LUMA

2025 Integrated Resource Plan

Solutions for the Energy Transformation of Puerto Rico
Preferred Resource Plan Presentation

October 2025

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Safety Moment

Tips to Prepare for Hurricanes and Emergencies

Keep an emergency kit with water, food, a flashlight, and batteries.

Charge your electronic devices and keep a battery-powered radio available.

Secure outdoor objects that could be blown away by strong winds.

Know your evacuation plan and the safe routes in your community.

Follow official advisories and avoid going outside during storms.

Agenda

- **Welcome Message and Agenda Overview:** Rebeca Maldonado, Government Affairs and Public Policy Director
- **Safety Moment:** Rebeca Maldonado
- **2025 IRP Recap:** María Hilda Rivera, Grid Modernization Director
- **2025 IRP Assumptions, Modeling, and Results:** Ajit Kulkarni, PhD, Senior Technical Expert and Grid Modernization Manager
- **Preferred Resource Plan:** Ajit Kulkarni, PhD
- **Questions and Discussion**

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2025 IRP Recap

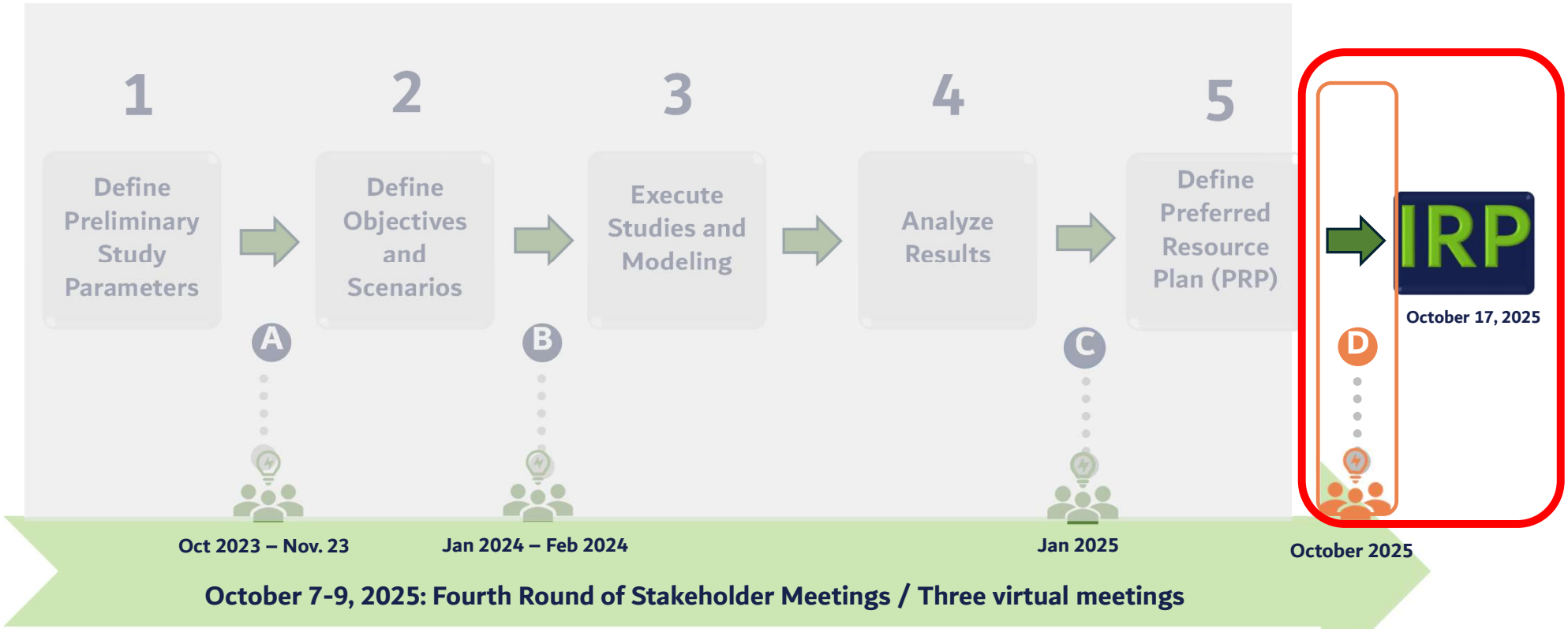
LUMA's Role Regarding the 2025 IRP

- The 2025 Integrated Resource Plan (IRP) is a public policy decision and planning tool for the benefit of utilities and regulators that maps out the least-cost, most reliable, and sustainable way to supply electricity, and must be updated every three years
- Under the Operation and Maintenance Agreement, LUMA is responsible for preparing, presenting, and defending the current and future IRPs
- Regulation 9021 requires the use of technically robust analyses and modeling for the development of the 2025 IRP

