfire mitigation program.

Wildfires are the result of a combination of three fundamental factors: (1) weather, (2) fuel, and (3) ignition sources. Adequate quantities of flammable and continuous fuel are essential for a wildfire to ignite and spread. The drivers of wildfire risk can be broadly categorized into two main groups: (1) human-related drivers and (2) climate-related drivers. Climate-related drivers include weather and climatic conditions, such as wind, temperature, humidity, rainfall patterns, and drought that influence vegetation density and fuel dryness, are affecting the likelihood and intensity of fires. Human-related drivers such as the expansion of populations into wildlands can introduce new ignition sources and increase fire occurrences. Understanding the interplay between these factors is essential for assessing and mitigating wildfire risks.

Through this initiative, LUMA plans to develop a holistic strategy for managing and reducing wildfire ignition risk for Puerto Rico and address key elements of developing such a strategy, including but not limited to: (1) developing solutions to address the data gaps identified, (2) vegetation management and other preventative maintenance programs, (3) developing and implementing proactive de-energization criteria to reduce wildfire ignition probability, (4) informing related programs working to deploy Distribution Automation technologies like fuses, trip-savers and reclosers, (5) developing and implementing capital infrastructure rebuilds to include technologies and mitigation options like covered conductor and strategic undergrounding to reduce the probability of ignition, and (6) establishing the customer and stakeholder engagement channels and protocols to the development of this holistic plan for managing wildfire risk.

## 2.0 Program Rationale

### 2.1 Initial State and Identified Gaps

#### 2.1.1 T&D System Studies

A thorough review of PREPA's T&D System planning and operational practices indicated that industry codes, standards, and best practices were not being followed. Asset data collection, storage, and the calculation of equipment and facility ratings were inadequate. This is being addressed by the adoption of applicable NERC facility ratings standard elements for rating facilities and documenting methodologies for

## Compliance & Studies

transmission equipment. The construction and maintenance of a digital transmission power flow model was also a gap that is being addressed by adopting applicable NERC modeling standard elements for transmission models.

Study practices were not consistent with applicable Puerto Rico energy law or policies and/or the Puerto Rico Transmission and Distribution System Operation and Maintenance Agreement requirements. This is being addressed by the adoption of applicable NERC TPL standard elements for performing steady state and transient stability assessments, and by incorporating reliability criteria into planning and designing upgrades for the transmission grid. The same gaps and issues exist in distribution, and applicable planning criteria and industry best practices guide the development of models, studies, and proposed solutions.

Similarly, the routine review of protection and coordination settings, or area protection and coordination studies were not historically performed. The lack of protective coordination on the T&D system can lead to widespread, cascading outages, as well as increased public safety risk. The potential issues include cascading outages from mis-coordinated devices, slow fault clearing, or failure to clear high impedance faults on downed powerlines. These increase the risk of serious public safety hazards, fire ignitions, and/or catastrophic equipment failure. These are being managed by performing system transmission protection and coordination studies, updating transformer and line impedances and constants in asset records, and validating simulation results with field information.

Initial assessments also revealed the lack of software simulation models for power flow analyses of the transmission system. Utility best practices involve having updated and detailed models for the transmission system, including from the current year through a 10-year planning window. In addition, transient stability models are inadequate to perform dynamic simulations to allow planners to assess changing system dynamics to faults for renewable energy system integration, including system stability, generation, and rotor angle stability, and investigate generation response to grid disturbances.

### 2.1.2 Renewable and Distributed Energy Resource (DER) Interconnection Studies

Studies and assessments with updated DER forecasts, including small-scale and large-scale solar photovoltaic and virtual power plant resources, are required to evaluate the renewables' impact on the grid. There has been a significant backlog of DER interconnections requiring evaluation, particularly for residential and small commercial systems with capacities less than 25 kW, for which an expedited interconnection process is mandated by law. In response, LUMA is performing expedited interconnection evaluations and feeder cluster studies of all feeders with large aggregations of small-scale solar photovoltaic interconnection.

Improving access and visibility, the LUMA website includes a page to enable customers and developers to see hosting capacity at the neighborhood and circuit level to assess the viability of connecting distributed generation systems in their homes or businesses. LUMA continues to work towards enabling the growth of residential and small-scale renewable interconnections while maintaining grid reliability and power quality.

### 2.1.3 T&D System Safety Studies

The grounding condition at transmission line structures, transmission substations, and distribution substations is poor. As proper grounding at transmission line structures and all substations is critical to protect against shock or electrocution during fault conditions, induced voltages due to overhead electrical circuits, or insulation failure of any electrical equipment along the line or within the substation, this condition can cause a step potential or touch potential hazard to the public and employees. Grounding

## Compliance & Studies

system deficiencies were also noted for switches and ground mats. Luma's gap assessment, performed before commencement, identified a few key gaps related to grounding:

- Substation fencing is inadequate, with corroded or stolen grounding connections
- Substation ground surfaces were identified as having insufficient gravel as required by applicable industry codes and standards for limiting step potential hazards
- Inadequate grounding exists throughout the transmission grid, though more precise data needs to be obtained

LUMA estimates that approximately 30 percent of the transmission and distribution substation ground grid systems fall in the high-risk category and require safety and hazard mitigation to achieve remediation. Field inspectors will categorize assets according to their health based on estimates of condition (likelihood of failure). Engineers will assess criticality (consequence of failure) and assign an asset score from 0 (worst) to 4 (best). Within 60 days of identification, risk mitigation related to only the highest-risk assets will be incorporated into a remediation plan. These will be assets that exhibit an extreme likelihood of failure, or that already failed and are likely to cause:

- Public or workforce safety risk
- Failure to meet applicable legal requirements or policies, including IEEE 80 and NESC, which includes requirements related to safe and reliable utility designs
- Potential for a widespread outage affecting critical customers and of long duration with potential for associated public safety risk

### 2.1.4 Additional Gaps Identified Post-Commencement

Additional gaps identified include the ongoing developments in legislative and regulatory proceedings that could modify current regulations on interconnection application and/or study fees. Additionally, as defined in the regulations, distribution upgrades are the responsibility of the developer, but no enforcement mechanisms exist to require payment of grid upgrade charges, while simultaneously, the law mandates interconnection of residential and small commercial systems regardless of grid impact. This is an unacceptable technical outcome that requires policy action for resolution. The risk to public safety of not rectifying this disparity include equipment like customer transformers that could catastrophically fail and lead to hazards like service interruptions, fire and explosion, equipment safety, and poor customer reliability, especially for the non-participating neighbors of DER adopters.

While not previously identified, the performance of transmission protection and coordination standards, and the performance of distribution protection and coordination standards had to be switched in an execution timeline. The transmission system is the major highway that connects generation from large central-station power plants to customer loads; therefore, technical requirements necessitate transmission short-circuit models and studies to be completed first since they also are the source of short-circuit current to the distribution system. Once completed, the accurate transmission system fault-current contributions are used as the input to distribution protection and coordination studies. These have been updated in the System Remediation Plan timeline graphic.

