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

IN RE: LUMA'S RESPONSE TO HURRICANE FIONA	**CASE NO. NEPR-MI-2022-0003** **SUBJECT: Presentation Offered in Technical Conference of October 11, 2022**

MOTION SUBMITTING PRESENTATION OFFERED IN TECHNICAL CONFERENCE OF OCTOBER 11, 2022

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 the following:

1. In a Resolution and Order of October 7, 2022 ("October 7th Order") with the subject "Baseload Generation Dispatch Status-Post Hurricane Fiona," this honorable Puerto Rico Energy Bureau ("Energy Bureau") convened a Technical Conference to discuss concerns raised by LUMA in a letter dated October 6, 2022 regarding Resource Adequacy and potential Generation resource deficiencies following Hurricane Fiona. Per the October 7th Order, the topics to be discussed at the Technical Conference were "Dispatch Status of the available Baseload Generation post Hurricane Fiona and (ii) the identified temporary emergency mitigation measures thought to address the generation deficiencies arising from Hurricane Fiona."

2. The Technical Conference was held as scheduled on October 11, 2022. With leave from this Energy Bureau, LUMA representatives offered a presentation on generation inadequacy concerns. As requested verbally by the Energy Bureau, LUMA hereby submits an

electronic copy in pdf format, of the presentation that was offered and projected during the Technical Conference. *See* Exhibit 1.

WHEREFORE, LUMA respectfully requests that the honorable Bureau **take notice** of the aforementioned and **accept** the pdf copy of the presentation offered by LUMA during the Technical Conference of October 11, 2022.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 11th day of October, 2022.

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Exhibit 1

Presentation
Generation Inadequacy Technical Conference

LUMAPR.COM

Generation Inadequacy Technical Conference

NEPR-MI-2022-0003

October 11, 2022

Executive Summary

- As System Operator, LUMA is performing its obligation under the OMA to inform PREB and relevant Puerto Rican Government Agencies of the risks from the Power Generation portfolio to Resource Adequacy and LUMA's ability to provide safe, reliable, and affordable energy to the people of Puerto Rico
- Prior to Hurricane Fiona, the existing power generation portfolio did not meet Prudent Utility Practices and has inadequate generation resources and excessive risk of generation shortfalls
- As a separate and new additional factor, several plants (e.g. AG2, SJ5, EcoElectrica, etc.) suffered direct damages from Hurricane Fiona. The generators are taking steps to return these units to previous availability levels, but the long-term impact from Fiona on these plants will not be fully understood for several weeks or months
- Furthermore, planned maintenance, scheduled for October and the fall has been postponed, creating a build up of maintenance required with an already very tight schedule in order to complete maintenance in advance of next summer
- Due to these impacts, the potential risk of load shed due to generation shortfall has increased as a direct result of Fiona.
- **LUMA is recommending a Generation Risk Mitigation Plan to be implemented to protect against the risk of significant deterioration in generator availability over the next several months.**

Generation Risk Mitigation Actions Required

Urgent and immediate action is required. Recommendations:

1. Government to initiate the sourcing of emergency portable generation (300-500 MW) immediately to stabilize the generation for the next 12-18 months (look to utilize FEMA funding), to mitigate risk of load shed events and provide breathing room to complete repairs on existing fleet, options included (among others):
    a. Power Barge
    b. Mobile peaking units

2. Conduct an emergency assessment of additional generation (300-500 MW) options to replace the emergency portable generation in 12-18 months, complete in coordination with FEMA, considerations include:
    a. PREPA project proposals
    b. New generation options
    c. Utility Scale Batteries
    d. Demand Side Management

3. Continue with a review and update of the IRP in line with current timelines

Dispatch Status of the Available Baseload Generation Post- Hurricane Fiona

Current Status of Baseload Generation

- In a note from PREPA, they have identified:

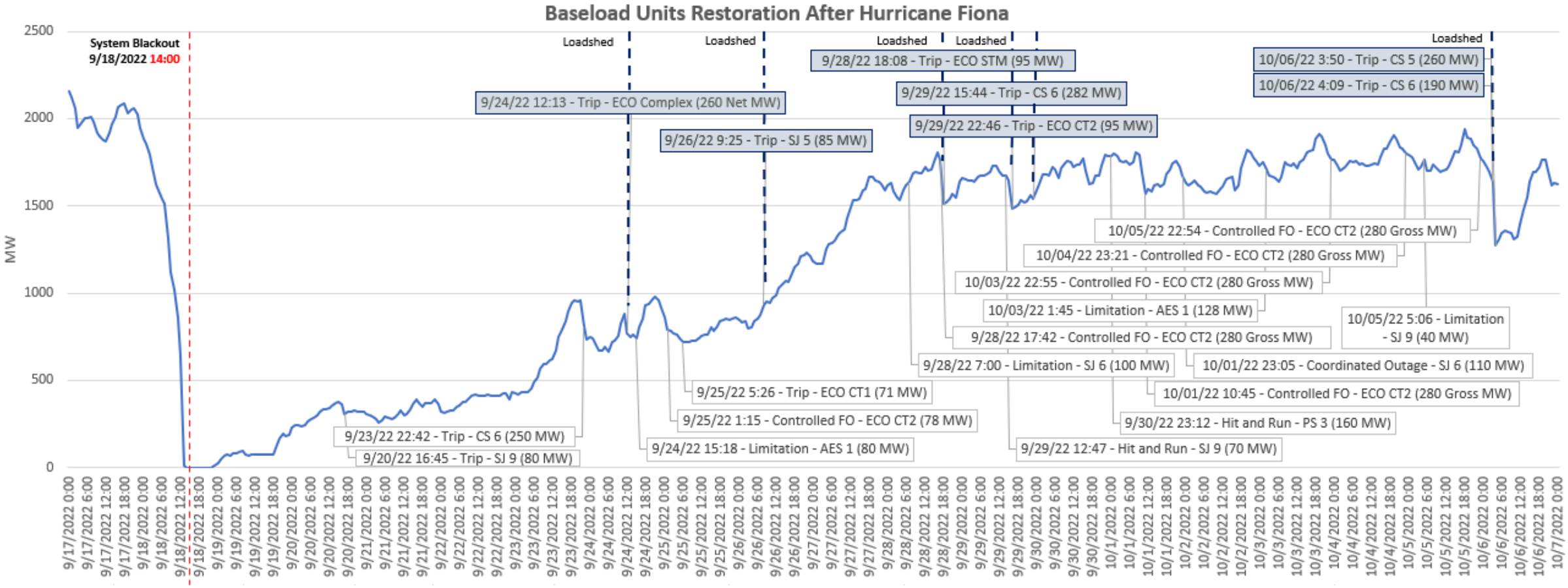
  "Hurricane Fiona negatively impacted the already-compromised reliability and availability of Aguirre 2, San Juan Steam 5, Aguirre 1. Fiona caused outages, and to maintain minimum reserve in the system PREPA modified its outage programs. Aguirre 2 is expected to be online ending this week; SJ5 is expected to be in service December 21 2022. Also, PREPA had a forced outage last week in the Costa Sur Steam Plant. Unit CS6 was back online the same day, but CS5 suffered problems with the motor driver boiler feed pump. CS5 best-case forecast next week (October 17-October 20).

  PREPA postponed maintenance for SJ6 -combustion inspection- from October 2022 to December 2022, postponed CS5 major outage from October 2022 to January 2023 and postponed PS3 mayor outage from December 2022 to March 2023."

- PREPA has identified timelines for each unit to return to service, however additionally issues continue to be identified. For instance, today an additional issue at Aguirre 2 was identified, delaying the return to service (it has been delayed multiple times since the original October 2, 2022, return to service date). Similar delays to return to service dates have occurred with SJ5, PS4, Costa Sur 5 and Yabucoa. This shows the increased uncertainty of the generation availability forecast and the increased risk to the electric system

- Taking into account the damages from Hurricane Fiona, preliminary estimates are that the Loss of Load Event (LOLE) probability has increased from approximately 8.8 events per year, to as high as 50 events per year under worse case scenario (compared to 0.1 events per year recognized as industry planning standard)