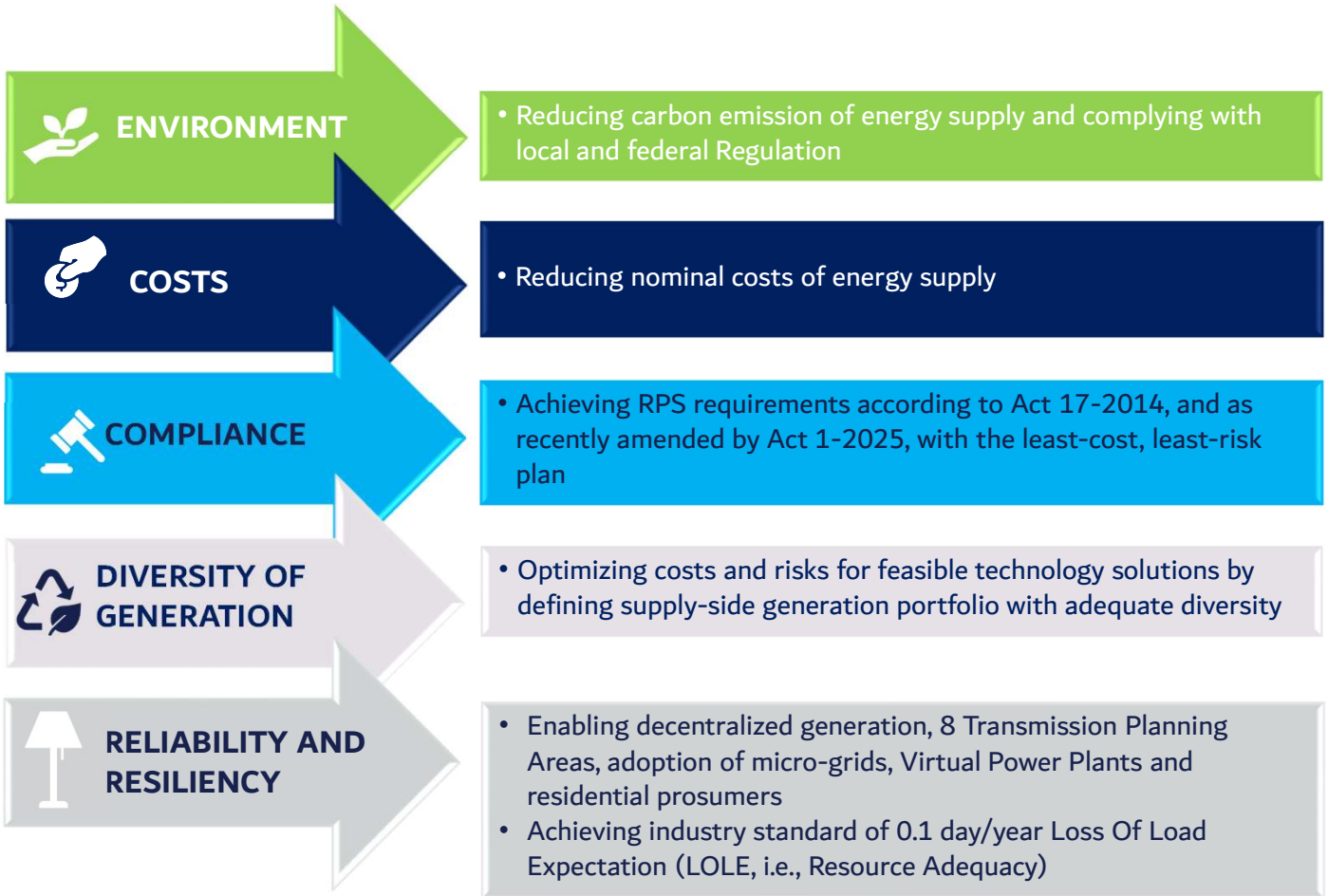
LUMA's Role Regarding the 2025 IRP

- As operator of Puerto Rico's transmission and distribution (T&D) system, LUMA works to enable the safe and reliable interconnection of any approved energy resource addition and carries out multiple planning functions that examine the current and future shape of the grid and the resources interconnected to it
- LUMA does not own nor operate generation resources and does not hold primary responsibility for the policy decisions that determine future energy resource projects
- In developing the 2025 IRP, LUMA remains technology-agnostic, enabling a unique approach focused on delivering the greatest benefits to customers at the lowest cost