### 2.1.5 Wildfire Mitigation

In the current state, the Puerto Rico grid presents an elevated risk of starting a wildfire primarily due to the following reasons: (1) the deteriorated state of the transmission and distribution grid experiences a high occurrence of equipment failure that can become an ignition source for a wildfire; (2) the prevalence of vegetation related equipment operations and outages highlights the heightened risk that electrical infrastructure plays in wildfire ignition which could become problematic as longer, hotter, drier periods become more commonplace; and (3) the lack of operator visibility and control of equipment outside of the substation breaker (for example, along a circuit or circuit section) means that events may occur in heavily



# Compliance & Studies

vegetated areas and the operator cannot identify a fault location. To address these current-state concerns, the future state requires comprehensive evaluation of wildfire risk on a granular community-level data, as well as the development of mitigation and management solutions to prevent a wildfire from initiation, reducing the likelihood of electrical infrastructure igniting a wildfire, and then by limiting its potential impact if one does occur.

These and the gaps discussed in section 1.4 continue to highlight the need develop a holistic plan for managing and reducing wildfire ignition risk for Puerto Rico. Improvements in the following areas can directly and indirectly help to mitigate wildfire risk:

Note: While the list of these mitigation options is not exhaustive, it is focused on highest priority areas.

- **Wildfire Prediction:** Effective wildfire prediction is critical for resource mobilization and root cause elimination.
- **Wildfire Detection:** Early detection is crucial for timely response and minimizing damage.
- **Vegetation Management:** Risk of wildfire ignition increases with decreased distance between conductors and vegetation.
- **Asset Management:** Effective asset management can prevent faults leading to wildfires.
- **Fault Detection, Prevention, and Protection:** LUMA's system is prone to high-impedance faults, which are a leading cause of wildfire ignition. Enhancement of fast-trip settings and identifying high-risk assets and considering the Rapid Earth Fault Current Limiter (REFCL) technology can help to reduce the risk.
- **Preemptive De-Energization and Recloser Disablement:** Proactive shut-off of power lines, known as preemptive de-energization, is used as a last resort to reduce wildfire risk. De-energization is a key component of LUMA's emergency response strategy, aiming to minimize risks during emergencies.
- **Early Warning and Situational Awareness Systems:** Real-time monitoring and early warning systems are critical for effective wildfire response, including operational systems such as EMS and ADMS that provide operations enhanced situational awareness to field conditions.

## 2.2 Description of Remediated State

### 2.2.1 T&D System Studies

In the remediated state, industry-standard T&D system planning, and operational studies will be performed using appropriate standards, methods, and tools and refreshed consistent with industry standards or regulatory requirements.

### 2.2.2 Renewable and Distributed Energy Resource (DER) Interconnection Studies

This is not part of the SRP.

### 2.2.3 T&D System Safety Studies

In the remediated state, transmission line facilities, transmission substations, distribution substations, equipment, fences, gates, and metal objects at these sites will be effectively grounded as required for step-and-touch potential hazards in IEEE standards. Corroded or missing fence grounding will have been replaced. The risk of people encountering inadequately grounded surfaces will have been substantially reduced in alignment with prudent utility practices. Substation site surfaces will also have sufficient insulating gravel to eliminate hazardous step potentials for utility workers by IEEE standards.

In the remediated state, approximately 30% of the transmission line, transmission substation, and distribution substation facilities estimated to be in high-risk condition (0 and 1) relative to grounding will comply with IEEE standards.

# Compliance & Studies

## 2.3 Description of Program Completed State

### 2.3.1 T&D System Studies

In the completed state, the following will apply beyond that which has already been noted:

- T&D system analysis standards, planning criteria, and industry standard practices are successfully developed and implemented to ensure compliance with codes and regulations and support the electrical system's orderly, cost-effective deployment
- Planning, protection, and control studies are coordinated across LUMA
- Periodic protection coordination review is implemented

### 2.3.2 Renewable and Distributed Energy Resource (DER) Interconnection Studies

In the completed state, the following will apply beyond that which has already been noted:

- Interconnection studies are completed consistent with regulatory requirements following accepted industry standards and procedures
- Completed feeder hosting capacity studies for every feeder where distributed generation/DERs can be installed, a hosting capacity map will be available. These maps will be updated as required by regulation
- Publicly available hosting capacity tools and resources will be available for customers and developers

### 2.3.3 T&D System Safety Studies

In the completed state, the following will apply beyond that which has already been noted:

- Grounding studies are completed: 100% of the transmission and distribution substations have ground grid studies and soil resistivity tests completed to meet the minimum acceptable limits of step-and-touch potentials and substation ground potential rise
- Identified gaps are addressed: Restoration of fencing and ground grid integrity, required gravel to mitigate step potential risks added. LUMA anticipates that 30% of transmission and distribution substation sites will need this work expected to be completed over a 5-year period

### 2.3.4 Wildfire Mitigation

In a completed state, the Wildfire Mitigation program will develop a multi-dimensional plan for managing and reducing wildfire ignition risk for Puerto Rico and addressing key elements of developing such a plan, including but not limited to: (1) developing solutions to address the wildfire risk assessment data and analytics; (2) developing and implementing proactive de-energization program to reduce wildfire ignition risk; (3) informing related programs working to deploy Distribution Automation technologies like fuses, trip-savers and reclosers; (4) informing capital infrastructure rebuilds to include technologies like covered conductor and strategic undergrounding to significantly reduce wildfire risk ignition; and (5) establishing the customer and stakeholder engagement channels and protocols to the development of this holistic plan for managing wildfire risk.

## 2.4 Program Activities

### 2.4.1 T&D System Studies

- T&D planning criteria development and performance of T&D planning studies:
  - Transmission line, substation, and distribution feeder capacity





## Compliance & Studies

- Acceptable voltage and VAR performance, including voltage unbalance
- Generator commissioning standard
- Transmission system studies and transmission infrastructure plans to address deficiencies:
  - Transmission system studies follow industry best practices – NERC standards TPL-001, CIP-014, FAC-008 for thermal, voltage, and protection performance, where the system is N-1 secure and designed to withstand a range of common failure modes
  - Flood/storm mitigation
  - Transient stability studies are performed, and issues are mitigated
  - Proposed projects, including undergrounding to address reliability and resilience needs
  - Achieve efficient operation of the transmission system
  - Renewables are integrated into the grid to support decarbonization goals
- System-wide protection coordination in the T&D System
  - Protection and coordination studies are routinely performed
  - Guidelines, validated models, validated coordination, and verified settings data are available
- Distribution coordination and fusing criteria are developed

### 2.4.2 Renewable and Distributed Energy Resource (DER) Interconnection Studies

- Review and update generator interconnection standards consistent with industry practices and regulatory requirements
- Investigate and employ generation and load forecasting capabilities to enable increased DERs, electric vehicles, demand response, and virtual power plants
- Hosting capacity maps are now available on the LUMA website

### 2.4.3 T&D System Safety Studies

- Thorough review of current applicable PREPA standards and comparison with industry codes, regulations, and best practices, including IEEE standards
- Identification and prioritization of the changes to current practices as applicable, including the development and implementation of a plan to use the new standards. This will lead to identifying and prioritizing the infrastructure changes that may be required
- Engineering studies as covered in these programs, such as grounding studies
- Correction of grounding at identified substations
- Procurement of required gravel and deployment across facilities
- Completion of grounding studies and identification of issues
- Prioritization and completion of repairs/corrections based on the level of hazard
- Placing of additional gravel occurs within one year of completing the studies for the specific substations

### 2.4.4 Additional Activities Identified Post-Commencement

Completed a backlog of studies in FY2024 for Rooftop Solar PV Interconnection customers requiring supplemental studies. Going forward these studies will continue on a more regular cadence to keep pace with the application volume. Engaged with PREB and stakeholders to develop alternative routes to supplemental studies, system upgrades required to accommodate DER and manage high volumes of customer interconnection notifications.

