

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

**NEPR**

**Received:**

**Feb 15, 2023**

**9:14 PM**

IN RE:  
LUMA'S RESPONSE TO HURRICANE  
FIONA

**CASE NO. NEPR-MI-2022-0003**

**SUBJECT: Motion Submitting Seventh Update on  
Stabilization Plan**

**MOTION SUBMITTING SEVENTH UPDATE ON STABILIZATION PLAN FOR  
TEMPORARY EMERGENCY GENERATION CAPACITY**

**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 7<sup>th</sup> 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 7<sup>th</sup> 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."<sup>1</sup>

2. On October 12, 2022, the Energy Bureau entered a Resolution and Order whereby it ordered LUMA to develop a stabilization plan as a direct response to Hurricane Fiona, in coordination with the Federal Emergency Management Agency ("FEMA") and the Puerto Rico

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<sup>1</sup> The Technical Conference was held as scheduled on October 11, 2022. During the Technical Conference, the Energy Bureau and consultants for the Energy Bureau posed questions to LUMA's representatives.

Electric Power Authority (“PREPA”) “to address any baseload generation inadequacy or shortfall that affects the dispatch availability and has the potential to cause load shedding or a blackout event of the electric system (“Stabilization Plan”)” (“October 12<sup>th</sup> Order”).

3. Per the October 12<sup>th</sup> Order, LUMA was directed to submit the 1<sup>st</sup> and the 15<sup>th</sup> day of each month from the notice of the Order, an updated report addressing the efforts conducted by LUMA to assure the completion of the Stabilization Plan.

4. On October 27<sup>th</sup>, 2022, the Energy Bureau issued a Resolution and Order whereby it set a technical conference for November 1, 2022 (“October 27<sup>th</sup> Order”) in connection with the first update on the Stabilization Plan. The Energy Bureau stated that it is particularly interested in “learning about the (1) U.S. Army Corps of Engineers (“USACE”) Generation Assessment underway, (2) Emergency Temporary Generation under a potential FEMA Public Assistance Emergency assignment that can expeditiously mitigate the impact of Hurricane Fiona, and (3) Replacement of Emergency Temporary Generation that seeks to phase out the temporary generation with permanent capacity, noting that this permanent capacity is consistent with the approved Integrated Resource Plan (“IRP”).” *See* October 27<sup>th</sup> Order at page 1.

5. As per the October 27<sup>th</sup> Order, the Technical Conference was held as scheduled on November 1<sup>st</sup>. LUMA representatives appeared to discuss the Stabilization Plan and answered questions by this Energy Bureau.

6. On October 31<sup>st</sup>, 2022, LUMA submitted the First Update on the Stabilization Plan.

7. On November 15, 2022, LUMA submitted a Second Update on the Stabilization Plan (“Second Update”). In addition, LUMA submitted supplemental information to the Second Update arising from a joint press conference of November 15<sup>th</sup>, 2022, where the Governor of Puerto Rico, the Hon. Pedro Pierluisi and the Federal Coordinator for FEMA, Nancy Casper,

announced that FEMA’s power stabilization initiative aims to install between 600 to 700 MW of temporary emergency generation capacity through the mobilization of power generation maritime barges and temporary land-based generators. *See Supplemental Submission to Second Update on Stabilization Plan to Inform of Announcement by the Puerto Rico Government and FEMA on Temporary Emergency Generation Capacity*, filed on November 15, 2022.

8. On December 1<sup>st</sup>, 2022, LUMA submitted the Third Update on the Stabilization Plan.

9. LUMA filed the Fifth Update on the Stabilization Plan on January 17<sup>th</sup>, 2023.

10. On January 31, 2023, LUMA submitted the Sixth Update on the Stabilization Plan.

11. In compliance with the October 12<sup>th</sup> Order, LUMA hereby submits as *Exhibit 1*, the Seventh Update on the Stabilization Plan (“Seventh Update”). The Seventh Update includes, among others, a summary of the status of Stabilization Plan with reference to the tasks performed in the past month in coordination with FEMA and PREPA, as well as a summary of LUMA’s internal efforts and an update on the project timeline. Furthermore, the Seventh Update identifies current operational issues and concerns and provides an update on LUMA’s risk analyses. *See also Appendix A to Exhibit 1* (Resource Adequacy Update).

**WHEREFORE**, LUMA respectfully requests that this Energy Bureau **take notice** of the aforementioned, **accept** the Seventh Update submitted as **Exhibit 1** to this Motion, and **deem** that LUMA complied with that portion of the October 12th Order that requires submission of bi-monthly updated reports on the Stabilization Plan.

**RESPECTFULLY SUBMITTED.**

In San Juan, Puerto Rico, this 15<sup>th</sup> day of February 2023

I hereby certify that this motion was filed using the electronic filing system of this Energy Bureau. I also certify that copy of this motion will be notified to the Puerto Rico Electric Power Authority, through its attorneys of record: [jmarrero@diazvaz.law](mailto:jmarrero@diazvaz.law) and [kbolanos@diazvaz.law](mailto:kbolanos@diazvaz.law).



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*Exhibit 1*  
*Seventh Update on Stabilization Report*



# Generation Stabilization Plan Discussion

February 15, 2023

# Agenda

- I. Executive Summary
- II. Past Two Weeks Area of Focus
- III. Team Organization
- IV. Project Timeline
- V. Generation Operational Issues and Concerns as of Report Date
- VI. Risk Analysis Update

Appendix – 90-day Resource Adequacy Update



# Executive Summary

- **FEMA is reducing the target capacity, but the lower amount will still substantially reduce risk to customers**
  - Reduction of emergency generation from 750 MW original plan to 350 MW current plan
  - FEMA will continue to assess the situation and if required, could reauthorize the remaining 350 MW
  - LUMA's resource adequacy analysis indicates that risk (as measured by Loss of Load Expectation (LOLE)) remains high and above minimum standards but will be significantly reduced by addition of 350 MW of emergency generation
- **FEMA's current preliminary schedule indicates the land-based emergency generators to arrive in late March or April**
  - San Juan and Palo Seco remain the primary emergency generation sites.

Generation Site	Emergency units expected On-Site	LUMA Field Assessment for Interconnection
Palo Seco	Late March	Complete
San Juan	Late April	Underway

- **Communication and Coordination efforts increase among the project teams**
  - PREPA, LUMA, FEMA, USACE and COR3 had multiple meetings to advance the project over the last two weeks.
  - Most of the initial focus has been on the primary emergency generation sites.



# Area of Focus Past Two Weeks

- **Current working plan for sites at San Juan and Palo Seco**

- Field assessment of San Juan was completed by LUMA Substation Operations and Engineering. A Stabilization Plan document was developed and discussed with the Task Force.
- Field assessment at Palo Seco Plant was completed by LUMA Substation Operations and Engineering, a Stabilization Plan document is being developed for this site and will be discussed with the Task Force during the current week.
- PREPA requested additional support from LUMA for the Palo Seco interconnection, which is underway.
- LUMA will develop a maintenance plan for Palo Seco and Aguirre. A procurement process is being finalized for transformer processing and additional work needed for this maintenance plan.

- **Multiple site assessments have been performed by field teams**

- Information regarding the Unit Stabilization Checklist spreadsheet (received from FEMA on 2/1/2023) was sent to the Task Force on 2/7/2023. This is related to the assessments performed for the Fiona Emergency of T- lines and HV Equipment, on proposed generation sites.
- In addition to this, test results from the Substation team for the different HV equipment were sent to FEMA.
- RFIs are expected from FEMA by the week of 2/12.

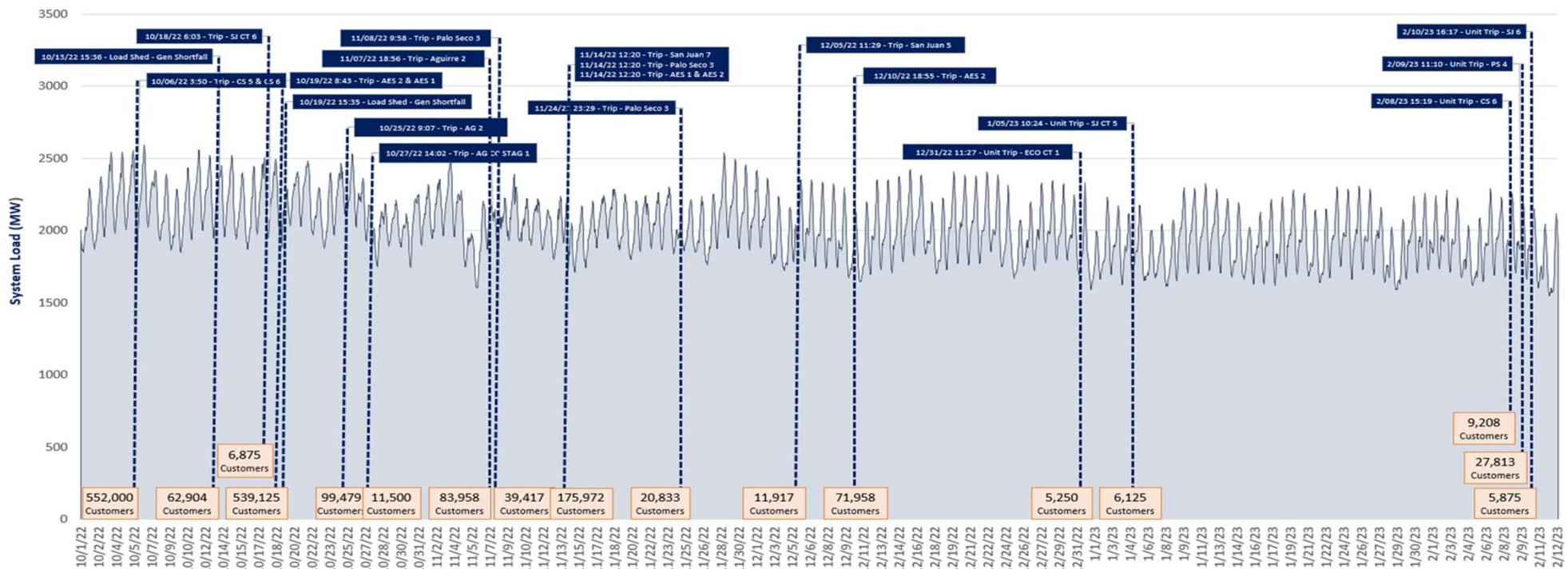
- **LUMA has finished update of Resource Adequacy analysis**

