NEPR

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

Jul 22, 2022

Received:

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IN RE: INTERRUPCIÓN DE SERVICIO ELÉCTRICO DE 12 DE JULIO DE 2022

CASE NO. NEPR-IN-2022-0003

SUBJECT:

Submission in Compliance with Request for Information on July 13th, 2022

MOTION SUBMITTING PRELIMINARY REPORT ON JULY 13TH INCIDENT AND REQUEST FOR CONFIDENTIAL TREATMENT

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 July 12th 2022, a failure in the electric system led to a fire at the 115KV/4KV

Jayuya Substation, which resulted in a power outage in the municipality of Jayuya (hereinafter, the "July 12th Incident").

2. On July 13th 2022, this Honorable Puerto Rico Energy Bureau ("Energy Bureau") issued a Resolution and Order whereby it initiated a confidential investigation of the July 12th Incident ("July 13th Order").

3. The July 13th Order instructed LUMA to submit on or before July 19th, 2022, at 3:00 p.m., a preliminary report on the causes of the July 12th Incident and the corrective actions taken by LUMA (the "Preliminary Report").

4. Further, the July 13th Order instructed LUMA to submit on or before October 15th 2022, at 3:00 p.m., a final and more detailed report on the July 12th Incident with the following information (the "Final Report"):

- (i) A summary of the incident including, but not limited to, a chronological description of the events and their effect, if any, on the Puerto Rico Electric Power Authority's ("PREPA") generation fleet, other energy producers, and the transmission and distribution system, as well as investigative, corrective, or other actions taken by LUMA;
- (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 and the transmission and distribution system;
- (iii) Any document produced, prepared, or received by LUMA and/or PREPA, its agents, attorneys, or consultants in the course of investigative, corrective, or any 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 the transmission and distribution system;
- (iv) Repercussions, consequences, or effects that clients and the electricity system will face in the short or long term because of the incident; and
- (v) Any information, in digital or tangible format regarding the incident in possession of LUMA and/or PREPA, which includes, but is not limited to, data, graphs, maps, videos, audios, photos, reports, or documents related to the incident and its effect on the electric service, the generation fleet, and the electricity transmission and distribution system of Puerto Rico

5. The July 13th Order also required LUMA to submit monthly progress reports (the "Monthly Progress Reports") until LUMA files its Final Report on the July 12th Incident.

6. On July 15, 2022, LUMA filed a *Request for a Brief Extension of Time to Comply with July 13th Resolution and Order on July 12th Incident Investigation*. Therein, LUMA requested a brief extension of time until the end of the day today to submit the Preliminary Report in compliance with the July 13th Order.

7. In compliance with the July 13th Order, and to be transparent with its customers and regulators about its operations, LUMA hereby submits the Preliminary Report of the July 13th Order. <u>See</u>, Exhibit 1. The Preliminary Report includes the information that LUMA has gathered thus far and preliminary findings and assessments of the July 12th Incident.

7. The Preliminary Report filed as Exhibit 1 to this Motion, includes the following:

- (i) Summary of Information on the July 12th Incident
- (ii) Incident Chronology
- (iii) LUMA's Response to the Outage
- (iv) Damage Assessment and Affected Assets
- (v) Restoration Plans and Next Steps

8. As detailed by LUMA in the Preliminary Report, on July 12, 2022 at 5:50 a.m., a fault occurred in the Jayuya substations (the Jayuya 1 substation and Jayuya 2 substation), resulting in the substations being de-energized, affecting 6,208 customers. All customers were fully restored approximately 12 hours after the initial fault. While an understanding of the steps leading to the event is clear, additional information and analysis will be necessary to determine the initial and exact cause of the outage.

9. LUMA is committed to investigating the factors that may have led and contributed to this specific substation event, including 1) identifying and understanding the root cause(s) of

this event, 2) the role and impact played by the fragile nature of the grid, and 3) the series of actions and improvement(s) that must be taken by LUMA, and other actors, to help mitigate against similar incidents occurring again.