## Compliance & Studies

### 2.4.5 Wildfire Mitigation

We have divided our Wildfire Mitigation Program into three categories which have the following activities at a high level listed below:

#### Preemptive De-energization

- Establishing criteria for preemptive de-energization
- Reclosing disablement program to prevent ignitions
- Enhanced protection equipment settings to prevent ignitions
- Development of communications protocols
- Data-driven Communication strategy with public relations, engineering, and operations teams to support regulatory approval process
- Communication strategy to engage with customers to obtain their buy-in
- Design of the process for sending notifications before, during, and after preemptive de-energization
- Development and testing of Information and Communications Technology (ICT) infrastructure required for preemptive de-energization

#### Investment and Design Analysis

- Alignment between LUMA's LTIP (Long Term Investment Plan) and wildfire risk
- Guiding principles to include risk lens in LTIP Wildfires
- Identification of investment opportunities and capital programs for wildfire mitigation
- Development of prioritization mechanism for competing mitigation solutions

#### Situational Awareness

- Develop requirements for wildfire situational awareness technology and process
- Create pilot program for wildfire situational awareness
- Select sensors and hardware for pilot
- Select software for pilot
- Pilot implementation
- Pilot evaluation
- Plan and estimate for full scale rollout opportunity

### 2.4.6 FY2025 Activities

The focus for the upcoming fiscal year will be on continuing T&D system studies, renewable and DER integration studies, and continuing safety, grounding and civil site studies and mitigations. For the area of **Wildfire Mitigation** - this includes identifying high-risk areas, devising specific mitigation measures, and deploying advanced study and monitoring devices for early detection and ongoing monitoring. The proposed \$1.955 million budget includes planning and identifying wildfire mitigation options, and selection of pilot wildfire situational awareness system and tools to support the decision-making process for wildfire risk reduction.

In addition, a set of short-term mitigation options including preemptive de-energization and recloser disablement as well as long-term investment opportunities and design options to mitigate the risk were identified and assessed by benchmarking LUMA with current practices at leading investor-owned utilities.

# Compliance & Studies

Based on the risk analysis efforts, high risk areas were identified, and mitigation options were qualitatively assessed.

At this point, the approved \$1.955 million budget by PREB for this project can help to continue this effort by using the derived wildfire risk data along with the assessed mitigation options to identify the projects and initiatives that LUMA can adopt in its service territory as part of its wildfire risk mitigation process. In addition, the risk data will be used to design a risk-informed preemptive de-energization program that can be used as an option of last resort to potentially reduce the probability of grid-caused ignitions and to reduce the subsequent wildfire risk. Further, a pilot wildfire situational awareness system will be developed to provide more transparency on this evolving risk. This system can be evolved in the future where LUMA's wildfire mitigation ecosystem can be built around that, going forward.

## 2.5 Program Benefits

PRIMARY GOALS	OBJECTIVES	DIRECT OR INDIRECT IMPACT
<input checked="" type="checkbox"/> <b>Prioritize Safety</b>	<input checked="" type="checkbox"/> Promote a safe workplace	Direct
	<input checked="" type="checkbox"/> Implement effective public safety practices	Direct
<input checked="" type="checkbox"/> <b>Improve Customer Satisfaction</b>	<input checked="" type="checkbox"/> Deliver a positive customer experience	Direct
	<input checked="" type="checkbox"/> Increase service reliability	Direct
	<input checked="" type="checkbox"/> Deliver electricity at reasonable prices	Indirect
<input checked="" type="checkbox"/> <b>Operational Excellence</b>	<input checked="" type="checkbox"/> Enable systematic management of the business	Direct
	<input type="checkbox"/> Pursue project delivery excellence	
	<input checked="" type="checkbox"/> Enable employees to execute operations systematically	Direct
<input checked="" type="checkbox"/> <b>System Rebuild and Resiliency</b>	<input checked="" type="checkbox"/> Effectively Deploy Federal Funding	Direct
	<input checked="" type="checkbox"/> Restore damaged grid infrastructure	Direct
	<input checked="" type="checkbox"/> Improve the resilience of vulnerable infrastructure	Direct
<input checked="" type="checkbox"/> <b>Sustainable Energy Transformation</b>	<input checked="" type="checkbox"/> Modernizing the grid	Direct
	<input checked="" type="checkbox"/> Enable the digital transformation	Direct
	<input checked="" type="checkbox"/> Enable the sustainable energy transformation	Direct
<input type="checkbox"/> <b>Other</b>	<input type="checkbox"/> Other	

### PRIMARY GOAL: PRIORITIZE SAFETY

Objective: Promote a safe workplace



## Compliance & Studies

The T&D System Safety Studies identify the need for improved grounding, including grounding of substation fencing, and adding gravel will directly impact the shock and electrocution risk caused by the present condition of insufficient grounding inside the substation.

The T&D System Studies inform protection practices to develop protective device settings to maximize their effectiveness, remedy situations where protection equipment cannot effectively detect faults along a line section, and reduce the incident energy at a fault by properly and quickly detecting and clearing faults.

### **Objective: Implement effective public safety practices**

In addition to the previously described safety benefits, the studies in this program also directly impact the public by keeping them safe when they come into contact with fences.

Wildfires can have a devastating impact on communities. Smoke from wildfires can cause breathing difficulties for everyone, including healthy people, children, and people with lung diseases. Wildfire smoke is a mixture of hazardous air pollutants, such as PM2.5, NO2, ozone, aromatic hydrocarbons, or lead. Wildfires can cause burns, trauma, mental health effects, and reproductive and immunological disorders. The impact of wildfires on a community depends on the size, speed, and proximity of the fire and whether the population has advanced warning to evacuate. With climate change leading to warmer temperatures and drier conditions and the increasing urbanization of rural areas, the fire season is starting earlier and ending later. Wildfire events are getting more extreme in terms of acres burned, duration, and intensity, and they can affect the quality of life and the wellbeing of the communities by disrupting transportation, communications, water supply, and power and gas services. Given the above and knowing the state of the aging grid infrastructure in Puerto Rico, the probability of ignition generated by the grid, which can result in significant consequences, is growing over time.

Implementation of a Wildfire Mitigation program for Puerto Rico promotes public safety practices and ensures that communities remain safe and protected from the impacts of a wildfire initiated by electrical equipment. The wildfire mitigation program promotes the public safety practices in following ways: (1) It creates higher visibility and transparency to LUMA's wildfire risk across its service territory and communities that it serves. That will help to take more data-driven, risk informed action to protect communities and LUMA's employees. (2) It enables to strategically identify critical areas with high ignition risks, allowing risk-informed wildfire mitigation investments and system design decisions. (3) It supports more risk-informed and data-driven preemptive de-energization to reduce the risk of fire ignition that can help to protect LUMA's employees and the community that it serves, while considering its impacts on grid reliability.

### **PRIMARY GOAL: IMPROVE CUSTOMER SATISFACTION**

#### **Objective: Deliver a positive customer experience**

The Renewable Integration Studies enable transparent, customer-centric tools like the publicly available hosting capacity maps that allow customers and developers to quickly access information on adding renewable generation to their home or business. These studies also enable safe integration of large-scale renewable generation and ensure that resources can operate and contribute to grid reliability.