- Summary of results are in Appendix to this presentation



# 15 load shed events caused by generation have occurred since October 1, 2022

Generation Load Shed Events



- Resource Adequacy analysis done after Fiona in September estimated 14 load shed events in the following four months, versus the 15 events which have actually occurred



# Generation Planned Outages

- Continual adjustment of outage schedules suggest planned outage performance will deteriorate
- Major changes since last report
  - The 4-month outage planned for San Juan 6 (Combustion Turbine & Steam Unit) has been deferred to early 2024
  - The AES Unit 1 Planned Outage was moved-up two weeks sooner into February to support March, April outage schedules. This change lowers overall risk but will increase risk in February.

Unit Name	2023												2024				Changes From Last Revision (Rev. of 2022-01-17 filed on 2022-02-01)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
▾ Aguirre 1																	
▾ Aguirre 2																	
▾ Costa Sur 5																	
▾ Costa Sur 6																	
▾ Palo Seco 3																	
▾ Palo Seco 4																	
▾ San Juan CT 5																	
▾ San Juan STM 5																	
▾ San Juan CT 6																	
▾ San Juan STM 6																	
▾ San Juan 7																	
▾ San Juan 8																	
▾ San Juan 9																	
▾ San Juan 10																	
▾ AES 1																	
▾ AES 2																	
▾ EcoElectrica 1																	
▾ EcoElectrica 2																	
▾ EcoElectrica STM																	

Added a Planned Outage from Jan 1, 2024, to Apr 30, 2024

Added a Planned Outage from Jan 1, 2024, to Apr 30, 2024

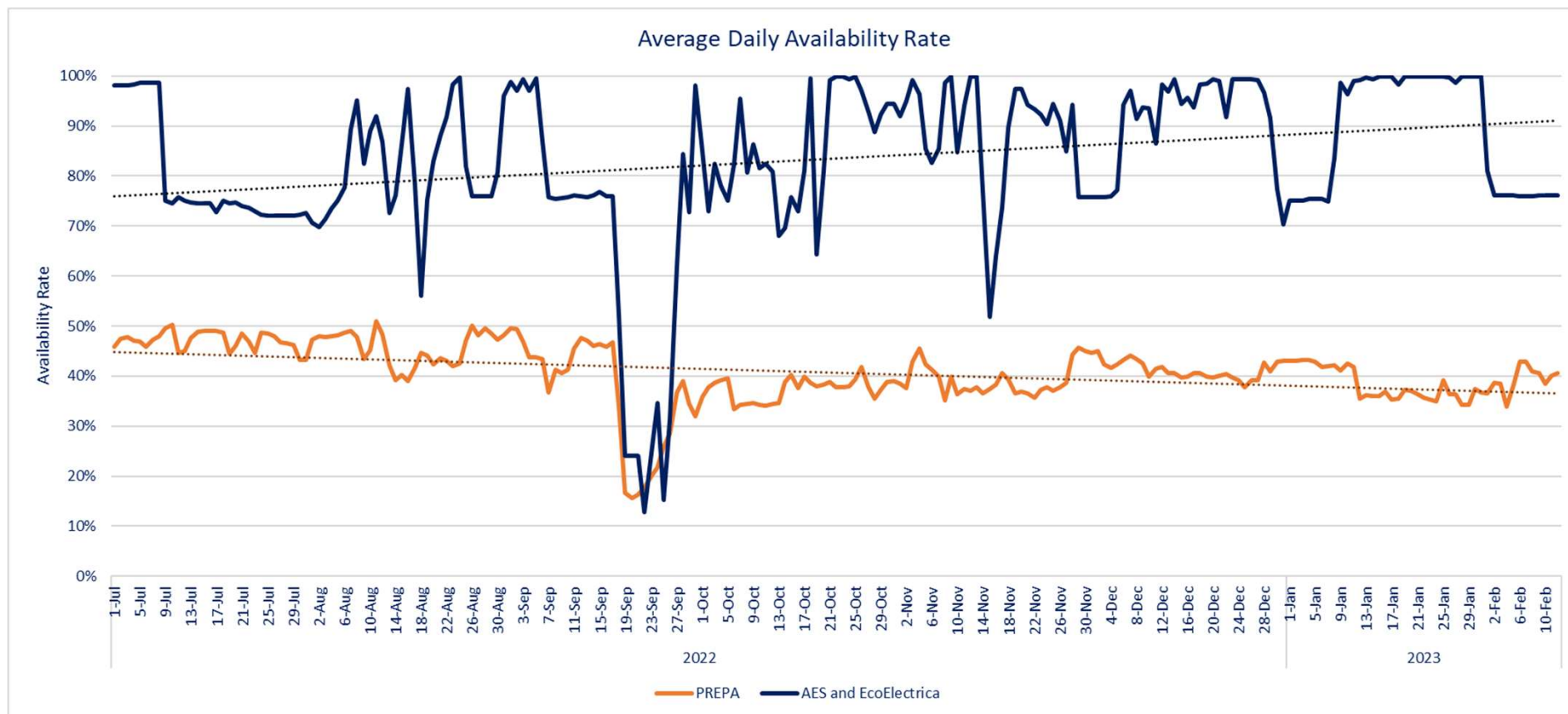
Forced Outages

Planned Outages

Out of Service



# Average Daily Availability Rate Since July 1, 2022



As of 2/12/2023

- Availability Rates continue on trend with PREPA fleet decreasing and AES & Ecoelétrica increasing

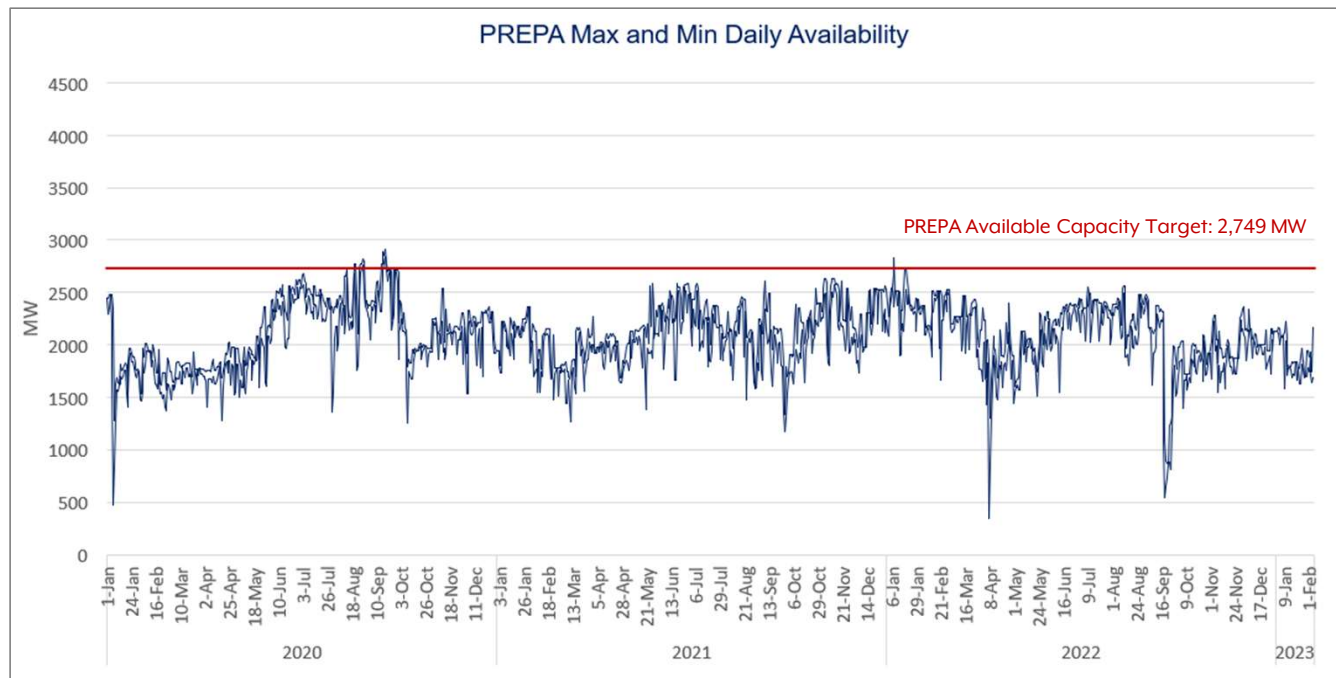


# PREPA fleet required to maintain 2,750 MW availability (approximately 60% availability) in order to meet minimum reserves

This graph shows average daily available capacity for all PREPA units since January 1, 2020.