Fourth and Last Round of Stakeholder Meetings



2025 IRP Objectives for the Preferred Resource Plan (PRP)



Additional Indicators to be tracked that are not considered objectives

- Acres of land used
- Percentage of energy from DER
- Number of technologies screened

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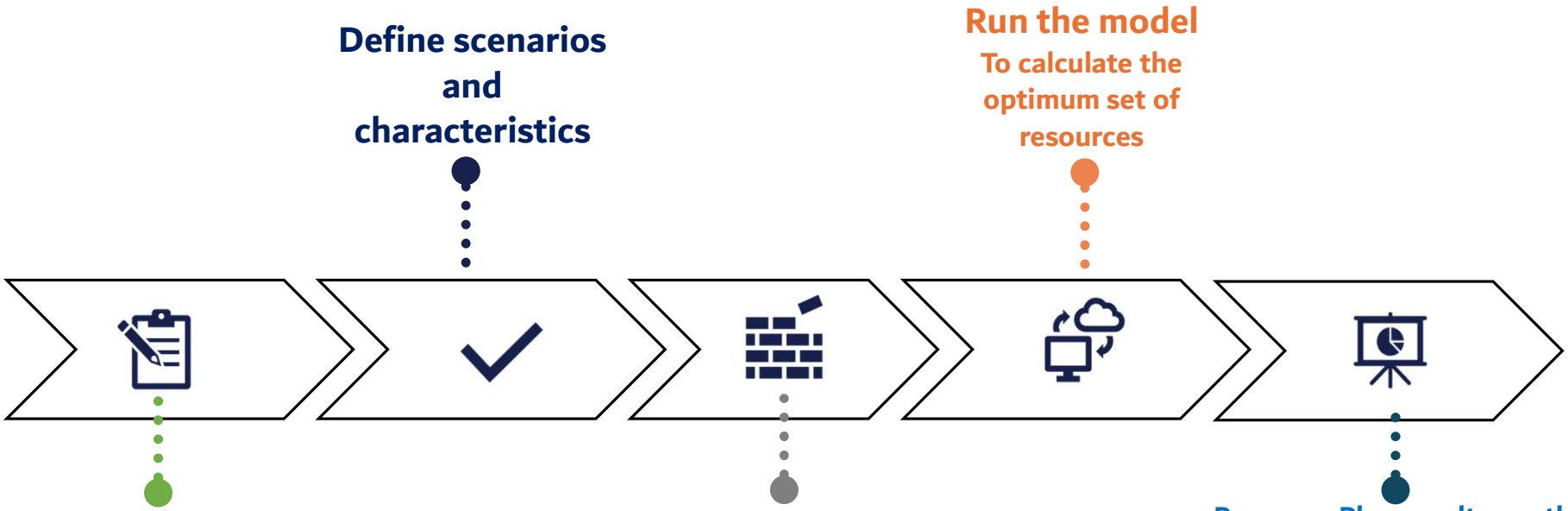
2025 IRP Assumptions, Modeling, and Results

2025 IRP Modeling Process

The model tests different combinations of energy resources against the conditions of each primary scenario in a 20-year planning horizon. The scenarios represent different possible futures in Puerto Rico. The output is the resource plan that reliably meets the projected electricity demand at the lowest cost for each scenario.



Preferred Resource Plan (PRP) – Resource Plan Hybrid A

- The results or outputs of Scenarios are referred to as resource plans
- Resource Plans were evaluated and rated according to Affordability, Environment, Compliance, Diversity of Generation, System Reliability and Resilience
- Resource Plan Hybrid A was selected as the Preferred Resource Plan, optimized for most likely conditions and performed well when tested against different scenarios

Results are preliminary and subject to change.

Technologies Considered in the 2025 IRP

Energy technologies screened:

Biodiesel

Distributed & Utility Scale Batteries

Distributed & Utility Scale Solar PV

Geothermal

Hydroelectric

Hydrogen

Liquefied Natural Gas

Municipal Waste Energy

Ocean Thermal Energy Conversion (OTEC)

Other Biofuels

Renewable Diesel

Small Modular Reactor (SMR)

Wave and Tidal System

Wind (Onshore and Offshore)

Energy technologies incorporated into the 2025 IRP:

Liquefied Natural Gas

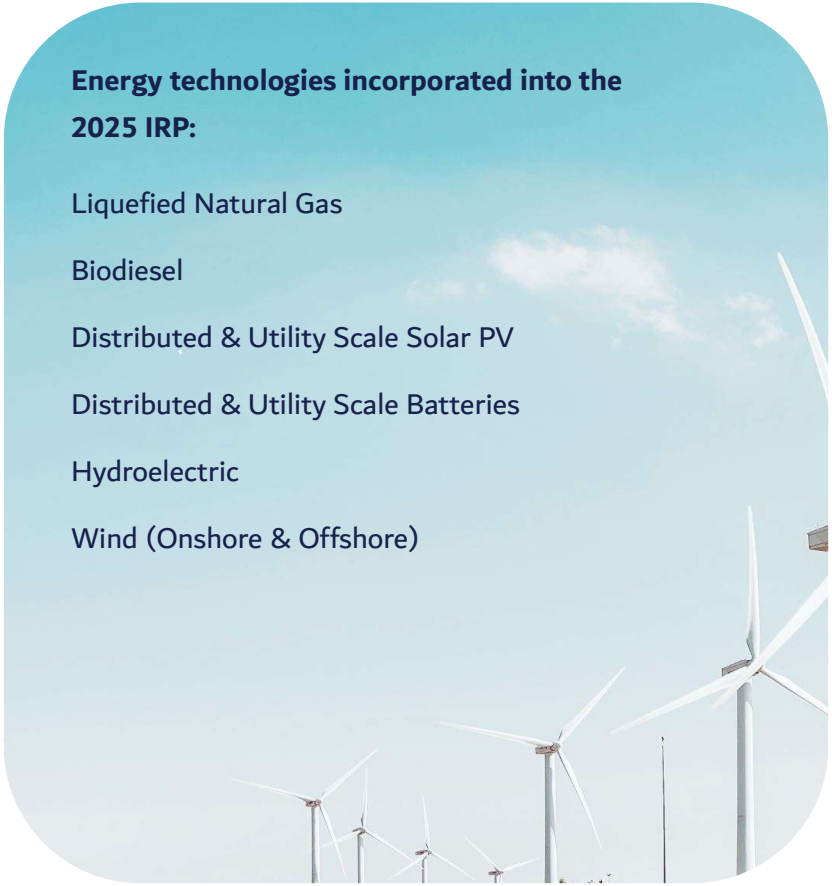
Biodiesel

Distributed & Utility Scale Solar PV

Distributed & Utility Scale Batteries

Hydroelectric

Wind (Onshore & Offshore)



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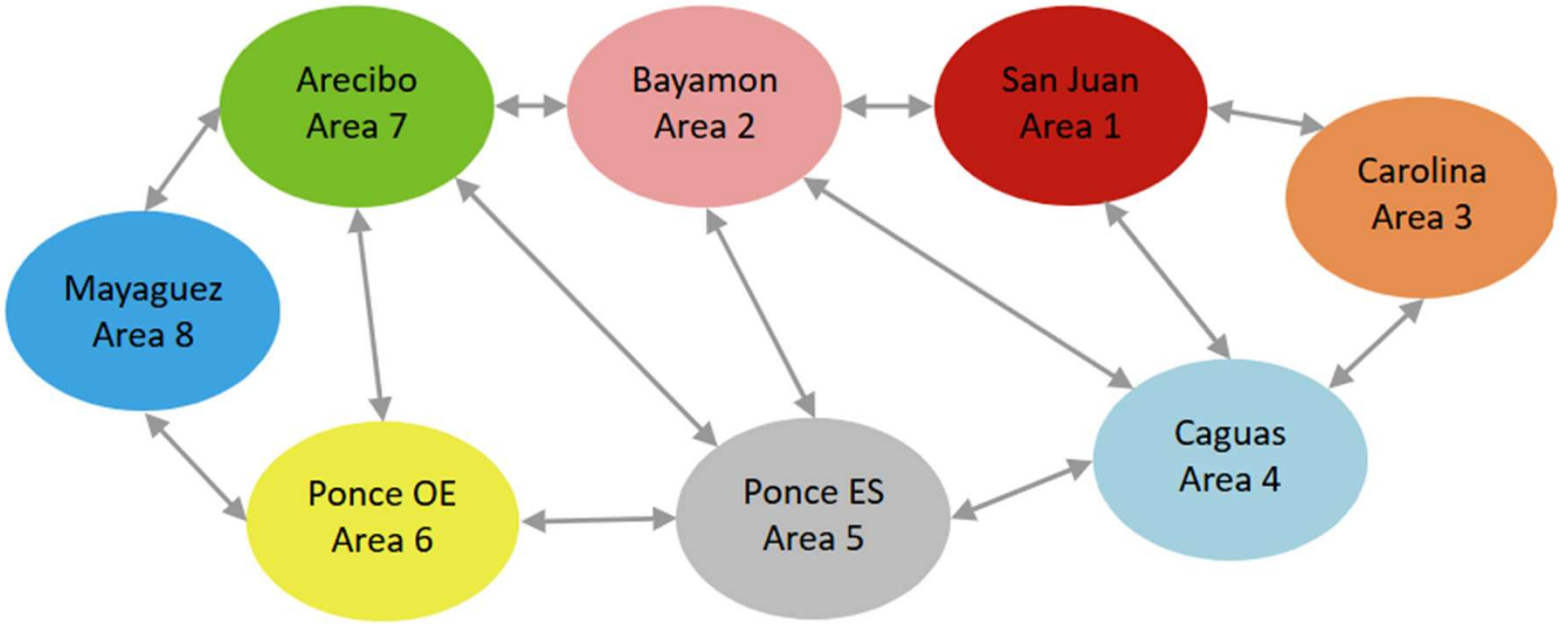
2025 IRP Project Status- Primary Scenarios*