#### **Objective: Deliver electricity at reasonable prices**

T&D System Studies, including area plans, identify existing bottlenecks, grid constraints, unbalance, and voltage violations. Studies allow planners to optimize the grid, reducing losses, improving power quality,



## Compliance & Studies

and improving the utilization of grid infrastructure and assets. Studies lead to more optimal grid planning, which produces a T&D system that operates more efficiently, with fewer losses and service interruptions, and provides a better value for consumers at a reasonable price.

### **Objective: Increase service reliability**

T&D System Studies incorporate new industry codes and standards into planning and system design. These standards directly impact the grid's service reliability. For example, the implementation of NERC planning standards ensures that the loss of a single transmission line or a substation element does not result in a consequential load loss. In addition, the protection and coordination studies ensure only those facilities required to clear a fault condition respond, thereby improving service reliability by reducing or eliminating interruption to lines or line segments that are not faulted.

While the activity of preemptive de-energization or disabling reclosers reduces reliability performance in an area, it promotes public safety to support the local communities. Conversely, implementing solutions like covered conductor, strategic undergrounding and enclosed substation equipment all have the effect of increasing service reliability for customers (for example, eliminating the potential for vegetation contact to cause an outage) and simultaneously reducing wildfire ignition risk. Identifying the impacts of preemptive de-energization on reliability metrics (such as SAIDI) from one hand, and improving the accuracy of preemptive de-energization through improved transparency realized from situational awareness systems, predictive wildfire risk modeling can help to achieve a balance. In addition, long-term wildfire mitigation investments can reduce the risk (and thus the frequency of preemptive de-energization), leading to improved system reliability in long term.

### **PRIMARY GOAL: OPERATIONAL EXCELLENCE**

#### **Objective: Enable systematic management of the business**

Renewable Integration Studies and improved DER and load forecasts will enable more effective and proactive grid planning to address deficiencies and maintain grid reliability.

#### **Objective: Enable employees to execute operations systematically**

Planners and designers will have better processes and guidelines for planning activities such as constructing new lines, interconnecting new loads and DERs, and enabling decarbonization while maintaining grid reliability.

Ensuring digital grid models reflect the physical condition of the grid allows for improved operability by proactively studying load transfers, conducting system protection and coordination reviews, and identifying and mitigating over- and under-voltage to manage safe and reliable system operations.

### **PRIMARY GOAL: SYSTEM REBUILD AND RESILIENCY**

#### **Objective: Restore damaged grid infrastructure**

Asset information is used to build the T&D simulation models, which in turn inform the planning studies and assessments. Hurricane-damaged infrastructure is prone to frequent failure and constitutes a large share of existing out-of-service transmission, distribution, and substation equipment. The models, studies, and assessments performed here are essential to prioritizing and guiding the system rebuild for enhancing Puerto Rico's grid reliability and driving resilient T&D investments that will prevent the devastation experienced in similar future events like Hurricane María or Fiona. Planning and designing

## Compliance & Studies

equipment to withstand the expected wind speeds from strong storms will provide a major improvement in reliability and resilience. An outcome of this program's deliverables is to plan and design the grid optimally, in order of priority, and with the infrastructure that has the most significant impact on keeping customer load energized.

### **Objective: Improve the resilience of vulnerable infrastructure**

Repaired grounding and additional gravel will correct problems caused by hurricanes.

The enhanced T&D system research standards and studies will improve resiliency as they are implemented in the field by reducing the frequency and duration of outages.

The enhanced T&D safety standards and studies will help restore damaged infrastructure and improve resiliency.

### **PRIMARY GOAL: SUSTAINABLE ENERGY TRANSFORMATION**

#### **Objective: Modernizing the grid**

Using state-of-the-art standards and procedures to plan distributed generation, DERs, electric vehicles, energy storage, and virtual power plants

#### **Objective: Enable the digital transformation**

Streamlining the planning and information to customers will improve the current processes and shorten timelines to interconnect renewables.

#### **Objective: Enable the sustainable energy transformation**

As discussed with Renewable Integration studies, data, and models are essential for the safe, reliable, and efficient integration of both customer small-scale and utility-scale renewable interconnections. This facilitates the sustainable energy transition to a decarbonized and renewable energy supply.

## 2.6 Program Risks

- LUMA cannot meet applicable legal requirements, policies, or standards
- Improperly protected T&D systems can cause dangerous step and touch potential hazards during electric system faults and other system abnormalities
- There is the risk of injury, possibly fatal, to anyone adjacent to deficient facilities during severe weather and other hazardous conditions
- Substations whose grounding is not corrected can cause an immediate risk to the public and employees under faulty conditions. Induced voltages and phase-to-neutral load imbalances can also create this hazard
- Operating with obsolete and antiquated practices and tools will negatively affect grid planning and operations and delay some improvements in system performance
- There is the risk of potential incidents impacting worker and public safety and damage to equipment and facilities

If LUMA does not have a Wildfire Mitigation Program or Plan, it can face several significant risks:

- **Public Safety:** LUMA's commitment to the safety of the communities that it serves and its own employees.





# Compliance & Studies

- Operational Risks: Wildfires can cause extensive damage to infrastructure, leading to costly repairs and prolonged downtime and affecting customers and critical services.
- Environmental Impact: Wildfires can devastate local ecosystems, leading to long-term environmental harm, which may be directly attributed to the power company's operations. Fires contribute to air pollution, particularly from PM2.5, which can have significant health impacts on nearby communities.

## 3.0 Program Funding

### 3.1 Program Funding (\$ millions)

Description	FY2025 Estimate	FY2026 Estimate	FY2027 Estimate	FY2028+ Estimate
<b>Total Expenditures</b>	<b>\$31.2</b>	<b>\$30.9</b>	<b>\$25.7</b>	<b>\$67.5</b>
SRP Expenditures	\$20.1	\$20.1	—	—

### 3.2 Program Resource Requirements

#### 3.2.1 T&D System Studies

- Internal resources and external contractor resources will conduct extensive engineering and operational studies, prepare documentation, and develop mitigation plans and functional specifications
- Wide area protection and coordination (Distribution) – We require 15 full-time senior-level employees for the first 2 years of development and 0.5 full-time senior employees on an ongoing basis
- Wide area protection and coordination (Transmission) – We require 16 full-time senior-level employees for years 3 and 4 and 0.5 full-time senior employees on an ongoing basis
- Distribution coordination and fusing criteria – We require one full-time senior-level employee for the first year and 0.5 full-time senior-level employees on an ongoing basis
- Distribution planning criteria: We require eight full-time senior-level employees for the first two years of development and 0.5 full-time senior-level employees on an ongoing basis

#### 3.2.2 T&D System Safety and Environmental Protection Studies

- Internal and external contractor resources will be used to develop the required documentation and studies
- Three engineers (two engineering technicians and one surveyor) will be assigned for each program year (carry out studies and plan the work)
- Both internal and external contractors will be used to make necessary repairs
- There must be enough suitable gravel to fulfill program needs

#### 3.2.3 Wildfire Mitigation

- Preemptive De-energization Program Design: We require two engineers and one data scientist to perform this task.
- Investment and Design Analysis: We require one power systems engineer, one civil engineer, and one risk management specialist.