Since Jan. 2020, PREPA's average available capacity has been 2,086 MW (44%).

YEAR	QUARTER	AVAILABILITY %	AVAILABILITY (MW)
2020	Q1	38%	1769
	Q2	43%	1999
	Q3	52%	2447
	Q4	45%	2091
2021	Q1	42%	1955
	Q2	45%	2114
	Q3	45%	2107
	Q4	48%	2230
2022	Q1	50%	2326
	Q2	42%	1987
	Q3	46%	2145
	Q4	41%	1940
2023	Q1	40%	1913



Note that minimum operating reserves required under System Operation Principles for Puerto Rico is about 700 MW

PREPA Units' Status in 2023	Nameplate Capacity (MW)	Total Unavailable Capacity due to Outages (MW)	Average Daily Limitations (MW)	Average Daily Outages (MW)
Baseload Units	3162	1330	408	1024
Peaking Units	1531	859	34	496
<b>TOTAL</b>	<b>4693</b>	<b>2189</b>	<b>442</b>	<b>1520</b>



# Resource Adequacy Update indicates risk of load shed remains significantly above minimum planning standard

- **Resource adequacy and risks of load shed remain an ongoing operational concern.**
- LUMA's risk scenarios includes an optimistic case and a risk-adjusted case that reflects historic trends. Under both cases, 350 MW will contribute to a significant reduction in load shed events. Although risk will remain of a smaller number of load shed events due to forced outages.
  - Emergency generation will lower LOLE from 3-4 per month to less than 1 per month which would result in a LOLE of 38 for the calendar year 2023.
  - Most importantly, the 350 MW will enable the generation portfolio as a whole to still accommodate outages schedules which are expected to continue through the hurricane season.
- Several generation trends since Fiona continue to be a cause of concern. PREPA availability has fallen from 46% before Fiona to less than 40% since Fiona as forced outage rates for several base load plants have increased. In addition, outage schedules continue to change constantly which will negatively impact schedule performance from inadequate pre-outage planning.
- Systems Operations continues to adjust outage schedules to improve resource adequacy. For example, the recent planned deferral of the schedules AES Unit 2 outage from July to October lowered LOLE significantly.
- Resource Adequacy model is robust. Resource Adequacy analysis done after Fiona in September estimated 14 load shed events in the following four months, versus the 15 events which have actually occurred. LUMA updates resource adequacy risk assessment regularly. The appendix contains a more detailed summary of the risk analysis update.





# Appendix: Resource Adequacy Update

February 15, 2023

# Contents

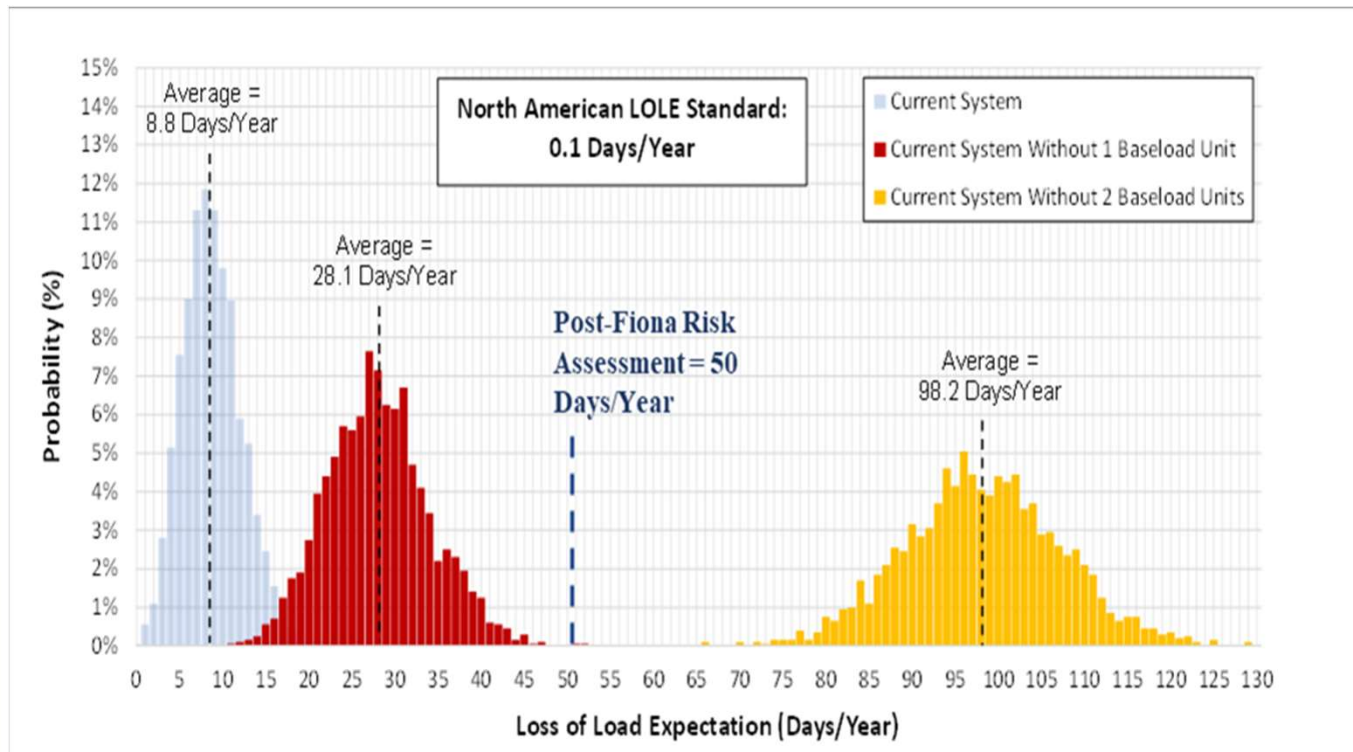
- Current Assessment of System Loss of Load Expectation
- Generation Trends Post-Fiona
- Adjusting Expectations For Historical Performance Trends



# Current Assessment of System Loss of Load Expectation



## During Hurricane Fiona, LUMA assessed the risk of a load shed event due to generation shortfall as an LOLE of 50, or one event per week



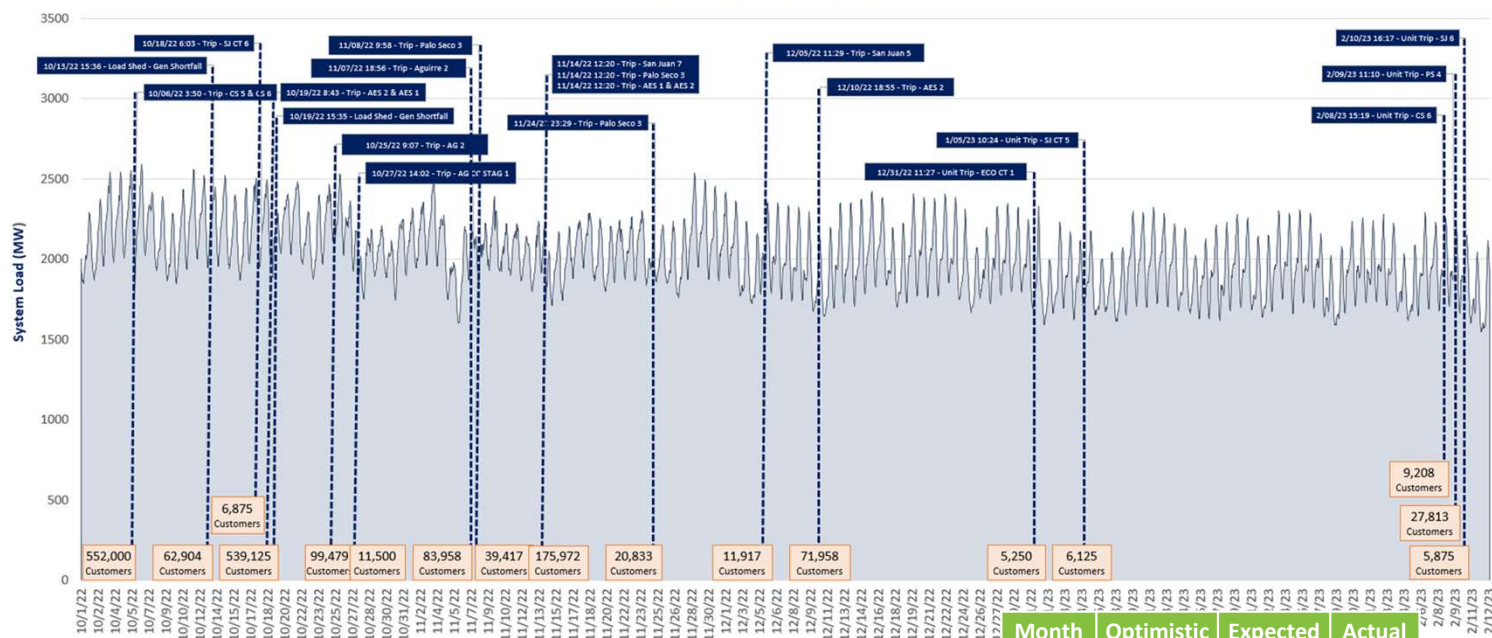
- Estimated to be between the risk of operating the generation system with one baseload unit out of service, and two baseload units out
- An LOLE of 50, is 500 times the risks that exists with most utilities in the mainland US
- At the time, a more precise estimate was not possible because the damages at individual plants had not yet been assessed