10. LUMA anticipates that it will file the Final Report of the July 12th Incident on or before October 15th, 2022. LUMA will provide monthly progress reports in compliance with the July 13th Order.

11. The Preliminary Report includes three confidential figures. <u>See</u>, Figures 1-1; 4-1; and Figure 4-2. The figures are being submitted under seal of confidentiality as they constitute Critical Energy Infrastructure Information ("CEII") that garners protection from public disclosures pursuant to federal statutes and regulations, see e.g., 6 U.S.C. §§ 671-674; 18 C.F.R. §388.113 (2020), and the Bureau's Policy on Management of Confidential Information. <u>See</u> Energy Bureau's Policy on Management of Confidential Information, CEPR-MI-2016-0009 ("Policy on Management of Confidential Information"), issued on August 31, 2016, as amended by the Resolution dated September 16, 2016.

12. Under separate cover and expediently, within the next ten days, as allowed by Section A.2 of the Energy Bureau's Policy on Management of Confidential Information, LUMA will submit a memorandum of law in support of this request to file the aforementioned portions of the Preliminary Report of the July 12th Incident under seal of confidentiality.

WHEREFORE, LUMA respectfully requests that the Energy Bureau **take notice** of the aforementioned and **accept** the Preliminary Report of the July 12th Incident that is being filed as Exhibit 1 to this Motion and **treat confidentially** the portions identified as such herein.

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 attorney for the Puerto Rico Electric Power Authority, Katiuska Bolaños-Lugo, kbolanos@diazvaz.law.

In San Juan, Puerto Rico, this 21st day of July 2022.



DLA Piper (Puerto Rico) LLC 500 Calle de la Tanca, Suite 401 San Juan, PR 00901-1969 Tel. 787-945-9132 Fax 939-697-6102

/s/ Iván Garau-González Iván Garau-González RUA NÚM. 20,229 ivan.garau@us.dlapiper.com

<u>Exhibit 1</u>

Preliminary Report on July 12th Incident



LUMAPR.COM

Jayuya 115/4.16 kV Substations 8301 and 8302 Outage July 12, 2022 Event and Restoration Report

July 21, 2022

Part of this document is protected from disclosure as Critical Energy Infrastructure Information ("CEII"), in accordance with 6 U.S.C. §§671-674; ;18 C.F.R. §388.113 (2020), and pursuant to the Puerto Rico Energy Bureau's Policy on Management of Confidential Information, CEPR-MI-2016-0009, issued on August 31, 2016, as amended by the Resolution dated September 16, 2016.



Summary

In compliance with Puerto Rico Energy Bureau's Resolution and Order issued July 13, 2022 in case number NEPR-IN-2022-0003, LUMA is providing data collected and initial findings herein for the July 12, 2022 outage event at Jayuya Substation.

Since beginning operations on June 1, 2021, LUMA has been focused on repairing, restoring, and fundamentally transforming and modernizing Puerto Rico's energy system that has long suffered from years – if not decades – of neglect under the prior operator. As has been well documented, nearly every aspect of the energy grid across Puerto Rico, including substations and other critical aspects of the T&D system, were weakened by past operational and maintenance failures, such as lack of maintenance and modernization.

With respect to the July 12th, 2022 Jayuya event, LUMA is committed to investigating the factors that may have led and contributed to this specific substation event, including 1) identifying and understanding the root cause(s) of this event, 2) the role and impact played by the fragile nature of the grid, and 3) the series of actions and improvement(s) that must be taken by LUMA, and other actors, to help mitigate against similar incidents occurring again.

As part of our commitment to transparency, LUMA will provide additional updates on the investigation, and will work with Puerto Rico Electric Power Authority (PREPA) and other parties in order to address their questions and to determine subsequent corrective actions.

Event Update

This report is based on the outage event data, restoration timeline, and repair update of the disturbance event that caused a power outage on July 12th, 2022.