## Compliance & Studies

- Situational Awareness Pilot: We require two engineers to design and implement the pilot project and one fire risk analyst to run and monitor the system after implementation, assess fire risk, monitor weather, analyze relevant risk data, and inform responsible teams. In addition, we require three contractors to implement the situational awareness pilot project.

### 3.3 Estimating Methods and Assumptions

#### 3.3.1 T&D System Studies

- Estimates for engineering resources were prepared based on previous experience, which includes the development of similar standards for other utilities
- We are currently assuming the use of internal resources. If it becomes necessary to supplement with consultants, the average labor costs may increase

#### 3.3.2 Renewable and Distributed Energy Resource (DER) Interconnection Studies

We anticipate using internal resources but may need to supplement these with consultants, which may increase average costs.

#### 3.3.3 T&D System Safety Studies

##### For Distribution Sites

- Details of the current state of the grounding systems in the distribution system are unknown due to a lack of recorded information. An evaluation of electrical facilities will be required to determine the actual state before remedial plans can be implemented. The standards to be used are those outlined in IEEE Std 80- IEEE Guide for Safety in AC Substation Grounding which provides industry guidance on best practices for substation grounding

##### For Transmission Sites

- Estimates are based on previous experience, adjusted for local conditions

#### 3.3.4 Wildfire Mitigation

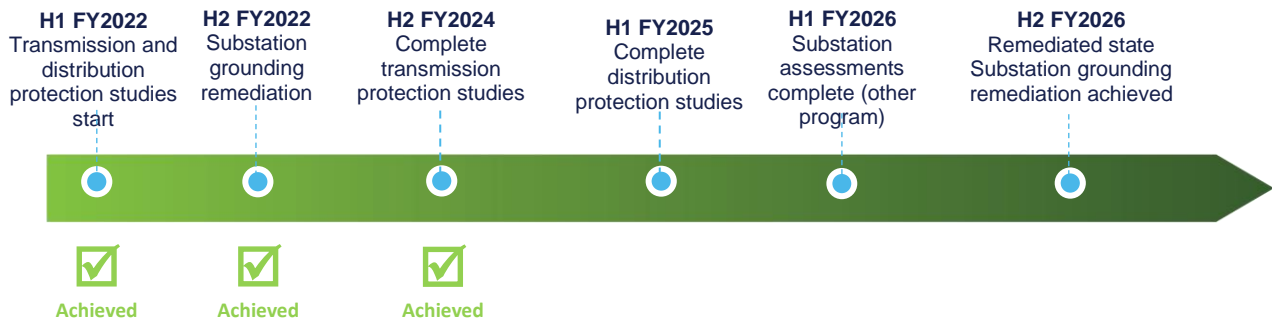
- Estimating Methods: Utilize historical wildfire data, weather forecasting, vegetation and fuel load modeling, equipment failure rates, and fire-spread simulations to assess future fire risks and potential impacts.
- Assumptions: It is assumed that available data is complete and representative, historical patterns will reliably indicate future risks, weather forecasting models will accurately predict high-risk conditions, fire-spread and fuel load models will perform as expected, and equipment failure rates will reflect actual ignition.

### 3.4 Timeline and Milestones

As discussed previously, earlier versions included distribution protection studies being completed before transmission protection studies. However, practical execution requires transmission protection studies to be completed first since the transmission is the source of both generation and short-circuit current to the distribution system. The transmission studies have been completed (in the timeline it was expected to take to complete distribution studies); therefore, the distribution studies are underway and will be completed in the time it was expected to complete all T&D protection studies.



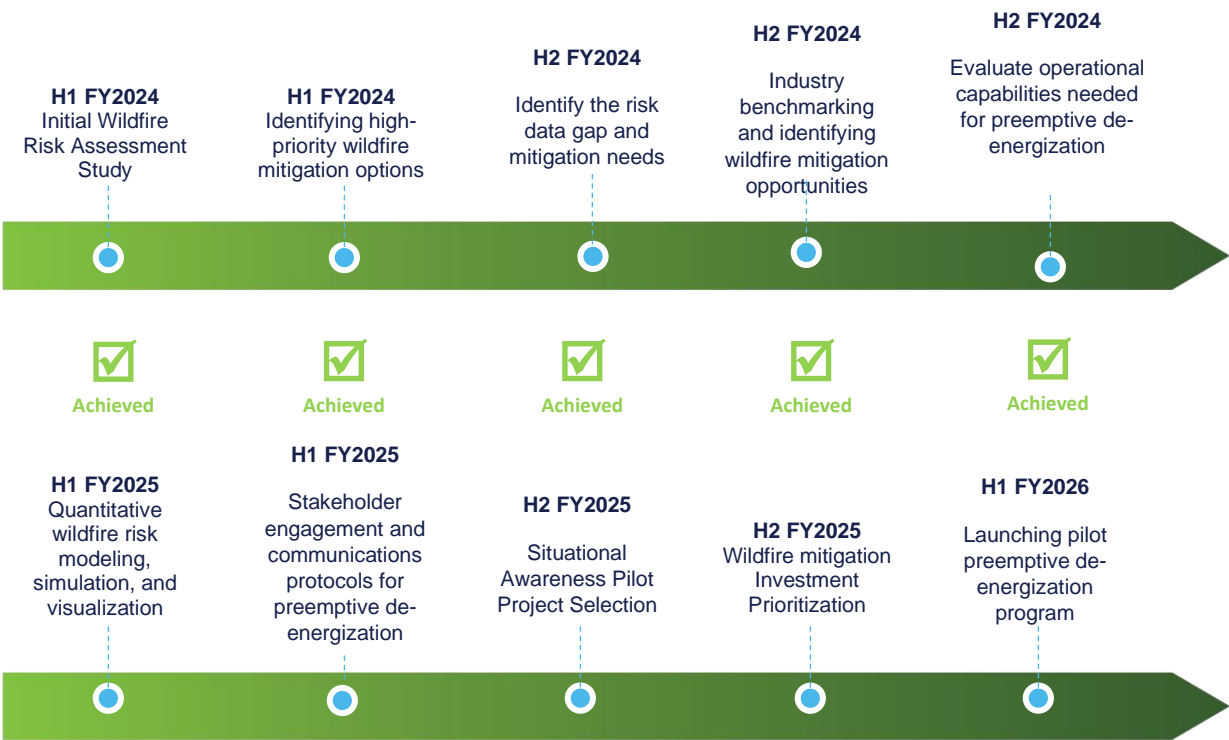
# Compliance & Studies



In the aftermath of the 2023 Hawaii Wildfire, LUMA's management in prudence initiated an assessment of wildfire risk in September of 2023. It included gathering quantitative and qualitative data, and review of policies and procedures to identify the wildfire risk and to assess LUMA's readiness level in addressing this emerging risk. That initial effort highlighted the importance of having a more granular assessment of wildfire risk and mitigation options. With funding from FEMA, LUMA developed a more granular, data-driven framework to assess wildfire risk geospatially. In addition, a set of short-term mitigation options including preemptive de-energization and recloser disablement as well as long-term investment opportunities and design options to mitigate the risk were identified and assessed by benchmarking LUMA with current practices at leading investor-owned utilities. Based on the aforementioned risk analysis efforts, high risk areas were identified, and mitigation options were qualitatively assessed.