Significant Number of Generation Events During Restoration Period



Dispatch Status of the available Baseload Generation post-Hurricane Fiona

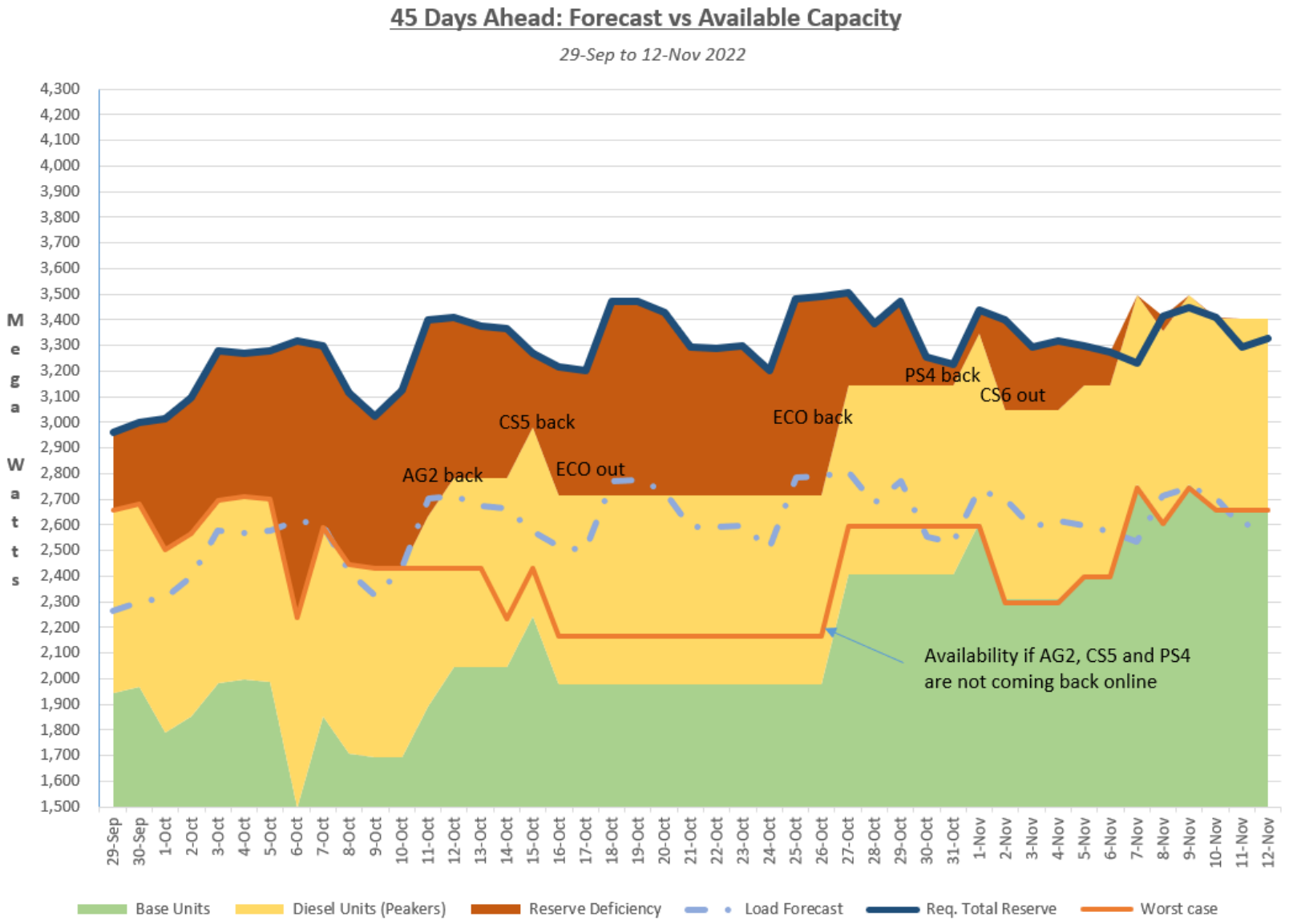
UNIT	29-Sep	30-Sep	1-Oct	2-Oct	3-Oct	4-Oct	5-Oct	6-Oct	7-Oct	8-Oct	9-Oct
AG-1	0	0	0	0	0	0	0	0	0	0	0
AG-2*	0	0	0	0	0	0	0	0	0	0	0
CS-5	305	305	305	305	320	320	320	0	0	0	0
CS-6	290	300	300	300	320	320	320	0	200	320	300
PS-3	190	190	0	190	190	190	190	200	200	200	200
PS-4	0	0	0	0	0	0	0	0	0	0	0
SJ-7	60	65	65	65	68	68	68	68	68	68	68
SJ-9	90	90	90	90	90	90	90	90	90	90	90
SJCC-CT-5	140	140	140	140	140	140	140	140	140	140	140
SJCC-STG-5*	0	0	0	0	0	0	0	0	0	0	0
SJCC-CT-6	120	120	120	0	140	140	140	140	140	140	140
SJCC-STG-6	0	0	0	0	0	0	0	0	0	0	0
ECO-STG**	100	100	100	100	100	100	100	200	200	100	100
ECO-CT-1**	165	165	165	165	165	165	165	165	165	165	165
ECO-CT-2**	0	0	0	0	0	0	0	165	165	0	0
AES-1	251	254	253	251	196	234	230	165	244	243	244
AES-2	231	238	252	248	254	231	224	165	242	243	245

* Units sustained damaged during Fiona

** Plant fuel line sustained damaged during Fiona. Unit CT2 is utilize only when required to extend LNG reserves.

Identified Temporary Emergency Mitigation Measures Thought to Address the Generation Deficiencies Arising from Hurricane Fiona