LOLE – Loss of Load Expectation



# The Resource Adequacy analysis has accurately predicted load shed event frequency since Fiona

Generation Load Shed Events



**Note:** October load shed events were avoided by deferring several outages which had been planned for October when Resource Adequacy analysis performed

- The September analysis estimated that 14 load shed events would have occurred by February 1<sup>st</sup>, versus the 15 events which have actually occurred
- The analysis identified that Mar-May would be the key period when LOLE risks would increase after the winter lull
  - Depending on how many outages could be completed before the demand increased
- Current expectations are that between 8-15 load shed events will occur during the 13-week period between Feb- April

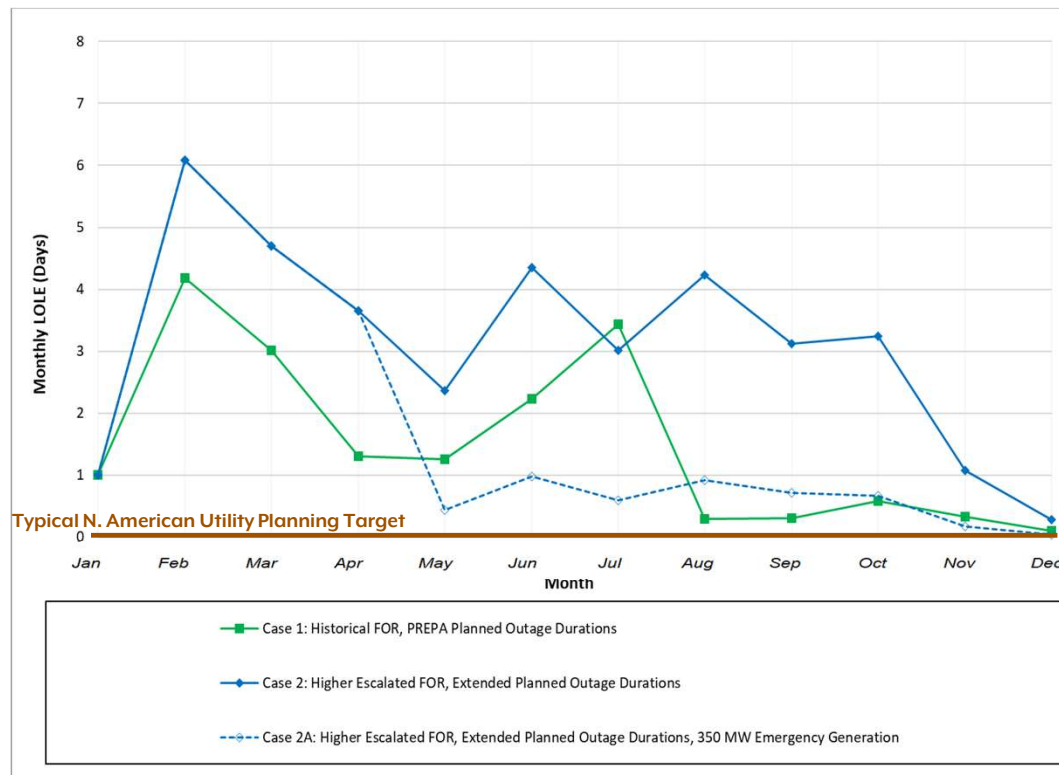


(1) Through Feb 12<sup>th</sup>

Updated through 2/12/2023

# The LOLE risk by month is determined by the Planned Outage performance and arrival dates of emergency generation

Monthly LOLE forecast for Cases 1, 2, 2a



February – April are critical months with highest LOLE risks

- Outage backlog builds due to outage deferrals, and emergency generators are still not yet inter-connected
- If outages are not completed as scheduled, the start date for other outages will be deferred into summer and LOLE risk will increase

# Hourly reserves will improve significantly with 350 MW of available emergency generation

Historic FOR, PREPA Planned Outage Durations

Case 1: Historical FOR, PREPA Planned Outage Durations

Month	1	2	3	4	5	6	7	8	9	10	11	12	Average
1	931	699	870	884	937	877	751	1,341	1,293	1,214	1,237	1,462	1,041
2	1,023	782	940	970	1,029	952	832	1,421	1,366	1,289	1,317	1,542	1,122
3	1,064	833	988	1,031	1,090	1,020	898	1,486	1,421	1,344	1,374	1,590	1,178
4	1,087	864	1,014	1,079	1,137	1,062	939	1,518	1,468	1,378	1,408	1,626	1,218
5	1,088	866	1,018	1,087	1,151	1,082	959	1,537	1,486	1,390	1,415	1,633	1,226
6	1,052	813	988	1,054	1,137	1,061	946	1,519	1,456	1,357	1,373	1,588	1,195
7	992	754	954	1,040	1,124	1,041	954	1,525	1,457	1,341	1,335	1,533	1,171
8	966	725	920	969	1,046	965	901	1,485	1,432	1,315	1,322	1,524	1,131
9	913	663	871	913	979	889	841	1,419	1,361	1,248	1,268	1,471	1,070
10	867	626	853	891	940	856	809	1,377	1,327	1,208	1,232	1,444	1,036
11	847	626	839	875	934	853	803	1,355	1,299	1,181	1,213	1,429	1,021
12	795	612	813	850	902	829	787	1,315	1,257	1,144	1,190	1,405	992
13	782	600	802	838	893	829	796	1,303	1,234	1,108	1,163	1,391	978
14	778	606	792	825	871	810	759	1,278	1,193	1,072	1,133	1,382	958
15	752	575	767	794	839	775	724	1,230	1,153	1,034	1,104	1,357	925
16	718	537	715	746	803	726	680	1,192	1,131	998	1,056	1,316	885
17	685	506	677	710	773	710	649	1,164	1,119	968	1,020	1,271	854
18	677	484	666	699	774	709	635	1,157	1,118	973	1,015	1,247	846
19	582	429	642	681	761	695	620	1,132	1,072	871	899	1,128	793
20	515	344	512	583	642	599	513	1,002	1,005	848	883	1,103	712
21	554	370	530	584	625	563	451	982	1,010	859	908	1,132	714
22	617	421	586	617	657	594	474	1,026	1,048	911	960	1,177	757
23	709	491	656	676	714	650	537	1,102	1,111	996	1,035	1,250	827
24	815	587	760	775	819	746	641	1,212	1,208	1,112	1,141	1,355	932
Average	825	617	799	841	899	829	746	1,295	1,251	1,132	1,167	1,390	

Increased FOR, Extended Planned Outage Durations

Case 2: Higher Escalated FOR, Extended Planned Outage Durations

Month	1	2	3	4	5	6	7	8	9	10	11	12	Average
1	863	637	791	732	862	760	818	805	860	914	1,065	1,374	873
2	956	721	861	817	954	834	898	885	934	988	1,144	1,453	954
3	997	772	909	878	1,015	903	965	950	990	1,043	1,201	1,501	1,010
4	1,019	807	918	876	1,061	944	1,006	983	1,037	1,077	1,244	1,538	1,047
5	1,021	804	940	935	1,074	964	1,026	1,002	1,055	1,090	1,242	1,544	1,058
6	984	750	909	901	1,060	943	1,013	983	1,026	1,056	1,200	1,500	1,027
7	924	691	875	887	1,047	923	1,022	988	1,026	1,041	1,161	1,444	1,002
8	899	662	841	816	968	847	969	948	1,001	1,014	1,149	1,435	962
9	846	599	792	760	902	770	908	882	930	948	1,095	1,383	901
10	800	563	773	739	863	737	876	840	896	908	1,059	1,356	867
11	780	563	759	722	857	734	869	818	868	881	1,040	1,341	853
12	729	549	733	688	825	709	853	779	826	844	1,017	1,316	823
13	715	537	723	686	825	710	862	766	803	808	990	1,303	810
14	711	544	713	673	794	691	825	741	761	772	960	1,292	790
15	685	513	688	641	762	656	791	694	721	734	931	1,268	757
16	651	475	635	594	726	608	746	656	700	698	884	1,227	717
17	618	445	598	558	696	592	716	629	687	668	848	1,182	686
18	611	422	587	547	697	591	702	623	687	673	843	1,158	678
19	515	367	563	529	684	577	688	598	639	572	728	1,038	625
20	449	283	432	431	565	481	580	467	573	548	711	1,015	545
21	487	309	451	431	548	445	519	447	578	560	737	1,044	546
22	550	360	506	465	581	476	541	491	615	612	789	1,089	590
23	638	430	577	524	638	533	604	567	679	696	864	1,163	659
24	748	525	681	623	743	628	707	688	776	812	970	1,268	764
Average	758	555	720	688	822	711	813	759	819	832	994	1,301	