The \$1.9 million budget for this project can help to continue this effort by using the derived wildfire risk data along with the assessed mitigation options to identify the projects and initiatives that LUMA can adopt in its service territory as part of its wildfire risk mitigation process. In addition, the risk data will be used to design a risk-informed preemptive de-energization program that can be used as an option of last resort in order to reduce the probability of grid-caused ignitions and to reduce the subsequent wildfire risk. Further, a pilot wildfire situational awareness system will be developed to provide more transparency on this evolving risk. This system can be evolved in the future where LUMA's wildfire mitigation ecosystem can be built around that, going forward. The timeline of the past and upcoming milestones for wildfire mitigation efforts at LUMA is, as follows:

# Compliance & Studies



*Exhibit 2*

# PREB Determination on FY2025 Annual Budget

## NEPR-MI-2021-0004

**Response: R&O-LUMA-MI-2021-0004-20240626-PREB-001**

---

### **SUBJECT**

Vegetation Management

### **REQUEST**

Provide a detailed implementation plan within 60 days of this order to complete the VM Remediation Phase. This plan should include:

- a. A revised timeline and milestones, acknowledging the delays in federal funding but showing how LUMA will accelerate efforts to achieve a fully remediated state as close to the originally ordered H1 2026 date as possible
- b. Strategies for maximizing the use of both federal and O&M funds to expedite VM activities
- c. Contingency plans for addressing potential further delays in federal funding obligations.

### **RESPONSE**

LUMA has updated the Vegetation Management and Capital Clearing Implementation Program Brief with the latest information available to reflect items requested in the Energy Bureau's order. Please refer to R&O-LUMA-MI-2021-0004-20240626-PREB-001\_Attachment 1 for the updated Vegetation Management Improvement Program.

# Vegetation Management and Capital Clearing Implementation

## Vegetation Management and Capital Clearing Implementation

### 1.0 Program Description

This program includes work to abate or mitigate immediate vegetation risk in the most critical locations, and an ongoing program to clear and re-establish rights of way (ROWs) to standard widths. The program also includes federally funded capital vegetation clearing and reclamation along transmission and distribution lines, in and around substations, and along facility access roads to achieve vegetation remediation as a key activity in LUMA's capital investment plan federally funded capital activity to be reimbursed by federal agencies. This vegetation management and capital clearing work includes an immediate response for the highest risk sites (those that pose hazards to public safety or routinely experience tree-caused service interruptions), and reclaiming rights of way corridors (especially those impacting the transmission and distribution systems). The program will also use a field-enabled IT tool to manage the vegetation management program, ongoing line clearance, pruning, tree removal, herbicides, etc., and vegetation management training. In addition, the program will evaluate and pilot an advanced artificial intelligence remote sensing project to improve the program's efficacy in vegetation management.

### 2.0 Program Rationale

#### 2.1 Initial State and Identified Gaps

There had been no centralized team with the responsibility and authority for maintaining vegetation and managing vegetation-related processes in the existing Transmission and Distribution System. Thus, there was no regular vegetation management program in place. In-house employees and contractors did not use the most up-to-date utility vegetation management industry standards and best management practices.

Vegetation maintenance and facility rights-of-way management had largely been deferred. The vegetation maintenance work performed by in-house personnel was predominantly reactive or corrective maintenance (a.k.a. "hot spotting"). Some preventive vegetation maintenance work was performed by contractors working under PREPA's PMO.

Pruning practices were not very effective, mainly resulting in excessive regrowth and wounding of trees, which increased the likelihood of structural failure.

Many personnel relied on machetes and did not have access to more useful tools. The equipment that the in-house personnel used was in poor repair, and personnel had no specialized vegetation management equipment. There was little use of herbicides and no use of tree growth regulators. The lack of appropriate tools and equipment contributed to the low productivity of in-house personnel.

Insufficient tree clearance and lack of vegetation maintenance, in general, are significant contributors to system unreliability, especially in extreme weather events such as hurricanes. This also creates a public

# Vegetation Management and Capital Clearing Implementation

safety hazard- directly in the form of fallen wires or children climbing trees too close to energized lines and indirectly in power outages.

These findings indicate possible failure to meet applicable legal requirements, policies, or standards or the Puerto Rico Transmission and Distribution System Operation and Maintenance Agreement (T&D OMA) requirements, including Prudent Utility Practice. Specifically, these are:

- Act 57-2014, providing that PREB will oversee the compliance of the T&D operator with a vegetation plan following industry best practice
- Act 17-2019, whose objective is to establish priorities for the maintenance of the infrastructure of the electric system and create vegetation management plans
- The T&D OMA requires LUMA to implement a vegetation management plan per Prudent Utility Practice and applicable laws

## 2.1.1 Additional Gaps Identified Post-Commencement

Post-commencement, LUMA identified a series of additional challenges that it could not identify during the gap assessment conducted in 2020 during the Front-End Transition. LUMA's gap assessment was based on satellite imagery that initially suggested there were significantly more clear and open spans in the system than existed. However, after Service Commencement, and once fieldwork commenced, it became apparent that there were fewer clear spans than originally estimated and the vegetation was denser than expected.

Moreover, after Service Commencement, LUMA became aware of the large volume of critical and required requests for vegetation work in addition to the remediation work, which entailed much more reactive and corrective actions than originally anticipated. Additionally, in LUMA's efforts to pursue and maximize federal funding for vegetation work, the process to procure federal procurement compliant contracts has required additional time in order to fully execute federally funded work.

Finally, LUMA expected a more straightforward regulatory pathway. For example, LUMA has received notice that the Fish and Wildlife Service would require incremental vegetation and capital clearing permitting, which it had not expected.

## 2.2 Description of Remediated State

In the remediated state, the following will apply:

- A centralized vegetation management team will have been created and staffed by professionals who will establish procedures and practices to eliminate public endangerment and promote a safe and efficient work environment
- A capital program for vegetation clearing will have been created to implement the federally funded capital clearing work plan that will work in coordination with the planned vegetation management team but at an expanded and accelerated pace
- The maintainable tree-conductor clearances will have been re-established on the T&D System, including:
  - Initially, reactive maintenance response that will target specific locations that pose the most significant risk to public safety, reliability, resilience, and system capacity (i.e., address the “worst of the worst”)

# Vegetation Management and Capital Clearing Implementation

- Reclamation of the ROWs that are currently overgrown and out of control and pose a risk to public safety, service reliability, and system capacity. This will include complying with Act 17-2019. In the remediated state, LUMA will set a baseline from which LUMA will establish reasonably maintainable conditions
- Establishment of steady state ongoing preventive vegetation maintenance practices (versus reactive response practices) as individual circuits are reclaimed (consistent with the principles of integrated vegetation management)
- Complying with Section 1.16 of Act 17-2019
- Meeting all requirements for federal agency reimbursement of vegetation-clearing activities

## 2.2.1 Tasks to Achieve Remediated State

LUMA's Vegetation Management Plan (VMP), submitted to PREB on April 11, 2021, lays out the specific approach LUMA will take in executing the remediation work. LUMA will utilize an industry best-practice, structured decision-making process known as Integrated Vegetation Management (IVM) to understand the dynamics of managing incompatible species and the ecosystem. By applying this approach, incompatible tall growing trees and woody plants are eliminated from rights-of-way to the extent possible to reduce interference with critically important power facilities. Low-growing plant communities are preserved, which "crowds out" taller growing species, thereby providing biological control. In urban areas, IVM can include planting compact plants in place of tall, growing landscape trees. The benefit of IVM is that the cost and intensity of vegetation work will reduce over time while system reliability and safety are improved.