At 5:50 a.m., a fault occurred in the Jayuya substations, (the Jayuya 1 substation and Jayuya 2 substation), resulting in the substations being de-energized, affecting 6,208 customers. Restoration began at 06:50 with the arrival of the first responders. Restoration was complex and laborious. It consisted of grounding, clean-up, isolation, electrical testing and system reconfiguration. Of the five feeders supplied by the substations, three were restored at approximately 5:00 p.m. and the remaining two were restored at approximately 5:30 p.m. All customers were fully restored approximately 12 hours after the initial fault.

The Jayuya substations are fed from two 115 kV lines (39000 and 36400) and have two transformers that step-down voltage to supply the five 4.16 kV distribution circuits (8301-01 (F1), 02 (F2) and 03 (F3) and 8302-04 (F4) and -05 (F5)). See Figure 1-1 Jayuya Substations.

An initial fault occurred on the downstream side of feeder circuit breaker F5 based on the significant thermal damage to the circuit breaker. The circuit breaker failed to clear the fault, which resulted in the melting of the high-side fuses of the transformers. A 115 kV fault developed after about 45 seconds, causing lines 39000 and 36400 to trip (via circuit breakers at remote terminals) and de-energize the substations. While an understanding of the steps leading to the event is clear, additional information and analysis will be necessary to determine the initial and exact cause of the outage.

The following report presents a detailed analysis of the restoration update, electrical repair and next steps.



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List of Acronyms

- Current Transformer (CT)
- Feeder Circuit Breaker (FCB)
- Generator Circuit Breaker (GCB)
- Motor-Operated Disconnect (MOD)
- Oil Circuit Breaker (OCB)
- Potential Transformer (PT)
- Remote Terminal Unit (RTU)
- Transmission Center (TC)



1. Overview of Event

1.1 Event Details

- Event name: 12JUL2022 Jayuya Outage Event
- Outage date: July 12th, 2022
- Outage time: 5:50 a.m.
- Number of customers impacted by event: 6,208
- Location: Jayuya 115/4.16 kV substations 8301 and 8302
- Description: An initial fault occurred on the downstream side of feeder circuit breaker F5, based on the significant thermal damage to the circuit breaker. The circuit breaker failed to clear the fault, which resulted in the melting of the high-side fuses of the transformers. A 115 kV fault developed after about 45 seconds, causing lines 39000 and 36400 to trip (via circuit breakers at remote terminals) and deenergize the substations. The outage affected 6,208 customers. All customers were fully restored approximately 12 hours after the initial fault.

1.2 Overview of Event

On July 12th, 2022 at 5:50 a.m., a fault occurred in the Jayuya substations that resulted in the substations being de-energized affecting 6,208 customers.

The Jayuya substations are fed from two 115 kV lines (39000 and 36400) and have two transformers that step-down voltage to supply the five 4 kV distribution circuits (8301-01 (F1), 02 (F2) and 03 (F3) and 8302-04 (F4), and -05 (F5). See figure below.





An initial fault occurred on the downstream side of feeder circuit breaker F5, based on the significant thermal damage to the circuit breaker. The circuit breaker failed to clear the fault. This resulted in some of the high-side fuses of the transformers melting. The 4.16 kV fault persisted and, after about 45 seconds, evolved into a 115 kV fault. The 115 kV fault caused lines 39000 and 36400 to trip (via circuit breakers at remote terminals) and de-energize the substation.



2. LUMA's Response to the Outage

LUMA is committed to building an energy system the people of Puerto Rico can rely on. When outages do occur, LUMA strives to take swift action to restore power as quickly and safely as possible and provide the reliability and resiliency our customers expect and deserve.