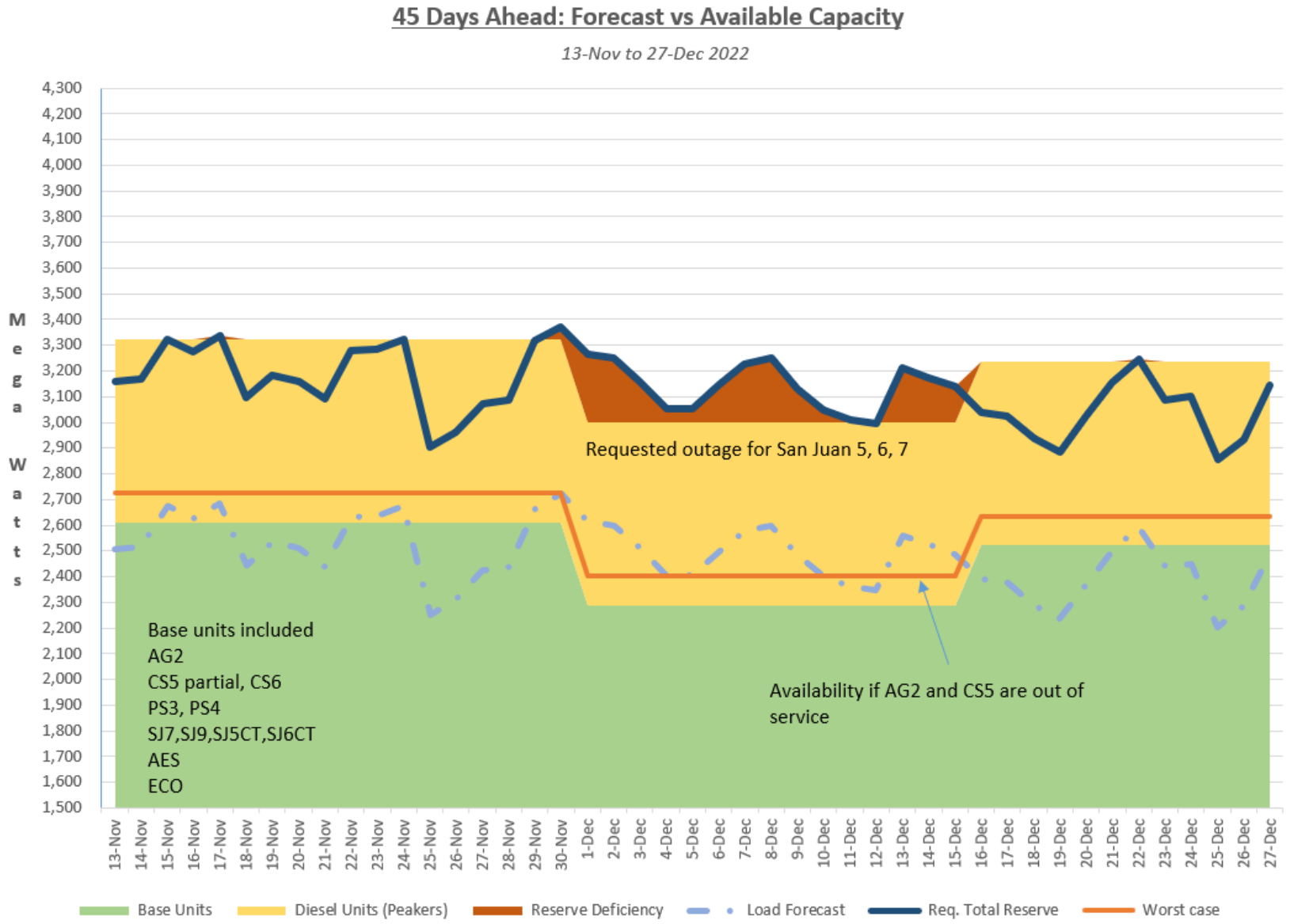
Load Forecast and Forecasted Generation Availability in the Near-Term



Risk mitigation for Near Term *(until end of October)*

- EcoElectrica LNG situation
  - Minimize the utilization of EcoElectrica CT2 to extend the reserves of LNG
  - EcoElectrica testing and attempting to utilize CT2 in Diesel
  - LNG reserves Expected to last until October 15 to 16
  - LNG refuel line on target for repairs to be completed by October 15th
  - Next LNG delivery schedule for October 26th. Attempts are being made by PREPA to accelerate LNG delivery
- PREPA performing repairs on units:
  - Aguirre 2, expected Oct 11 with limitations
  - Costa Sur 5, expected Oct 15 with limitations
  - Palo Seco 4, expected Oct 31
  - Aguirre 1, expected end of year or early next year
  - San Juan 5 ST, San Juan 6 ST expected mid-December
- Managing peaking unit's utilization and fuel availability closely with PREPA