In implementing an IVM approach, LUMA will restore overgrown rights-of-way to standard widths and maintainable tree-conductor clearances as specified in the VMP. LUMA will comply with all laws and regulations and incorporate appropriate industry standards and best management practices. Some of these include the National Electric Safety Code, American National Standards Institute (ANSI) standards, International Society of Arboriculture Best Management Practices, and Rights-of-Way Stewardship Council standards.

## 2.3 Description of Program Completed State

Oversight of vegetation-related practices will be centrally managed by a dedicated vegetation management (VM) team composed of utility vegetation management industry subject matter experts (SMEs) with the responsibility and authority to complete the work promptly and effectively. Capital vegetation clearing work will be managed by the capital organization, which operates separately but in coordination with the VM team. The VMP will guide the program based on current industry standards and in compliance with the requirements of Act 57-2014, Act 17-2019, and the T&D OMA.

The VMP will follow the principles of integrated vegetation management, an approach to sustainable vegetation management over the long term rather than simply controlling vegetation currently affecting overhead lines.

Transmission and distribution lines, substations, and access road vegetation clearing will be completed, consistent with federal agency requirements, to improve the public safety, reliability, and resilience of the infrastructure LUMA operates in Puerto Rico.

# Vegetation Management and Capital Clearing Implementation

Technical specifications will establish vegetation work expectations, and process flows will be used to define standard approaches to manage the necessary types of work more efficiently. In managing vegetation work, we will use performance measurement, quality systems, and specialized vegetation services to complete the job.

## 2.4 Program Activities

The program includes two major elements. The first involves reclamation of the existing ROWs—through preventive maintenance activities and federally funded vegetation clearing work—during the remediation phase, depending on acquiring the necessary approvals, permitting, and resources. As individual facilities are reclaimed, they will transition to long-term preventive maintenance efforts. The second element is a program of rapid reactive response to address the most critical locations.

A field-enabled IT tool will be implemented and used to manage vegetation work, including planning, scheduling, executing, and evaluating the effectiveness of vegetation activities for both vegetation maintenance and capital vegetation clearing. The data collected with the tool will support defining resource requirements and budgets based on quantitative estimates of the vegetation workload to be completed. Performance measurement and quality-control systems will be established to manage vegetation work.

The VM and vegetation clearing program teams will be staffed with SMEs who will act as mentors, assisting in developing SME level of knowledge among the VM employees. A range of specialty vegetation services will be engaged in executing the work.

### 2.4.1 Additional Activities Identified Post-Commencement

In alignment with the Vegetation Management Plan scope and activities required for the operation of the utility, the following activities have been added to the scope of this program:

- “Reactive” vegetation support for outage, afterhours, and storm restoration along transmission, distribution, and substation facilities
- “Corrective” activities to support re-occurring system reliability needs, customer requests, access, and system patrols along transmission, distribution, and substation facilities
- “Maintenance” and control of vegetation at substations, material laydown yards, switchyards, and other company facility sites

### 2.4.2 FY2025 Activities

The focus of the upcoming fiscal year includes:

- Initiating second maintenance cycle of 230kV ROW's which are now on a routine 3-year cycle.
- Continued clearing and maintenance work on all remaining voltage levels
- Pursuing federal funding obligation with FEMA for vegetation clearance work



# Vegetation Management and Capital Clearing Implementation

## 2.5 Program Benefits

PRIMARY GOALS	OBJECTIVES	DIRECT OR INDIRECT IMPACT
<input checked="" type="checkbox"/> <b>Prioritize Safety</b>	<input type="checkbox"/> Promote a Safe Workplace	
	<input checked="" type="checkbox"/> Implement Effective Public Safety Practices	Direct
<input checked="" type="checkbox"/> <b>Improve Customer Satisfaction</b>	<input checked="" type="checkbox"/> Deliver a Positive Customer Experience	Indirect
	<input checked="" type="checkbox"/> Increase Service Reliability	Direct
	<input type="checkbox"/> Deliver Electricity at Reasonable Prices	
<input checked="" type="checkbox"/> <b>Operational Excellence</b>	<input checked="" type="checkbox"/> Enable Systematic Management of the Business	Direct
	<input type="checkbox"/> Pursue Project Delivery Excellence	
	<input checked="" type="checkbox"/> Enable Employees to Execute Operations Systematically	Direct
<input checked="" type="checkbox"/> <b>System Rebuild and Resiliency</b>	<input checked="" type="checkbox"/> Effectively Deploy Federal Funding	Direct
	<input checked="" type="checkbox"/> Restore Damaged Grid Infrastructure	Direct
	<input checked="" type="checkbox"/> Improve Resilience of Vulnerable Infrastructure	Direct
<input checked="" type="checkbox"/> <b>Sustainable Energy Transformation</b>	<input checked="" type="checkbox"/> Modernizing the Grid	Indirect
	<input type="checkbox"/> Enable the Digital Transformation	
	<input type="checkbox"/> Enable the Sustainable Energy Transformation	
<input type="checkbox"/> <b>Other</b>	<input type="checkbox"/> Other	

### PRIMARY GOAL: PRIORITIZE SAFETY

#### Objective: Implement Effective Public Safety Practices

Correcting the backlog of untrimmed trees and deteriorated rights-of-way will mitigate public safety risks due to power outages, fallen wires, and people climbing onto energized lines.

### PRIMARY GOAL: IMPROVE CUSTOMER SATISFACTION

#### Objective: Deliver a Positive Customer Experience

#### Objective: Increase Service Reliability

# Vegetation Management and Capital Clearing Implementation

The primary benefit of effective vegetation management and well-maintained rights-of-way is to reduce outages caused by vegetation-caused line faults. This is a substantial contributor to the current poor reliability of the system. Improved reliability will improve customer experience. Cleared ROWs will also make it easier to assess storm damage and access sites to make repairs, shortening the duration of outages and enabling efficient design and construction of electric infrastructure.

## PRIMARY GOAL: OPERATIONAL EXCELLENCE

**Objective: Enable Systematic Management of the Business**

**Objective: Enable Employees to Execute Operations Systematically**

Current vegetation management practices are focused on reactive and corrective work, i.e., addressing problems after they arise. A well-functioning program will trim vegetation systematically, increasing the workforce's efficiency and the system's reliability. A clear VMP will also enable employees to work more effectively and efficiently.

## PRIMARY GOAL: SYSTEM REBUILD AND RESILIENCY

**Objective: Effectively Deploy Federal and Other Funding**

LUMA is taking a multi-pronged approach to expedite vegetation management (VM) activities and maximize the use of federal and O&M funds. LUMA has begun executing on this strategy through the following actions:

- LUMA continues to collaborate closely with COR3 and FEMA to streamline the obligation process for the remaining federally funded vegetation clearance projects, ensuring timely access to this critical source of funding.
- LUMA completed a request for proposal, competitively procuring experienced vegetation companies.
- LUMA commenced vegetation clearing activities in areas that require a shorter permitting process.
- LUMA has signed four contracts with experienced vegetation companies, who will be providing approximately 400 crews and their equipment which LUMA will safely ramp up over the life of the program to complete this work.
- LUMA will closely monitor obligations to be able to effectively deploy crews in order to reach program completion.