#	Core Scenarios Description	Load Forecast	Solar & Battery Capital Costs	Gas plant capital costs (CCs & GTs)	Level of DBESS Control	Natural Gas Fuel Cost	Biodiesel Option	Fixed Decisions
1	Base assumptions for all variables	Base	Base	Base	Base	Base	Yes	Base
2	High load (Peaker/Low LF) with base assumptions for other variables	High	Base	Base	Base	Base	Yes	Base
3	Base load with high fossil capital costs	Base	Base	High	Base	Base	Yes	Base
4	Base load with low renewable energy capital costs and high fossil capital costs	Base	Low	High	Base	Base	Yes	Base
5	Base load with high gas fuel costs	Base	Base	Base	Base	High	Yes	Base
6	Base load with high gas fuel costs and high gas capital costs	Base	Base	High	Base	High	Yes	Base
7	Flex Run of Portfolio B (from Scenario 2) run under Scenario 1 conditions	Base	Base	Base	Base	Base	Yes	Base
8	Flex Run Portfolio A (from Scenario 1) run under Scenario 2 conditions	High	Base	Base	Base	Base	Yes	Base
9	Flex run of either Portfolio A (from Scenario 1) under low load conditions	Low	Base	Base	Base	Base	Yes	Base
10	Flex Run Portfolio A (from Scenario 1) Run under high costs and high load (stress) conditions	High	Base	High	Base	Base	Yes	Base
11	Flex Run B (from Scenario 2) run under high cost and high load (stress) conditions	High	Base	High	Base	Base	Yes	Base
12	Biodiesel is unavailable/too costly on island	Base	Base	Base	Base	Base	No	Base

*Primary Scenarios approved by the Energy Bureau's May 13, 2025, R&O; For the 12 scenarios above, due to Act 1, RPS requirement is assumed to ramp in 2035-2050

* An additional five Supplemental Scenarios are to be filed approximately at the end November.

Transmission Planning Areas (TPAs)



The presented results are preliminary and subject to change.

Fixed Decisions Summary (Additions and Retirements)*

Additions

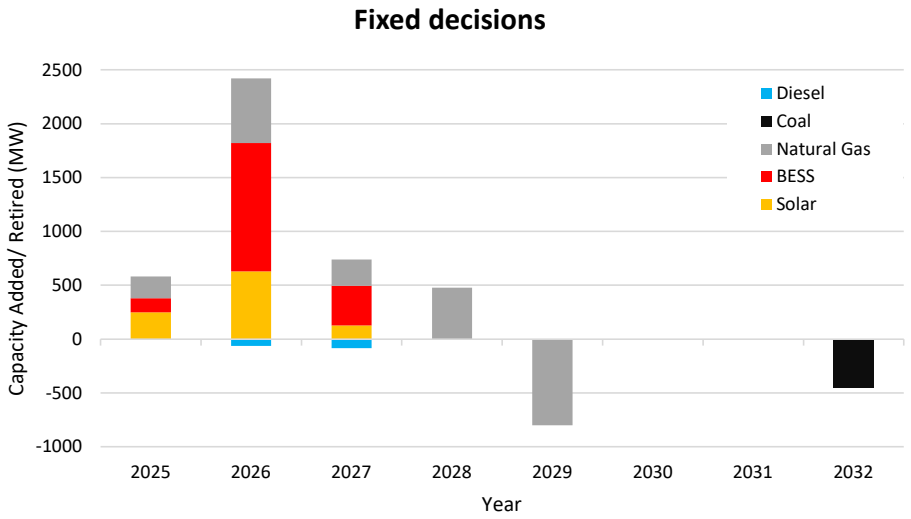
- Natural Gas
  - Energiza: 478 MW
  - Genera Peakers: 244 MW
  - Emergency Generators: 800 MW
- Solar
  - Non-Tranche Projects: 200 MW
  - Tranche 1: 739 MW
  - Tranche 2: 66 MW
- Hydro
  - PREPA HydroCo Refurbishment 38 MW
- BESS
  - Tranche 1: 535 MW
  - Tranche 2: 60 MW
  - Tranche 4: 50 MW
  - Genera BESS: 430 MW
  - ASAP / Competitive Process : 190 MW

