

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

NEPR

Received:

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IN RE: INTERRUPCIÓN DE SERVICIO
ELÉCTRICO DE 21 DE FEBRERO DE 2022

CASE NO. NEPR-IN-2022-0001

SUBJECT:

**Submission of Detailed Report on February
21st Incident and Request for Confidential
Treatment.**

**MOTION SUBMITTING DETAILED REPORT ON FEBRUARY 21ST INCIDENT AND
EXECUTIVE SUMMARY OF THE DETAILED REPORT**

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

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

1. On February 22, 2022, this Honorable Puerto Rico Energy Bureau (“Energy Bureau”) issued a Resolution and Order whereby it initiated an investigation of the incident that took place on February 21, 2022 (“February 22nd Order”). The incident caused the shutdown of certain generation units, including Central San Juan, Palo Seco, and Aguirre unit 2, operated by the Puerto Rico Electric Power Authority (“PREPA”) (hereinafter, the “February 21st Incident”), and multiple outages of the electric system as well as service interruption for many customers in northeast Puerto Rico.

2. In the February 22nd Order, the Energy Bureau fixed February 25, 2022, as the date for LUMA to file a root cause report of the February 21st Incident. Specifically, it instructed LUMA to provide the following information:

- i. a summary of the incident including, but not limited to, a chronological description of the events and their effect, if any, on PREPA's generation fleet, as well as investigative, corrective, or other actions taken by LUMA and PREPA;
- ii. any information received, obtained, or gathered in the course of investigative, corrective, or other efforts undertaken by LUMA and/or PREPA, its agents, attorneys, or consultants to determine the cause of the incident and its effect, if any, on PREPA's generation fleet;
- iii. Any document produced, prepared, or received by LUMA and/or PREPA, its agents, attorneys, or consultants in the course of investigative, corrective, or other efforts undertaken to determine the cause of the incident, including but not limited to, the root cause report of the incident and its effect, if any, on PREPA's generation fleet; and
- iv. any information, data, video, audio, photos, report, or document submitted to federal or local authorities regarding the incident and its effect on PREPA's generation fleet.

3. On February 25, 2022, LUMA filed a *Motion Submitting Preliminary Report on February 21st Incident and Request for Confidential Treatment* ("February 25th Motion"). The February 25th Motion included as Exhibit 1 a preliminary public report of the February 21st Incident. The preliminary report included the information that LUMA had gathered thus far and preliminary findings and assessments of the February 21st Incident. However, given the nature of the February 21st Incident, LUMA was unable to provide at that time additional documentation to

the information submitted in the preliminary report. Therefore, LUMA informed that the detailed report on the incident would take an estimated six weeks.

4. In view of the above, LUMA is submitting a detailed report of the February 21st Incident (hereinafter, the “Detailed February 21st Report”). The Detailed February 21st Report is based on the forensic analysis of the electrical system disturbance that caused a widespread power outage on February 21, 2022. LUMA submits the Detailed February 21st Incident Report under seal of confidentiality and requests that the Energy Bureau receive and maintain the same confidentially.

5. Considering that Section 15.10 of Regulation No. 8543 allows for the release to the public of information after an investigation has concluded, LUMA respectfully submits that the Detailed February 21st Incident Report should be designated as confidential material that should be protected from disclosure after the investigation of the February 21st Incident concludes. The Detailed February 21st Incident Report is protected from disclosure as CEII, *see e.g.*, 6 U.S.C. §§ 671-674; 18 C.F.R. §388.113 (2020), and pursuant to the Bureau’s Policy on Management of Confidential Information. *See* Energy Bureau’s Policy on Management of Confidential Information, CEPR-MI-2016-0009, issued on August 31, 2016, as amended by Resolution dated September 16, 2016.

6. Further, LUMA submits a public executive summary of the Detailed February 21st Incident Report as Exhibit 2 to this Motion.

WHEREFORE, LUMA respectfully requests that the Energy Bureau **take notice** of the aforementioned, **accept** the Detailed February 21st Incident Report included as Exhibit 1 of this Motion, **treat it confidentially**, **accept** the public executive summary of the Detailed February

21st Incident Report as Exhibit 2 to this Motion, and **deem** that LUMA complied with the February 22nd Order.