LUMA remains vigilant in evaluating and adjusting its plans, timelines, and resource allocation based on evolving conditions, and in order to enable continuous optimization and the effective use of the available federal funds. As funds are effectively deployed, we are aligning with our vegetation operations team to accomplish our Capital Clearing goals. Partnering with them allows us to focus on the larger island wide Capital clearing project to reclaim our right of ways and improve reliability, while our operations team can increase their focus on necessary reactionary work.

# Vegetation Management and Capital Clearing Implementation

**Objective: Restore Damaged Grid Infrastructure**

**Objective: Improve the Resilience of Vulnerable Infrastructure**

Rights of way currently contain debris deposited during hurricanes, which will be cleared through a better vegetation management process. Reclaiming rights of way will reduce outages in future hurricanes or weather events.

## PRIMARY GOAL: SUSTAINABLE ENERGY TRANSFORMATION

**Objective: Modernizing the Grid**

Clearing the ROWs of vegetation is necessary to facilitate the deployment of grid modernization programs. Reclaiming ROWs is an initial step toward modernizing the grid.

## 2.6 Program Risks

- The primary risk to delaying the program is that there will be no meaningful improvement in system reliability and perhaps a further decline resulting in an exceedingly poor level of service for customers. Resources would continue to be wasted on disorganized reactive or corrective maintenance, such as hot spotting
- Inability to meet contractual performance requirements
- Inability to meet requirements of Vegetation Management Plan required under Act 57-2014, as amended, and standards under Act 17-2019, as amended, and meet other legal requirements, policies, and T&D OMA requirements, including Prudent Utility Practice

## 3.0 Program Funding

### 3.1 Program Funding (\$ millions)

DESCRIPTION	FY2025 ESTIMATE	FY2026 ESTIMATE	FY2027 ESTIMATE	FY2028+ ESTIMATE
Total Expenditures	\$208.2	\$397	\$397	\$696.4
SRP Expenditures	\$158.2	\$347	\$347	\$346.4

### 3.2 Program Resource Requirements

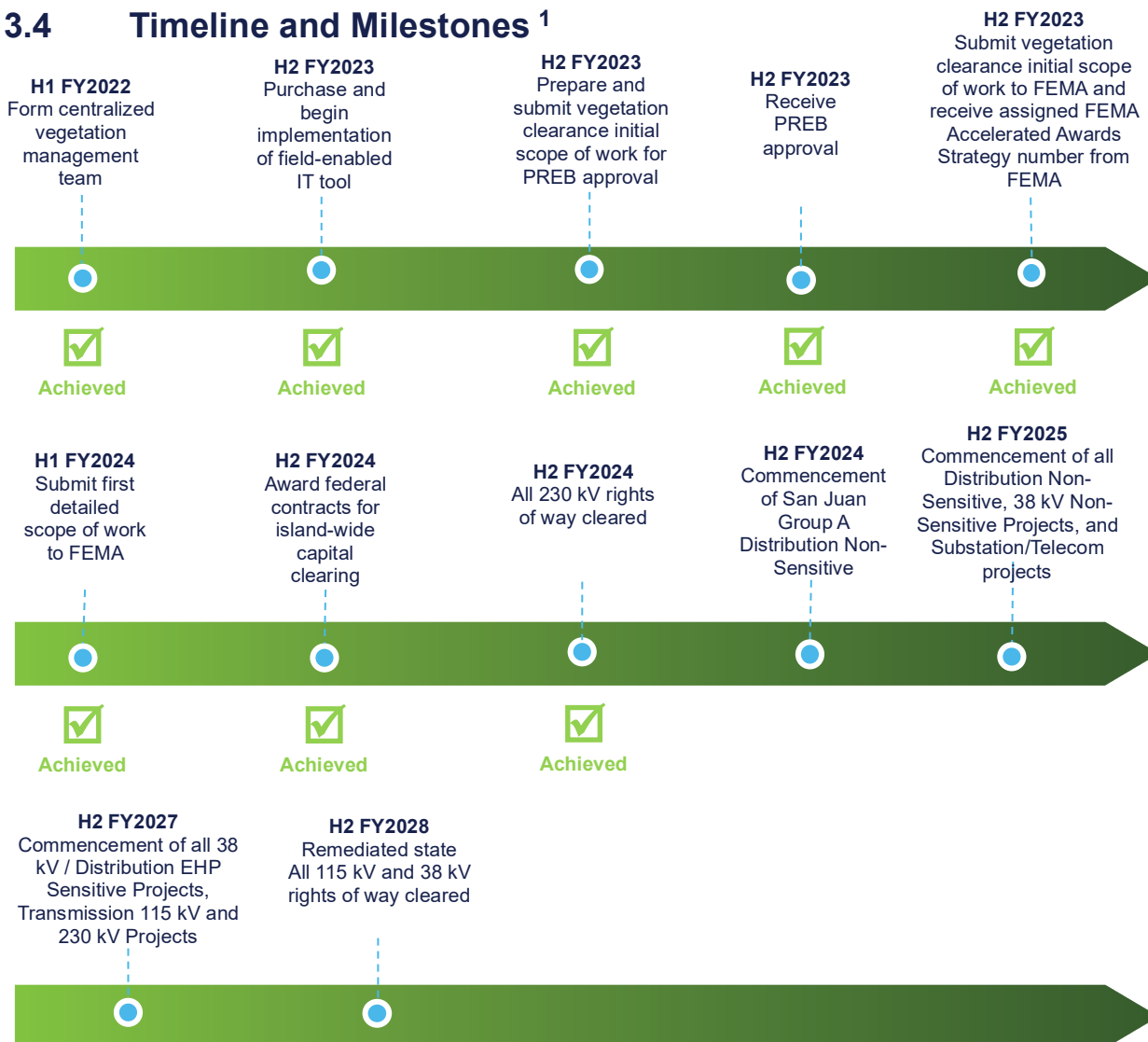
- Recruitment and inclusion of experienced VM SMEs in LUMA's VM and capital clearing teams to address any gaps in knowledge and skills to support the development of an effective program based on industry standards and best practices
- To the extent dictated by workload and system performance, engagement of experienced providers of core and specialized vegetation services
- IT Tool to support the application of performance management techniques across the VM and capital clearing programs
- Training of vegetation workforce on industry standards and best management practices to build required knowledge and expertise

# Vegetation Management and Capital Clearing Implementation

## 3.3 Estimating Methods and Assumptions

The cost estimate is based on spatial analysis and actual experience to define the vegetation workload. Satellite imagery (at two-meter resolution) and other remote sensing data sets were used to develop an initial assessment of vegetation-related field conditions. This was supplemented with high-resolution, near real-time satellite images of the entire T&D System, which were used to refine the estimate and to evaluate the need for “boots on the ground” field validation, which is ongoing.

## 3.4 Timeline and Milestones <sup>1</sup>



<sup>1</sup> Achieving milestones is dependent on the process to receive federal funding obligation from FEMA, receiving timely Environmental and Historic Preservation approvals from FEMA, and timelines associated with other legal or regulatory requirements. LUMA will continue to update this timeline and provide further detail as the federal funding process continues. With the information currently available, LUMA is unable to achieve a remediated state prior to the second half of FY2028.