Load Forecast and Forecasted Generation Availability in the Short Term



Risk Mitigation for Short-Term *(end of 2022)*

- As we enter the fall and winter, the demand is naturally going down and helping mitigate the risk of generation deficit
- In coordination with the generators, accommodate requested outages to performs planned repairs on units. PREPA has identified units that will need planned outages during November are SJ9, SJ5, CS6
- If enough generation is available, restart the behind schedule planned maintenance of the units starting on December 1st with San Juan 5 and San Juan 6
- Continue managing peaking unit's utilization and fuel availability closely with PREPA

Medium to Long Term Mitigation Strategies

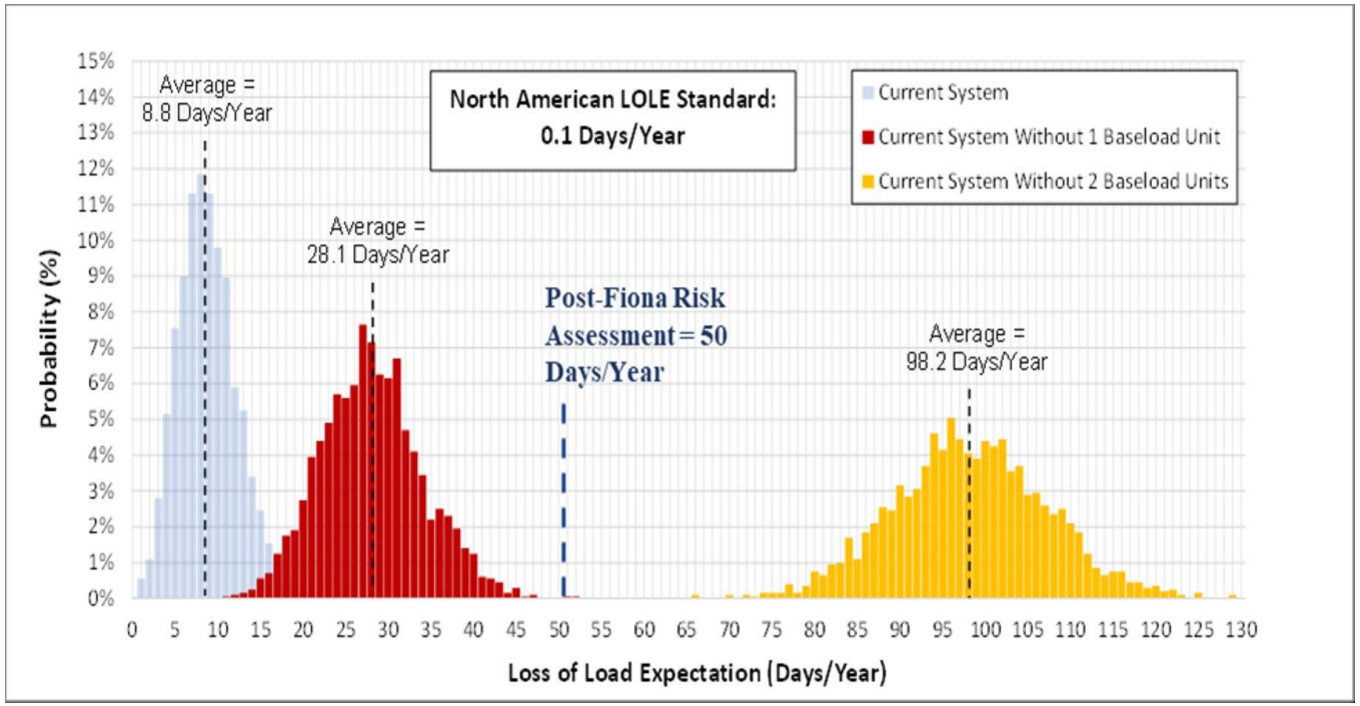
Post-2022 Resource Adequacy Risks

- For several reasons including the advanced age and poor condition of existing generators, the projected availability and capability of existing generators is consistently and significantly worse than forecast by those generators
- It is not prudent to take generator availability forecasts as future availability, and these must be statistically adjusted for known tendencies
  - Planned outage durations last approximately 50% longer than scheduled
  - Forced Outage rates average approximately 13% for PREPA and 2% and 3% for AES and Ecoelectrica
  - Plant de-rates change rapidly and very frequently (reduced output capacity)
- On a probabilistic, risk-adjusted basis, the Loss of Load Expectation (LOLE) is sufficiently high, that a risk mitigation plan with identified contingencies is justified