Retirements

- Coal: 454 MW in 2032 per Act 1
- Diesel: 147 MW**
- Natural Gas (Emergency Generators): 800 MW coordinated with Energiza COD

The presented results are preliminary and subject to change.

	2025	2026	2027	2028	2029	2030	2031	2032
Solar	250	629	126					
BESS	131	1191	368					
Hydro		38						
Natural Gas	200	600	244	478	-800			
Coal								-454
Diesel		-63	-84					



*Values are as defined at the time the modeling commenced

**Diesel retirements are a fixed decision based on LUMA's assumptions.

Resource Locations for Fixed Decisions (Additions)

Arecibo
Tranche 1 PV: 90 MW
Tranche 1 BESS: 50 MW
Tranche 2 BESS: 60 MW
Genera Batteries : 101 MW
BESS: 50 MW
Hydro: 4 MW

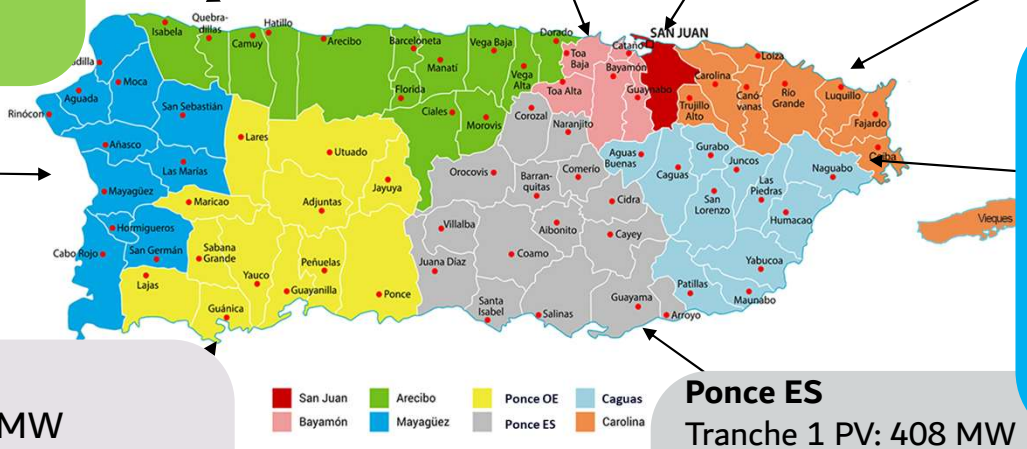
Bayamon
Genera Batteries: 101MW

San Juan
Gas Gen: 478 MW

Carolina
BESS: 20 MW

Caguas
Tranche 1 PV: 205 MW
Tranche 1 BESS: 25 MW
Tranche 2 PV: 26 MW
Genera Batteries: 40 MW
Genera Peak. Unit: 72 MW
BESS: 40 MW

Mayaguez
Tranche 1 PV: 35 MW
Tranche 2 PV: 40 MW



Ponce OE
Tranche 1 BESS: 125 MW
Genera Batteries : 30 MW
Genera Peak. Unit: 136 MW
BESS: 20 MW
Hydro: 26 MW
Emergency generator: 400 MW

Ponce ES
Tranche 1 PV: 408 MW
Tranche 1 BESS: 335 MW
Genera Batteries: 158 MW
Genera Peak. Unit: 36 MW
BESS: 60 MW
Hydro: 4 MW
Emergency generator: 400 MW