2.1 Restoration Timeline

- **05:50 h** At 5:50 a.m., a fault occurred in the Jayuya substations, resulting in the substations being de-energized, affecting 6,208 customers. There is no way to restore power in Jayuya on the distribution side upon the loss of the 115 kV source. The 5 feeders in Jayuya required the substation and the 115kv source to provide power to customers.
- **06**:**50h** crew members began arriving on site to start isolation activities and form restoration plan. The plan consisted of:
 - Isolating damaged 4KV Breakers 4 and 5
 - Isolating MOD 36447 for further evaluation
 - Grounding substation for safety and,
 - Clean Busses 1 and 2
 - Test Transformers 8301 and 8302
 - Make Portable unit #11 on ready for hot standby in case needed (Bayamon TC)
 - Replace blown fuses on transformer 8301 and 8302
 - Test RTU (remote terminal unit) and verify station DC
 - Throughout the outage, System Operations supported the Operation team with line clearance, permits, switching.
- **1100 h** damage assessment was completed by substation personnel. Isolation of damage equipment, testing of transformers and replacement of damaged disconnect switches commenced.
- 16:32 h Line 36400 was energized from Dos Bocas (circuit breaker #36450) down to Jayuya. Substation 8302 and bus 4.16 kV for substation 8301 were energized. Bus tie circuit breaker 4.16 kV was closed to be able to energize substation 8301 distribution bus through substation 8302. Substation 8301 was available but not energized.
- **16:43 h** The circuits fed from the undamaged circuit breakers were restored to normal service after the station was re-energized: feeders F1, F2, and F3 remained in service while feeders F4 and F5 remained out of service pending replacement.
- **17:30 h** The circuits fed from the damaged circuit breakers were restored vie ties to other feeders. Feeder F4 loads feed thru feeder F1. Feeder F5 loads feed thru F3. All customers are fully restored.



3. Damage Assessment and Affected Assets

3.1 List of Failed and Damaged Equipment

The below reflects the assessed failed and/or damaged equipment after the fault.

- Two 4.16 kV circuit breakers failed (feeders F4 and F5).
- One PT on the 4.16 kV bus failed.
- Six 4.16 kV fuse disconnect switches failed (metering and AMR circuits).
- Twelve 4.16 kV solid-blade disconnect switches failed (auxiliary switches for circuit breakers F4 and F5).
- 4.16 kV bus support and bus bar incurred damage at substation 8302.
- 115 kV bus support incurred damage at substation 8301.
- 115 kV insulator incurred damage at substation 8302.
- Jayuya's RTU failed.
- One 115 kV S&C Electric Company type SMD 2B 65E standard speed fuse extinguished in 115/4.16 kV substation 8302.
- Two 115 kV S&C Electric Company type SMD 2B 65E standard speed fuses extinguished in 115/4.16 kV substation 8301.

Equipment Type	Equipment No/Name	Date out (mm/dd/yyyy)	Time out	Date in (mm/dd/yyyy)	Time in	Duration (hr:min)
115/4.16 kV	8301	07-12-2022	05:51:00			
115/4.16 kV	8302	07-12-2022	05:51:00	07-12-2022	16:32:00	10:41
4.16 kV FCB	F1	07-12-2022	05:51:00	07-12-2022	16:43:00	10:52
4.16 kV FCB	F2	07-12-2022	05:51:00	07-12-2022	16:43:00	10:52
4.16 kV FCB	F3	07-12-2022	05:51:00	07-12-2022	16:43:00	10:52
4.16 kV FCB	F4	07-12-2022	05:50:00	07-12-2022	17:30:00	11:40
4.16 kV FCB	F5	07-12-2022	05:51:00	07-12-2022	17:30:00	11:40
115 kV GCB	36450	07-12-2022	05:51:00	07-12-2022	16:32:00	10:41
115 kV OCB	39080	07-12-2022	05:51:00	07-12-2022	05:51:00	00:00
115 kV OCB	39062	07-12-2022	05:51:00	07-12-2022	05:51:00	00:00
115 kV OCB	39042	07-12-2022	05:51:00	07-12-2022	05:51:00	00:00

Table 3-1 Other Major Equipment Affected











Figure 3-2 Photo of Damaged Circuit Breakers, Disconnect Switches, and Associated Hardware After Fault





Figure 3-3 Photo of Substation Damage - Side View



4. Event Details

The event details are based on the information available at the time. As the investigation progresses and new information emerges, the Event and Restoration report will be amended if required.