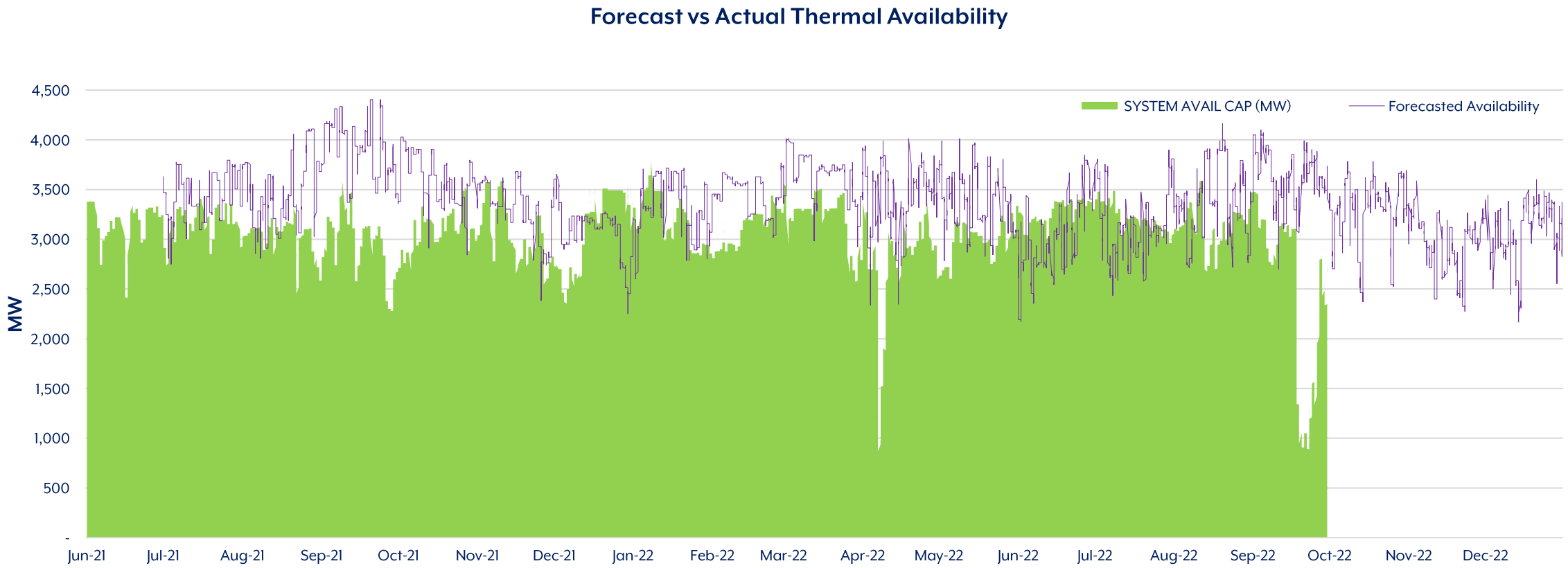
Medium to Long Term Impact on Risks of Load Shedding Events

If a baseload plant incurred damages following Fiona and suffered an extended outage of a few weeks or a few months, it would significantly increase the potential for load shed events

- A preliminary analysis based upon Resource Adequacy report data and methodology suggests the expected Loss of Load Event (LOLE) probability could have increased from approximately 28 days per year to as high as 98 days per year. Currently estimated as 50 days per year for planning purposes
- Preliminary damage assessments from the generators received October 10th suggest plants (SJ5, AG2 and EcoElectrica) incurred some damage but exact extent is still undetermined until plants can conduct detailed assessments
- A scenario where a baseload unit is out for a 4-6 week outage, or longer is considered a reasonable risk to plan for