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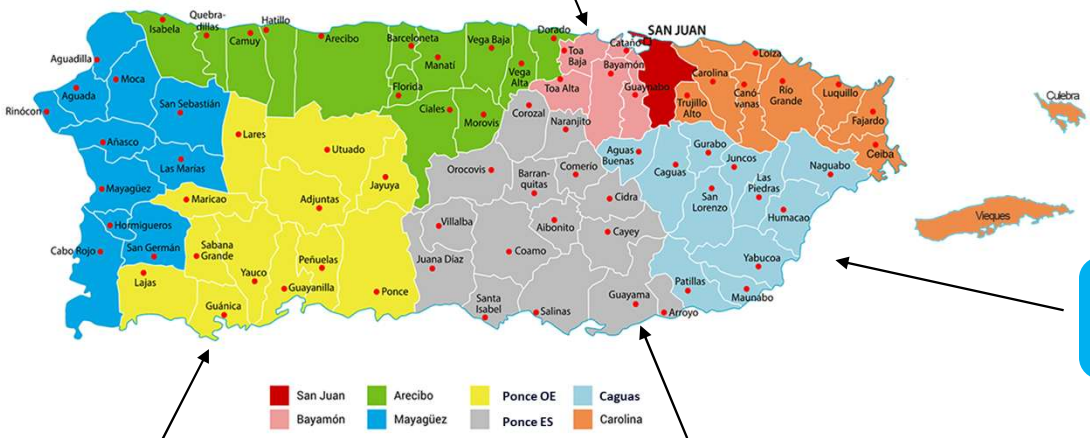
Resource Locations for Fixed Decisions (Retirements)

Bayamon
Genera GT: 42 MW



Caguas
Genera GT: 63 MW

Ponce OE
Emergency generator: 400 MW

Ponce ES
AES 1 and 2: 454 MW
Emergency Generator: 400 MW
Genera GT: 42 MW

The presented results are preliminary and subject to change.

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Preferred Resource Plan (PRP)

Resource Plans Metric Results - Scorecard

	Environment	Affordability (Costs)	Compliance	Diversity of Generation					System Reliability and Resiliency		
	Year last heavy fuel unit operates	PVRR for source scenario ($B)	% RPS Achieved in 2044 (67% was Target)	Fossil energy in 2044 (%)	Solar energy in 2044 (including DPV) (%)	Biodiesel energy in 2044 (%)	Wind energy in 2044 (%)	Other generation in 2044 (%)	Year 0.1/year LOLE achieved & sustained	Total LOLP Hours (2025 to 2044)	% Annual Energy from DER (2044)
Preferred Resource Plan	2032	34.355	67%	44%	31%	22%	2%	1%	2032	422	20%
Scenario 1	2032	35.883	67%	43%	32%	22%	2%	1%	2032	398	20%
Scenario 2	2031	38.366	67%	45%	26%	27%	1%	1%	2030	1291	17%
Scenario 3	2032	35.15	67%	45%	31%	21%	2%	1%	2039	404	20%
Scenario 4	2032	35.406	67%	45%	31%	21%	2%	1%	2028	398	20%
Scenario 5	2032	36.103	67%	45%	31%	21%	2%	1%	2034	419	20%
Scenario 6	2032	36.228	67%	45%	31%	21%	2%	1%	2033	407	20%
Scenario 7	2031	35.443	67%	45%	31%	21%	2%	1%	2028	399	20%
Scenario 8	2034	38.089	67%	45%	26%	27%	1%	1%	2030	1292	17%
Scenario 9	2031	30.117	67%	47%	47%	2%	3%	1%	2036	130	28%
Scenario 10	2034	37.855	67%	45%	26%	27%	1%	1%	2028	398	20%
Scenario 11	2031	38.552	67%	45%	26%	27%	1%	1%	2030	1292	17%
Scenario 12	2034	35.028	71%	43%	36%	0%	20%	1%	2034	398	17%

	Low		High		Low	High
	Medium		Medium		Medium	Medium
	High		Low		High	Low

LOLP - Loss of Load Probability
LOLE – Loss of Load Expectation

The presented results are preliminary and subject to change.