RESPECTFULLY SUBMITTED.

We hereby certify that we filed this motion using the electronic filing system of this Energy Bureau and that we will send an electronic copy of this motion to the attorneys for PREPA, Idelisa Carerro, icarrero@diazvaz.law; and Katiuska Bolaños-Lugo, kbolanos@diazvaz.law.

In San Juan, Puerto Rico, this 14th day of April 2022.



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Exhibit 1
(to be submitted confidentially)

Exhibit 2



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NEPR-IN-2022-0001

Executive Summary for Disturbance Event on February 21, 2022

April 14, 2022

Executive Summary

This report is based on the forensic analysis of the system's behavior during the electrical system disturbance that caused a widespread power outage on Monday, February 21, 2022.

LUMA is committed to being transparent with our customers and regulators about our operations and the successes and challenges we face in delivering more reliable energy. This report reflects LUMA's dedication to (1) highlight the significant challenges it continues to face as result of inheriting a Transmission & Distribution system that suffered from years – if not decades – of neglect; (2) address these legacy challenges through continuous improvement; and (3) determine the root cause of widespread outages in order to identify actions to reduce the likelihood of future incidents and mitigate the impact on our customers.

Based on our extensive analysis of the February 21st, 2022, outage event, LUMA determined that the cascading failure was the result of substation equipment that had been subjected to years of neglect predating LUMA. While LUMA is proposing a series of short and long-term actions to help mitigate these types of large-scale events, it is important to note that these substandard and deteriorated conditions are prevalent throughout the transmission and distribution system. These operational conditions are the result of past neglect and mismanagement by the prior operator. This effort will last several years. Nevertheless, LUMA is working every day to address these serious legacy issues in an effort to repair, rebuild and stabilize the system over the coming months and years.

February 21 Outage Event and Response

The estimated number of customers affected by this outage was approximately 590,000, or 40.3% of the customer base. Due to the hard work and professionalism of our utility workers, LUMA, working in conjunction with Puerto Rico Electric Power Authority (PREPA) and other generators, was able to restore power to nearly all customers – or 98% of the total customers affected by the outage – within three hours. By 16:12 on February 21st, or approximately 3 hours after the event began, the number of customers without power was below 19,000 or 1.3% of the customer base. Following restoration, LUMA immediately began an investigation to determine the cause of the outage and define what steps may help prevent future outages of this kind.

Identified Root Causes

On February 21, 2022, at 13:19, a single phase-to-ground fault occurred on the 115 kV line 38100 from San Juan Steam Plant (SP) to Viaducto Transmission Center, approximately one mile from San Juan SP. The initial fault was the result of vegetation contacting the line, which was detected by the line relays at both terminals. While the circuit breaker at Viaducto TC operated correctly, the circuit breakers at San Juan SP failed to operate due to lack of direct current (dc) power supply caused by damaged wires. As a result, a single transmission line fault cascaded into a series of larger outages.

Utility industry standard regularly scheduled maintenance is intended to address potential damages that impact the breaker failure scheme at San Juan SP. Had the necessary circuit breakers opened, the fault would have been isolated locally at the substation. However, the breaker failure scheme at San Juan SP failed to operate (due to aged wiring) thus requiring all the 115 kV circuits from San Juan SP to operate at the remote end to clear the fault.

Additional issues were identified during the remote backup operations explained in this report, which resulted in subsequent outage events across the power system in Puerto Rico.

The report covers the known details of the four stages of the power outage, as described in further detail in Sections 2 and 3 of this report:

- Initial fault at line 38100 – Viaducto TC to San Juan SP.
- Circuit breaker failure event in San Juan SP.
- Unresponsive circuit breaker failure protection in San Juan SP and remote-end operations.
- System-wide disturbance.

Based on the review of the events and the data available, the forensic analysis indicates the following causes:

- Critical equipment had suffered from years of neglect or poor maintenance, which directly contributed to a series of cascading faults that led to a large-scale outage.
- Loss of dc on circuit breakers 31840-0084 and 0086 was responsible for delayed and non-selective fault clearing.
- The breaker failure protection (50BF-38140-0084) failed to initiate, which prevented local clearing of the fault at the San Juan SP 115 kV bus.
- Additional issues during the remote backup operations extended the reach of the outage. These issues included remote ends that did not operate, or operated late, and coordination issues in Sabana Llana TC, Aguas Buenas TC, Caguas TC, and Vega Baja TC substations.