Increased FOR, Extended Planned Outage Durations 350 MW Emergency Gen

Case 2A: Higher Escalated FOR, Extended Planned Outage Durations, 350 MW Emergency Generation (Active on 5/1/23)

Month	1	2	3	4	5	6	7	8	9	10	11	12	Average
1	868	636	790	731	1,198	1,095	1,158	1,145	1,199	1,252	1,401	1,710	1,099
2	962	719	860	816	1,290	1,170	1,239	1,225	1,273	1,327	1,481	1,790	1,179
3	1,004	770	907	877	1,351	1,239	1,306	1,290	1,329	1,382	1,538	1,839	1,236
4	1,025	800	936	924	1,398	1,281	1,346	1,323	1,376	1,415	1,571	1,874	1,272
5	1,027	801	938	933	1,411	1,301	1,366	1,342	1,393	1,428	1,579	1,880	1,283
6	991	748	907	899	1,397	1,279	1,354	1,323	1,363	1,395	1,538	1,836	1,253
7	931	689	873	885	1,384	1,260	1,362	1,329	1,363	1,380	1,500	1,780	1,228
8	905	660	839	814	1,306	1,185	1,309	1,289	1,339	1,353	1,487	1,772	1,188
9	852	598	791	758	1,239	1,108	1,249	1,223	1,269	1,286	1,433	1,719	1,127
10	806	562	773	736	1,201	1,075	1,217	1,181	1,234	1,246	1,397	1,692	1,093
11	786	562	759	720	1,195	1,072	1,210	1,158	1,206	1,219	1,378	1,677	1,079
12	730	548	732	695	1,164	1,047	1,195	1,120	1,164	1,182	1,350	1,604	1,049
13	722	537	723	683	1,154	1,047	1,204	1,107	1,142	1,146	1,329	1,640	1,036
14	717	543	712	671	1,133	1,029	1,166	1,083	1,100	1,111	1,299	1,630	1,016
15	691	511	688	639	1,101	993	1,132	1,035	1,060	1,072	1,269	1,606	983
16	657	473	636	592	1,065	944	1,088	996	1,039	1,036	1,222	1,564	943
17	625	443	598	556	1,034	928	1,057	969	1,026	1,006	1,186	1,520	912
18	617	420	587	545	1,035	927	1,042	962	1,025	1,011	1,181	1,495	904
19	521	365	563	527	1,022	913	1,028	937	979	910	1,065	1,375	850
20	454	282	433	429	903	817	920	806	912	887	1,048	1,351	770
21	482	307	451	430	886	781	859	787	917	897	1,074	1,380	772
22	555	359	506	463	918	812	881	830	955	949	1,125	1,425	815
23	643	429	577	522	974	869	944	907	1,018	1,033	1,200	1,499	885
24	753	524	681	621	1,079	964	1,048	1,028	1,114	1,149	1,306	1,604	989
Average	764	554	719	686	1,160	1,047	1,153	1,100	1,158	1,170	1,332	1,638	

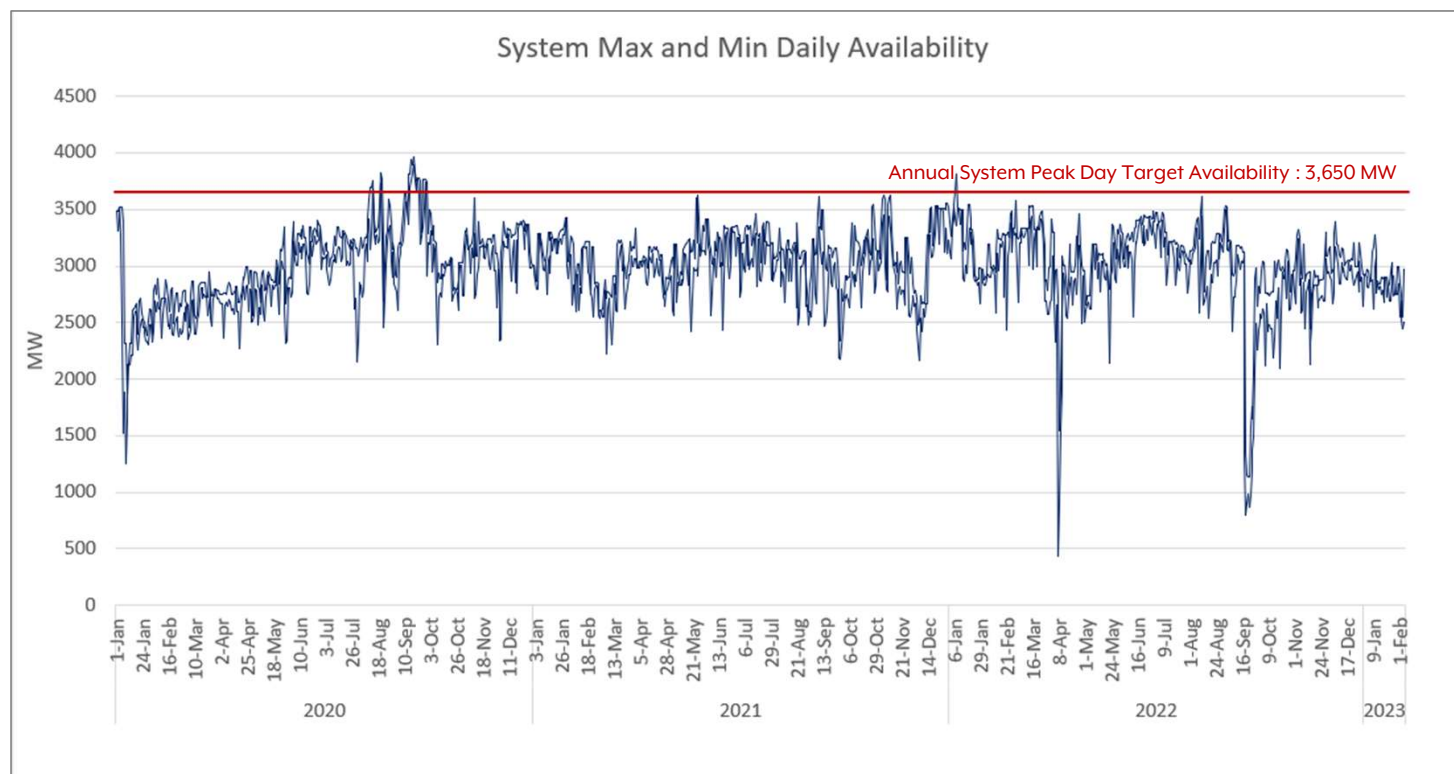
Legend: ≥750 MW <750 MW

- Under PREPA's availability projections, outages will be largely completed in July, de-rated capacity will be restored, and there will be adequate reserves
- Assuming planned outages will match historical schedule performance, and Post-Fiona forced outage rates will continue
- Even under more conservative planning assumptions, 350 MW of emergency generation will largely eliminate the reserve deficiencies on a deterministic, go-forward basis
- Most of the hours between 5-12 will be below targeted reserves until November
- Under all scenarios, there will still remain some statistical probability that availability will fall below 750 under some scenarios when results are considered stochastically
- If a randomly occurring forced outage occurs at a plant when there is not enough reserves, load shed events will occur; only three load sheds are projected in the 7 months after arrival of the 350 MW emergency generation

# Generation Trends Post-Fiona



## Nov. 9 FEMA defined the desired End-State as meeting Peak Load Demand of 2950 with 700MW in reserve for a total of 3650