4.1 System Status Prior to Event

The pre-disturbance/initiating conditions are presented in the figure below.

- Substations 8301 and 8302 were tied at the 4.16 kV since May 2022.
- 115 kV line 36400 from Dos Bocas was feeding both substations, via 115 kV circuit breaker #36450 and 115 kV MOD #36467.
- 115 kV MOD #36447 from Jayuya to line 39000 was open.
- Line 36400 to Ponce has been out of service since the 2017 hurricanes.
- A bypass with line 39000 was constructed to allow service to Jayuya via three terminal lines: 39000 from Toro Negro hydroelectric plant, Barranquitas, and Juana Díaz TC.

Figure 4-1 System Configuration Prior to the Event





Figure 4-2 115 kV System Single-line Diagram

Redacted

4.2 Timeline of Events

The below summarizes the timeline of the events of the outage, from restoration, and to normal state.

Figure 4-3 Timeline of Events

Time	Event
05:50:43.095	A three-phase fault is observed at the distribution level on line 36400 by the digital fault recorder at Dos Bocas.
05:50:43.635	Short-circuit current magnitude decreased at line 36400 as the F4 feeder's trip is shown in SCADA.
05:50:46.979	Short-circuit current magnitude at 115 kV phases A and B decreased for a short period and resumed afterward.
05:50:51.000	SCADA shows RTU failure signals.
05:51:26.160	A 115 kV side fault at Jayuya is sensed by the digital fault recorders.
05:51:26.790	The 115 kV OCB #39080 at Toro Negro hydroelectric plant opens to isolate the fault from that terminal.
05:51:26.910	115kV GCB #36450 at Dos Bocas opens to isolate the fault from that terminal.
05:51:27.140	The 115 kV fault evolves to a phase-to-phase (A-C) fault.



05:51:27.250	The 115 kV OCB #39042 at Barranquitas TC trips.
05:51:27.461	115 kV OCB #39062 at Juana Díaz TC trips and clears the faults at Jayuya's substations from the system.
	System in normal state

4.3 Technical Details

4.3.1 Frequency Changes

Table 4-1 Frequency Changes Before the Event

Prior to Event (Hz)	Immediately After 38 kV Event (Hz Maximum and Minimum)	
59.95	59.8	

4.3.2 Voltage Changes

Table 4-2 Voltage Changes at Dos Bocas 115 kV

Before (P-P kV maximum/minimum)	During (kV minimum)	After (kV maximum/minimum)	
67.95/67.83	36.48	68.15/67.97	



5. Restoration Plan and Next Steps

5.1 Restorative Actions

LUMA has completed or is in the process of completing the following actions to restore the Jayuya substations from the impacts due to the July 12th, 2022 outage.

LUMA is currently investigating the material requirements for the repairs and restoration work and, provided that all materials are available, the tentative schedule will have the Jayuya substations restored to normal by the end of July 2022.

The following restorative actions have been completed or are underway:

- Performed Megger, CT ratio, and power factor tests to onsite replacement circuit breakers for FCBs F4 and F5. Timing and velocity tests are being scheduled. The damaged FCBs F4 and F5 will be removed as well as 12 damaged disconnect switches.
- Installing replacement FCBs F4 and F5 and then commissioning.
- Replacing damaged control and power wiring.
- Replacing RTU damaged input and output cards. Once completed, the RTU will be commissioned to the interface point.
- Repairing transformer 8301's tap changer.
- Energizing transformer 8302 when all repairs in the substations have been completed.

5.2 Next Steps

LUMA is committed providing a complete analysis of the Jayuya event, and will prepare an additional investigation report by October 15, 2022 that will present specific findings, as well as identify key actions and next steps . The next report related to the July 12 Jayuya substation outage event will:

- Perform distribution line patrols to determine initial cause of the outage.
- Evaluate the protection system's performance.
- Investigate possible communications issues that resulted from the failed remote terminal unit (RTU).
- Finalize repairs outlined in Section 5.1