The chain of events and each root cause are discussed in this report.

Corrective Actions

While addressing the scope of these legacy infrastructure challenges will take time, LUMA is determined to take steps to help improve immediate reliability issues by making the necessary short-term repairs, as well as transforming the resilience of the grid over the long-term by advancing FEMA projects. The short-term and long-term actions are presented below.

Short-term Actions

The short-term actions identified to help mitigate the impact of these past legacy issues effect on reliability and improve the grid's resiliency are noted below, and are scheduled to be completed by LUMA before the end of July 2022:

- Implementation of dc monitoring in San Juan SP is underway. Final plan and schedule will be completed the week of 3/21.
- Develop a schedule by the week of 3/14 to implement dc monitoring in the following substations: Viaducto TC, Monacillos TC, Bayamón TC, San Juan SP, Costa Sur, and Sabana Llana TC. These substations were chosen based on weighing parameters, such as: station loading, asset health, age, and single point of failure.
- As the first two contingencies were due to failing aging equipment, the energization of the San Juan SP protection and control system upgrade and the 38 kV gas-insulated switchgear project will be scheduled for assessment. These projects and equipment were constructed more than a decade ago and never placed into service. An assessment plan was completed.
- Continue with functional relay to circuit breaker testing systematically.
- Address the corrective actions as presented in section 5.1.5.
- Collaborate with PREPA on corrective actions resulting from the battery tests at the San Juan SP once received from their contractor.

Long-term Actions

Given the scope and nature of legacy operational issues that are found across the energy grid, more long-term actions will be critical to fully reduce the risk of large-scale outages such as the one experienced on February 2nd. These long-term actions will be planned, scheduled, and tracked to completion aligned with LUMA's Long-Term Investment Plan (LTIP) initiatives and include the following:

- As part of LUMA's Area Planning and Substation improvement and expansion plans, the team will continue to analyze capacity, redundancy, and reliability factors affecting the transmission system, electrical substation, or switchyard facility. For instance, substation configuration evaluation from straight bus to ring bus or circuit breaker and a half, and additional transformers for N-1 design compliance.
- Inclusion of transient recorders and certain substations protection systems into the new cyber-secure platform with remote access, including Sabana Llana TC, amongst others.
- Completion of the protection and control system upgrades in Viaducto TC and Monacillos TC.
- Development of a protection and control renovation plan for Bayamón TC in coordination with existing multiple capital projects underway.
- Development of a protection and control upgrade plan to supplement the Substation Rebuild projects currently in progress.
- Continue the transition to new protection relaying philosophies, according to industry standards and best practices, including revised transmission line-zone protection and revised backup protection for lines and transformers. The changes proposed will provide faster response times of backup protection systems and eliminate chances for miscoordination.

While these long-term actions depend on the adequate funding of various FEMA projects, implementing these steps and actions will help ensure fast clearing of the fault and proper operation of substation equipment in addition to isolating the disturbance should a similar event occur.

Conclusion

Preventing future large scale outages demands a clear and transparent explanation of the causes that contribute to such events. In the case of the February 21st, 2022 outage, it is clear that past legacy issues continue to pose an ongoing threat to everyday reliability. While service interruptions of this size would be rare in any modern energy system, the fragile and aged nature of the transmission and distribution system in Puerto Rico highlights the significant challenges that still exist.

To help provide the reliability that our customers expect and deserve, LUMA is committed to undertaking all necessary actions, including an area-wide protection study, which began last year, that will help identify broad improvements to the protection systems of the critical transmission infrastructure across Puerto Rico. We understand that any electrical outage, no matter its magnitude or reason, is very frustrating for our customers. And while significant progress has been made since June 1st, the day of transition, it is clear that significant work remains to address these legacy issues. All of us at LUMA remain committed to not only being transparent about the causes of such events, but to building an energy system that our 1.5 million customers can rely on.