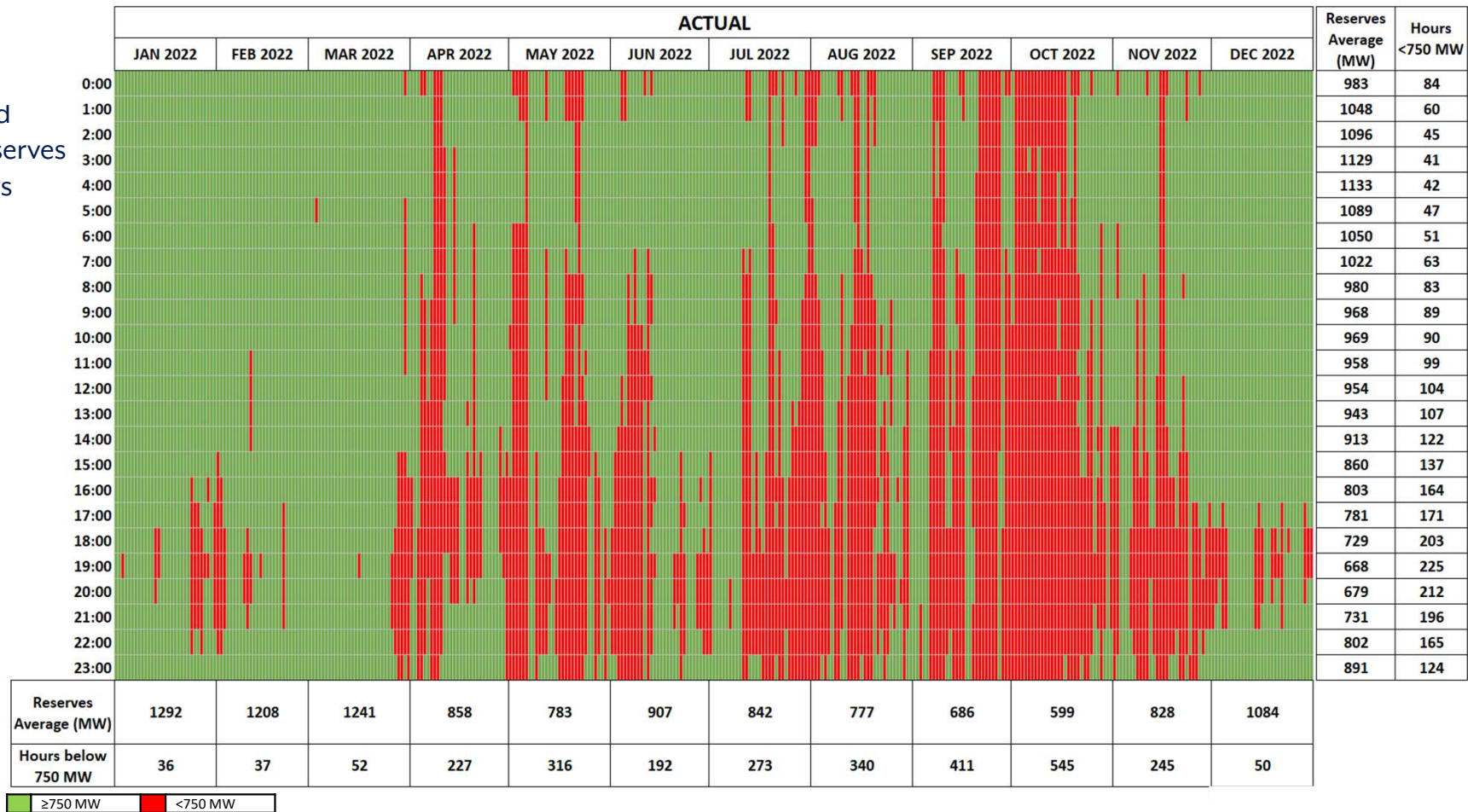


- The entire bulk power system has exceeded 3,650 MW of available capacity in 24 out of 1,131 days since 2020
- On an hourly basis, a total of 372 hours (1.4% of total period hours)
- Note: On those hours where peak demand was less than 2,950 MW, there were numerous hours where reserve requirements fell slightly below 750 MW

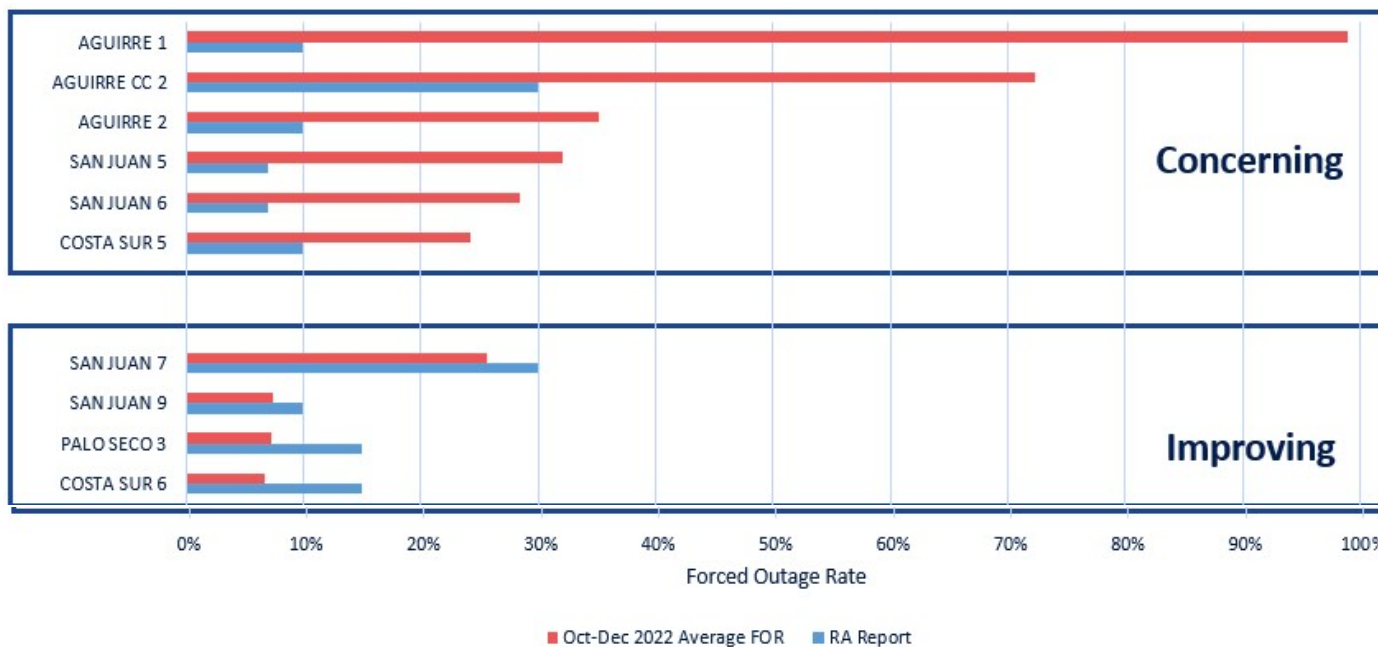


# Hourly reserves during 2022 indicates increased risk during most evening peak periods

- The system had inadequate reserves 31% of the hours during 2022



## Several of PREPA units' Forced Outage rates have further deteriorated since Fiona



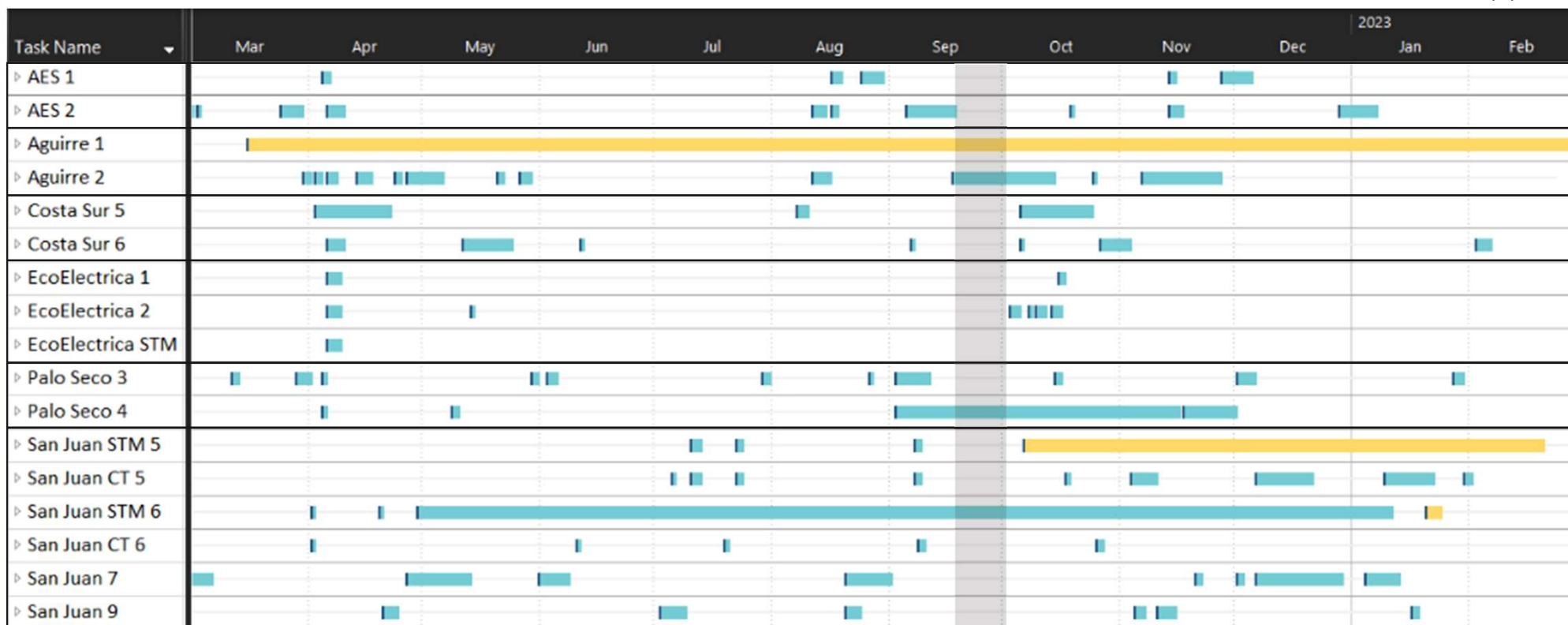
- Aguirre, San Juan, and Costa Sur 5 have experienced higher forced outage rates since Fiona
- San Juan 7 & 9, Palo Seco 3, and Costa Sur 6 have actually achieved better than historical performance since Fiona

# Forced Outages Per Unit

This graph shows the forced outages per unit reported in the Daily Availability Report. The period shown is from 1/1/2022 - 12/31/2022. The purpose is to display the units with unforeseen and unplanned outages that can impact how the generation demand is met.