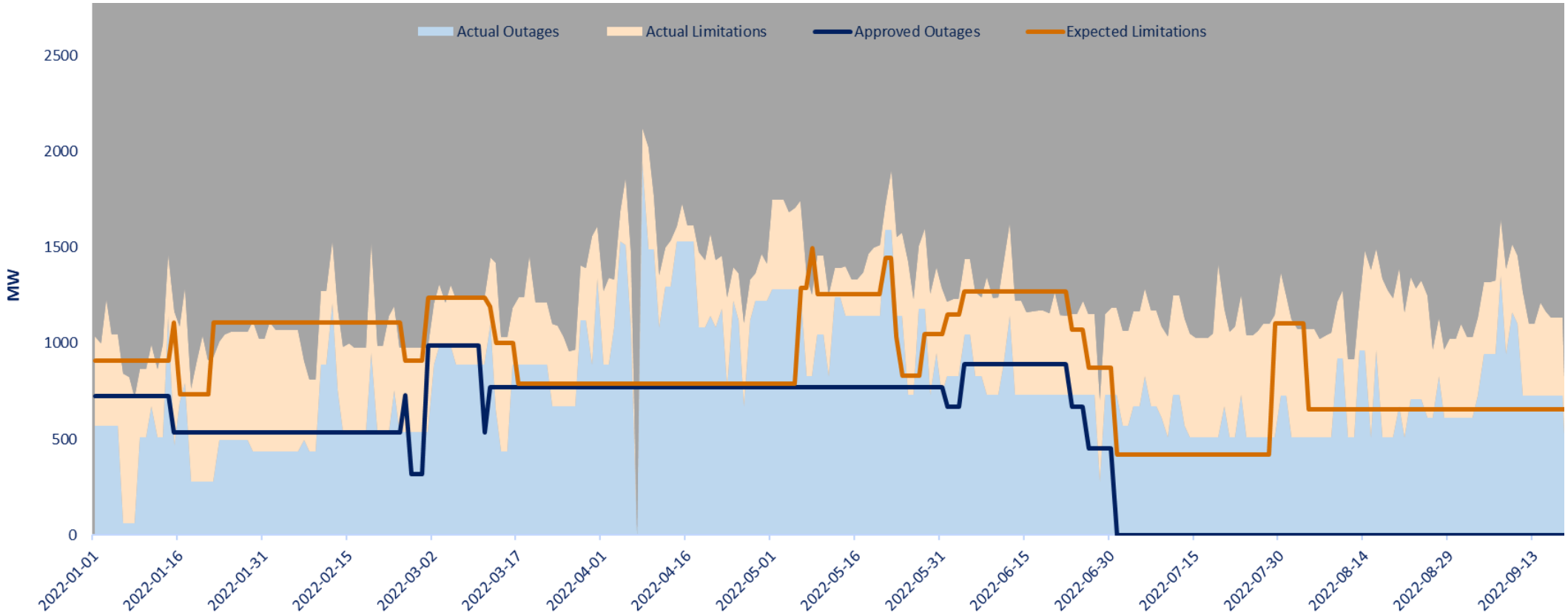


Hourly PREPA Thermal Availability Forecast vs. Actual



PREPA Expected Capacity Reduction (in MW) vs Actual Capacity Reduction

- This graph compares the expected capacity reduction based on the Approved Outages included in the Generation Outage Schedule updated quarterly with the actual capacity reduction caused by Actual Outages and Limitations.
- Date Range shown is 1/1/2022 to 9/18/2022



Data shown corresponds to in-service baseload units. This data does not consider the following units: SJ 8, SJ 10, PS 1, PS 2, CS 3, and CS 4.

Emergency mitigation options to address the generation deficiencies arising from Hurricane Fiona

Barge Mounted Generation

Recent phone calls identify two barge units in the Caribbean market:

- EDMII, a 106 MW Wartsila dual fuel (oil and gas). Cost is approximately $85M plus another $10M in spares
- Rigel I a 48 MW turbine power barge that is currently configured for distillates but can reconfigure for HFO or gas and costs an estimated $12M including spares.
- Both units could be effectively put to work in Puerto Rico with EDMII as baseload and Rigel I is a as peak and emergency plant.

Rental

Land Based, Mobile Generation

Renewable Internal Combustion Engine (RICE)

- Can be renewable if utilizing biodiesel (generally tri-fuel capable)
- Modular, ~20 MW gen-set blocks leads to more efficient dispatch
- 132 MW were emergency delivered to Bahamas in 9 months in 2019

Combustion Turbines

- GE has ~10 TM2500 units in Jacinto Point Texas; Grey market model: never sold, never used
- Approximately 10 days to ship, 11 days to install
- Approximately $18 mil each (~30MW)

Rental/CAPEX

New Capacity Construction

New capacity could increase reserves and remove the risk of load shed

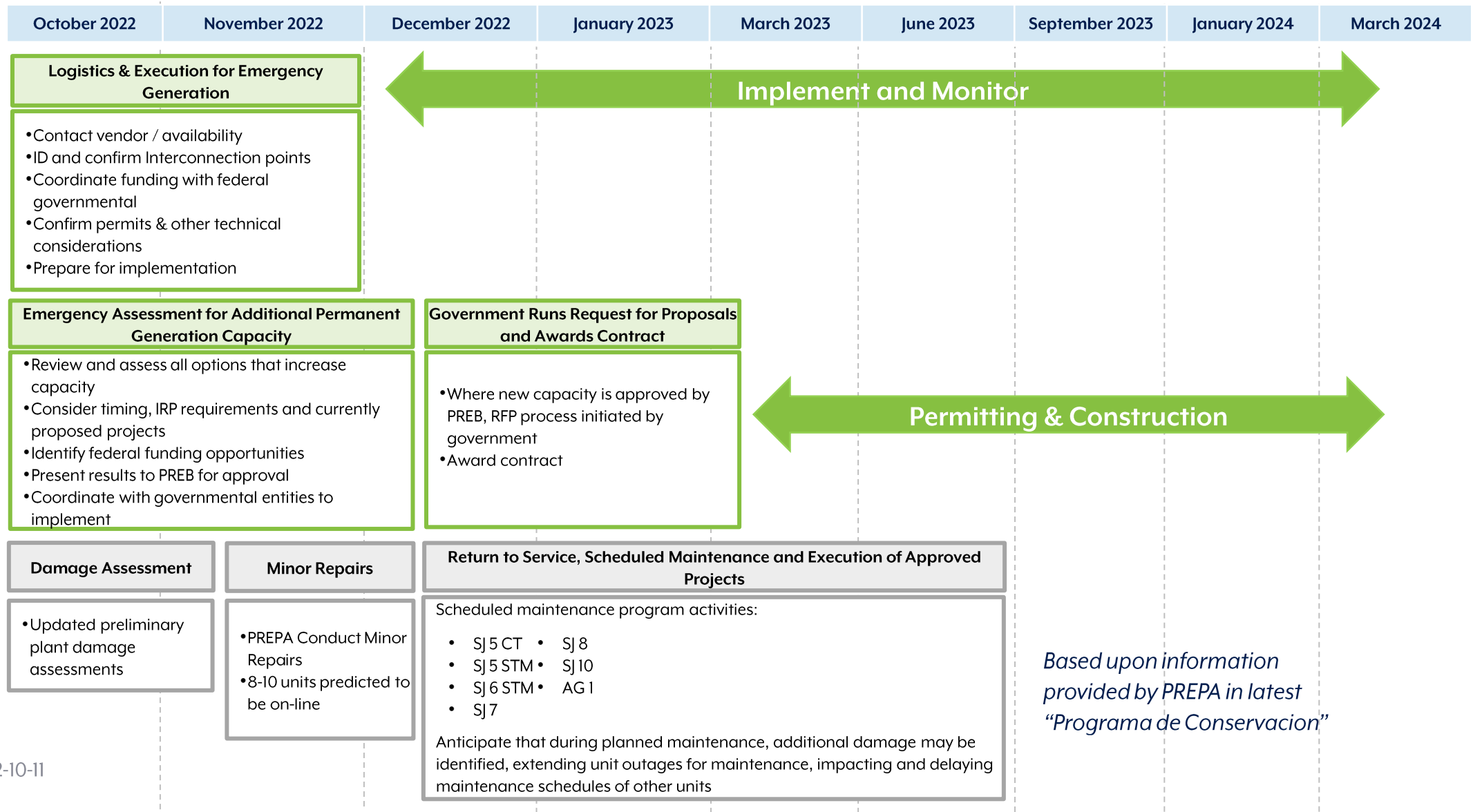
Solicitation and RFP management would need to be managed by PREB or P3A per the OMA; RFP would define decision evaluative criteria for selection of preferred alternatives

- Cost / Technology / Fuel / Environmental / Timing / Location

Options for construction of new capacity could be weighed against modification or conversion opportunities that have been proposed by PREPA and received recent resolution and order by PREB

CAPEX

Potential Path Forward



Based upon information provided by PREPA in latest "Programa de Conservacion"

Demand Response Mitigation Actions

- LUMA submitted a program plan for Large Commercial and Industrial Emergency Demand Response Program in the June 2022 Transition Period Plan
- This program will incentive customers to reduce load of shift load to back-up generation during emergency events
- It is expected that this program could enroll up to 20 MW of emergency demand response capacity during the first year of operation as these programs take time to develop, recruit customers and scale up
- LUMA is currently in the process of procuring a contract with an Energy Efficiency and Demand Response Program Implementation Contractor to develop the program
- Once the Implementation Contractor is onboard, they will begin recruiting for the C&I Emergency DR program along the other EE and DR programs in LUMA's Transition Period Plan
- Timeline could be accelerated, and enrollment could increase with additional funding

Conclusion

- As System Operator, LUMA is performing its obligation under the OMA to inform PREB and relevant Puerto Rican Government Agencies of the risks from the Power Generation portfolio to Resource Adequacy and LUMA's ability to provide safe, reliable, and affordable energy to the people of Puerto Rico
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