Legend: Completed In Process

As of 2/4/2022



- The period from September 18 – October 3 (shaded in gray) does not consider outages that occurred during Hurricane Fiona.

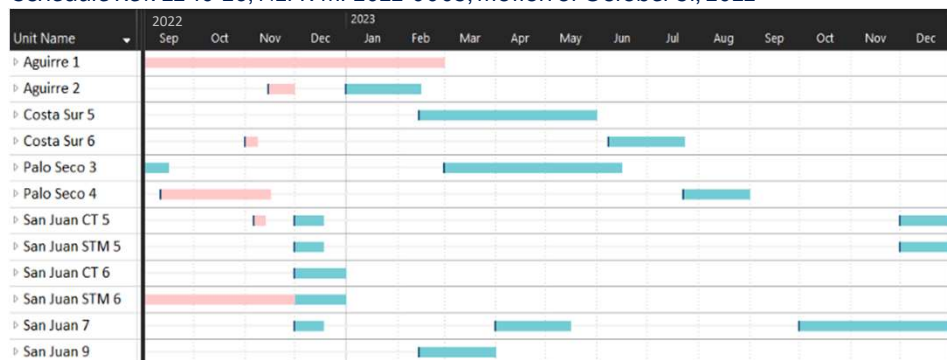


# Continual adjustment of outage schedules suggest planned outage performance will deteriorate

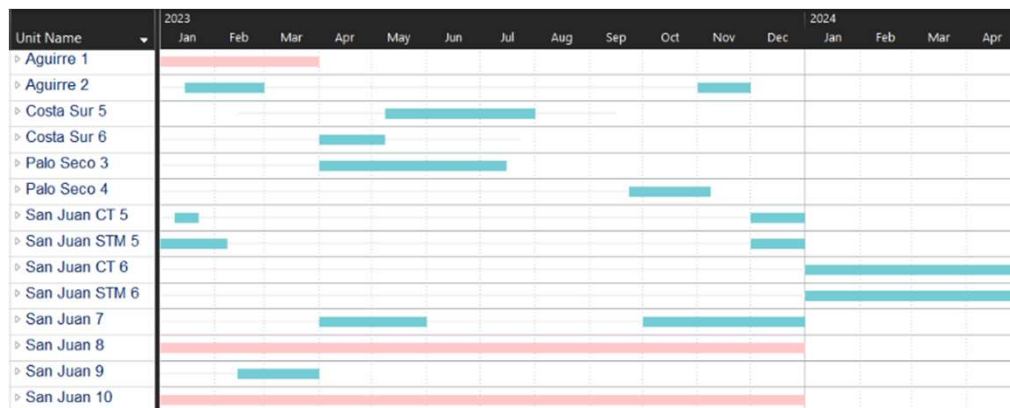
Unit	Changes in Rev. 22-10-28	Changes in Rev. 22-12-08	Changes in Rev. 23-01-05	Changes in Rev. 23-01-17	Changes in Rev. 23-02-06
Aguirre 1		Extend FO duration			
Aguirre 2		Move up FO start	Delay PO start	Add PO in Nov 2023	
Costa Sur 5		Delay PO start	Move up PO start		
Costa Sur 6		Move up PO start	Shorten PO duration		
Palo Seco 3		Delay PO start			
Palo Seco 4		Extend PO	Delay PO Start		
San Juan CT 5		Delay PO start	Add PO in Dec 2023		
San Juan STM 5	Extend PO	Extend PO duration	Extend PO duration		
San Juan CT 6					Add PO in 2024
San Juan STM 6					Add PO in 2024
San Juan 7		Delay PO start		Extend PO duration	
San Juan 8	Add OOS through 2023			Change OOS to FO	
San Juan 9					
San Juan 10	Add OOS through 2023			Change OOS to FO	

PO – Planned Outage; FO – Forced Outage; OOS – Out of Service

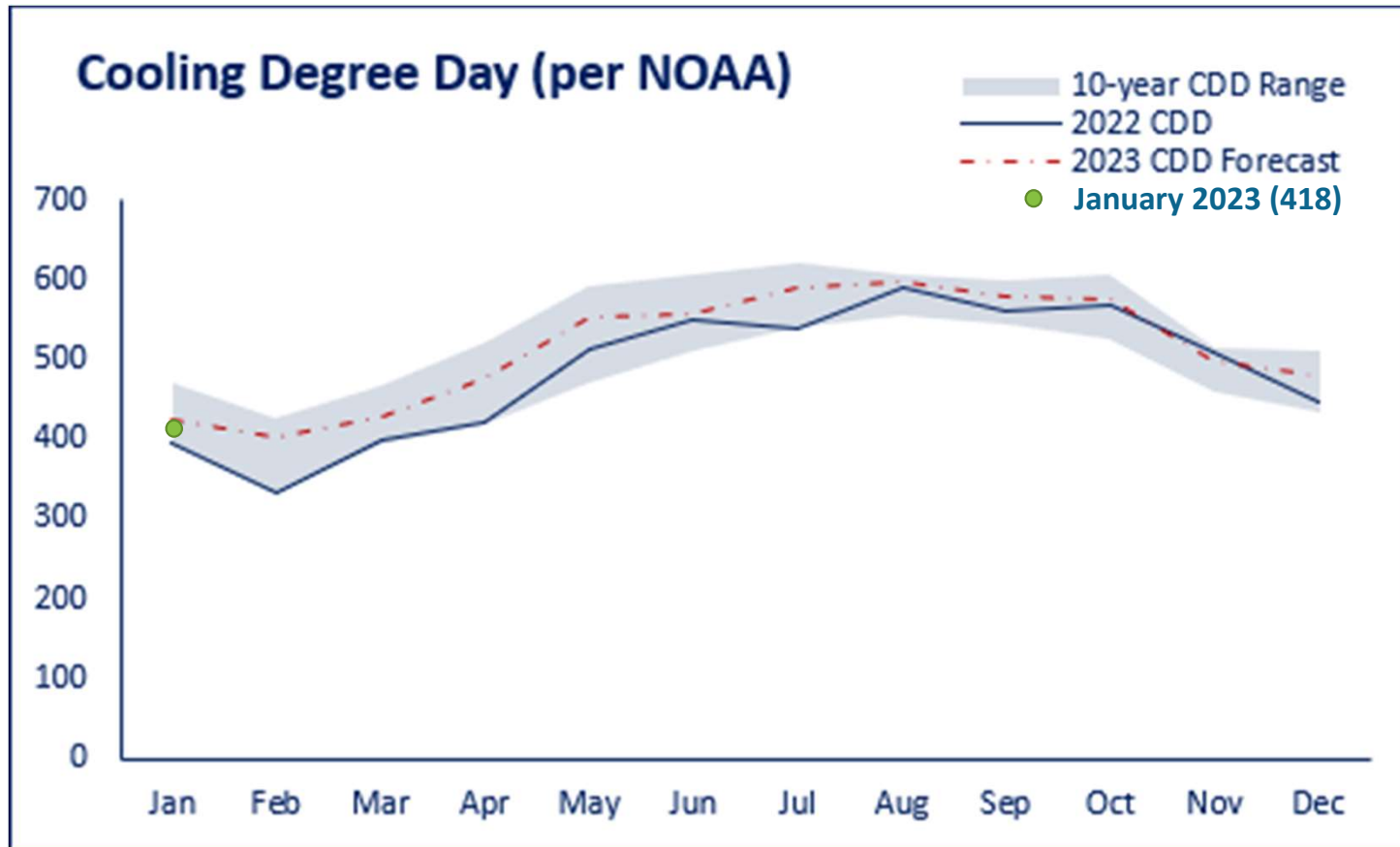
Schedule Rev. 22-10-26, NEPR-MI-2022-0003, Motion of October 31, 2022



Schedule Rev. 23-02-06



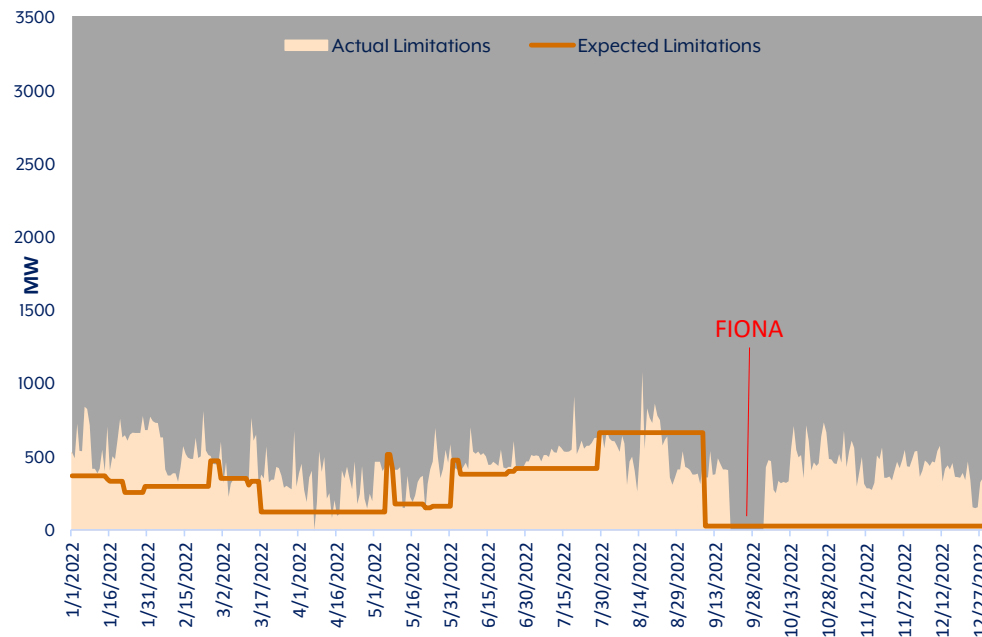
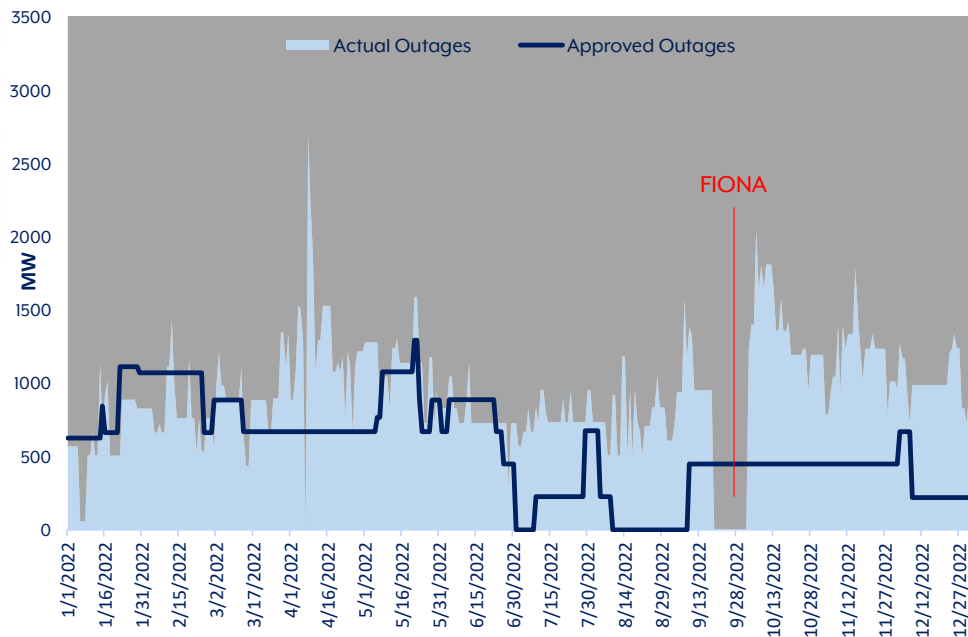
2022 was a cooler year than average and a reversion to mean temperature trends would increase load and reduce reserves



# Adjusting Expectations For Historical Performance Trends



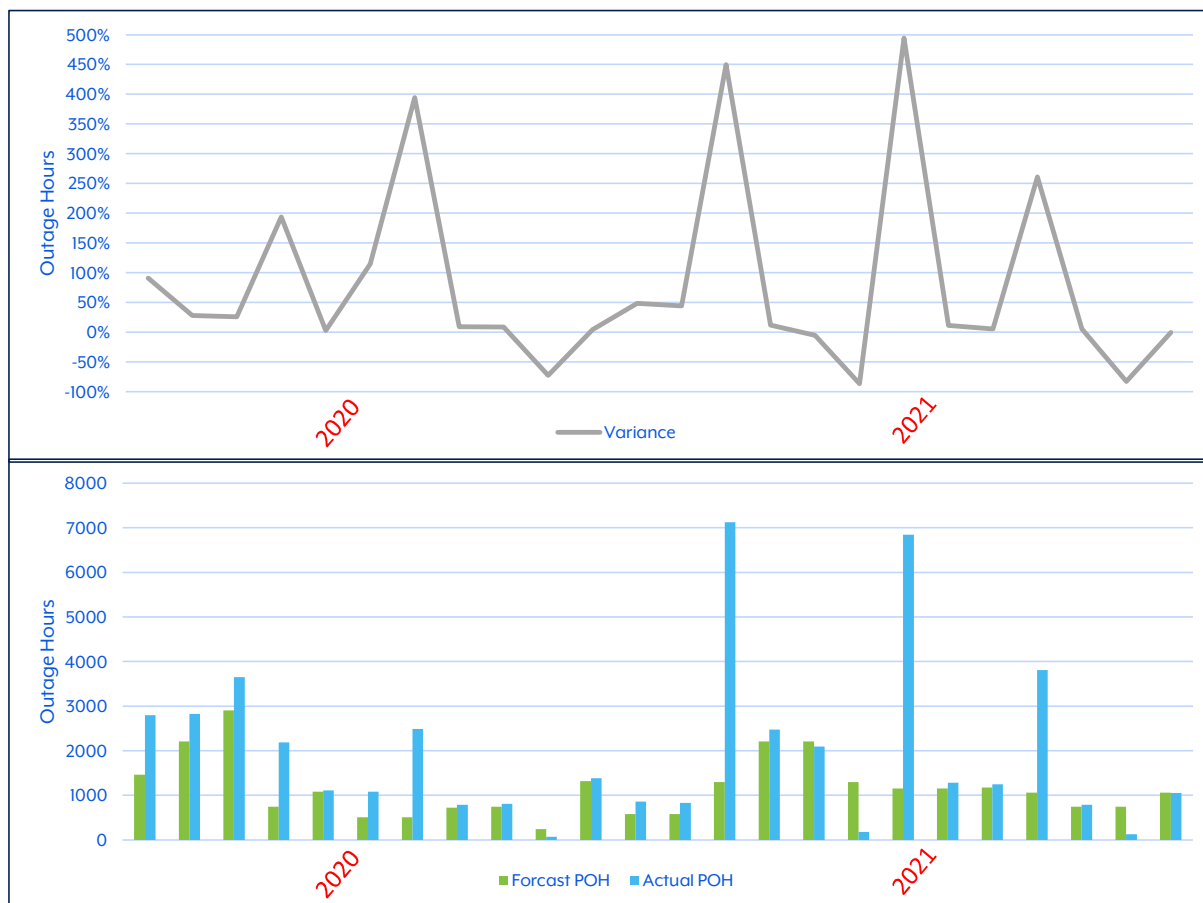
# The system's ability to accurately project outages and limitations is historically poor, but deteriorated after Fiona



- In 2022, total system unavailable due to outages was 66% higher than planned on a weighted basis, compared to what was projected in the 90-day Generation Outage Schedule, and performance has deteriorated after Fiona
- Total capacity limitations (de-ratings) were 79% higher than expected and have significantly deteriorated after Fiona
- Actual system overall had approximately 565 MW less availability than projected, 498 of which was due to PREPA



# Planned Outages at PREPA between 2019 – 2021 Last 74% Longer than Forecast on an Aggregated Basis



- PREPA's planned outages between October 2019 and December 2021 lasted approximately 74% more hours than planned
- Ignoring the three worst performing outages at SJ9, SJ7, and PS3 still results in an average outage schedule duration 22% longer than planned

Plant	Forecast Outage Hours	Actual Outage Hours	Variance
CS 5	1,056	1,051	0%
SJ 8	1,080	1,112	3%
Camb 3	1,320	1,380	5%
SJ STM 5	5,856	6,129	5%
SJ CT 6	1,896	2,003	6%
AG 1	1,176	1,243	6%
SJ CT 5	4,416	4,919	11%
PS 4	1,152	1,285	12%
SJ STM 6	576	856	49%
AG 2	2,544	4,813	89%
PS 1	1,464	2,798	91%
SJ 9	1,056	3,810	261%
SJ 7	1,296	7,125	450%
PS 3	1,152	6,847	494%
<b>Total</b>	<b>26,040</b>	<b>45,371</b>	<b>74%</b>
Total excl SJ9, SJ7, & PS3	22,536	27,589	22%

## PREPA's outage effectiveness is poor as evidenced by 25% of its forced outages occurring in the 30 days immediately after planned outages