Resource Plans Metric Results - Scorecard

	System Reliability and Resiliency								DBESS control (%)
	Year 2044 %TPA Peak Load (MW) at system peak hour* that is served by internal MW capacity in TPA (includes utility scale generation, UBESS, DR & CHP)								
	San Juan	Bayamon	Arecibo	Mayaguez	Ponce OE	Ponce ES	Caguas	Carolina	
Preferred Resource Plan	223%	10%	31%	3%	310%	173%	29%	8%	25%
Scenario 1	257%	-2%	97%	4%	241%	103%	26%	10%	25%
Scenario 2	218%	3%	91%	13%	352%	120%	19%	24%	25%
Scenario 3	156%	2%	77%	6%	423%	72%	66%	38%	25%
Scenario 4	222%	-2%	47%	15%	280%	143%	40%	34%	25%
Scenario 5	230%	-2%	42%	6%	314%	133%	39%	18%	25%
Scenario 6	230%	3%	93%	0%	310%	85%	36%	8%	25%
Scenario 7	181%	17%	34%	4%	426%	99%	51%	18%	25%
Scenario 8	195%	19%	19%	1%	475%	130%	26%	89%	25%
Scenario 9	166%	6%	75%	5%	349%	109%	72%	14%	25%
Scenario 10	229%	14%	82%	40%	359%	46%	34%	25%	25%
Scenario 11	242%	19%	46%	16%	348%	113%	25%	18%	25%
Scenario 12	183%	2%	83%	6%	343%	112%	41%	35%	25%

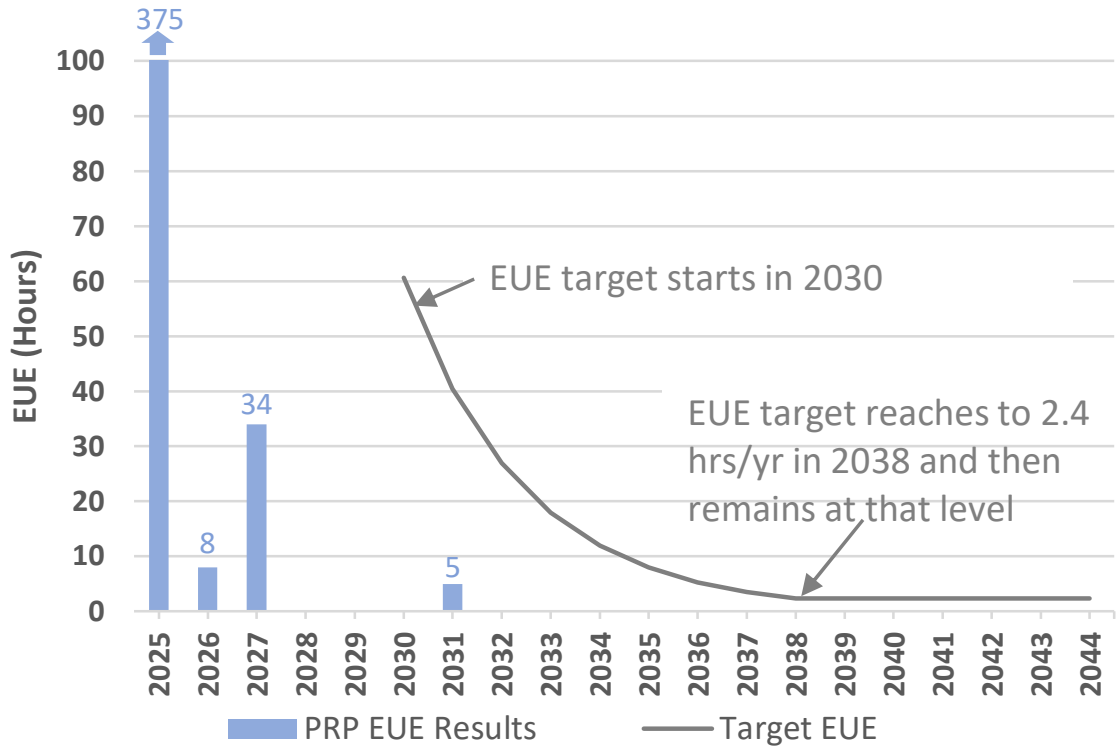
High
Medium
Low

The presented results are preliminary and subject to change.

Preferred Resource Plan (PRP) — Overview

- The 2025 IRP Report was led by a rigorous and comprehensive analysis for the development and ranking of resource plans from the 12 scenarios
- **Resource Plan Hybrid A** was selected as the Preferred Resource Plan (PRP) with the lowest Present Value Revenue Requirement (PVRR) cost alternative across all scenarios: $34.4B spread throughout the next 20 years
- The Present Value Revenue Requirement (PVRR) cost of the PRP is **$34.4B.** (Includes CapEx, maintenance and operation costs, and high-level estimates of T&D system upgrades [to be revised with the November filing])
  - Fixed decisions represent 100% of the total utility-scale resources added in the first five years and 41% of the total PVRR for the first five years ($6.1B PVRR from fixed decisions versus a $14.8B total PVRR in the first five years)

Expected Unserved Energy – Preferred Resource Plan (PRP)



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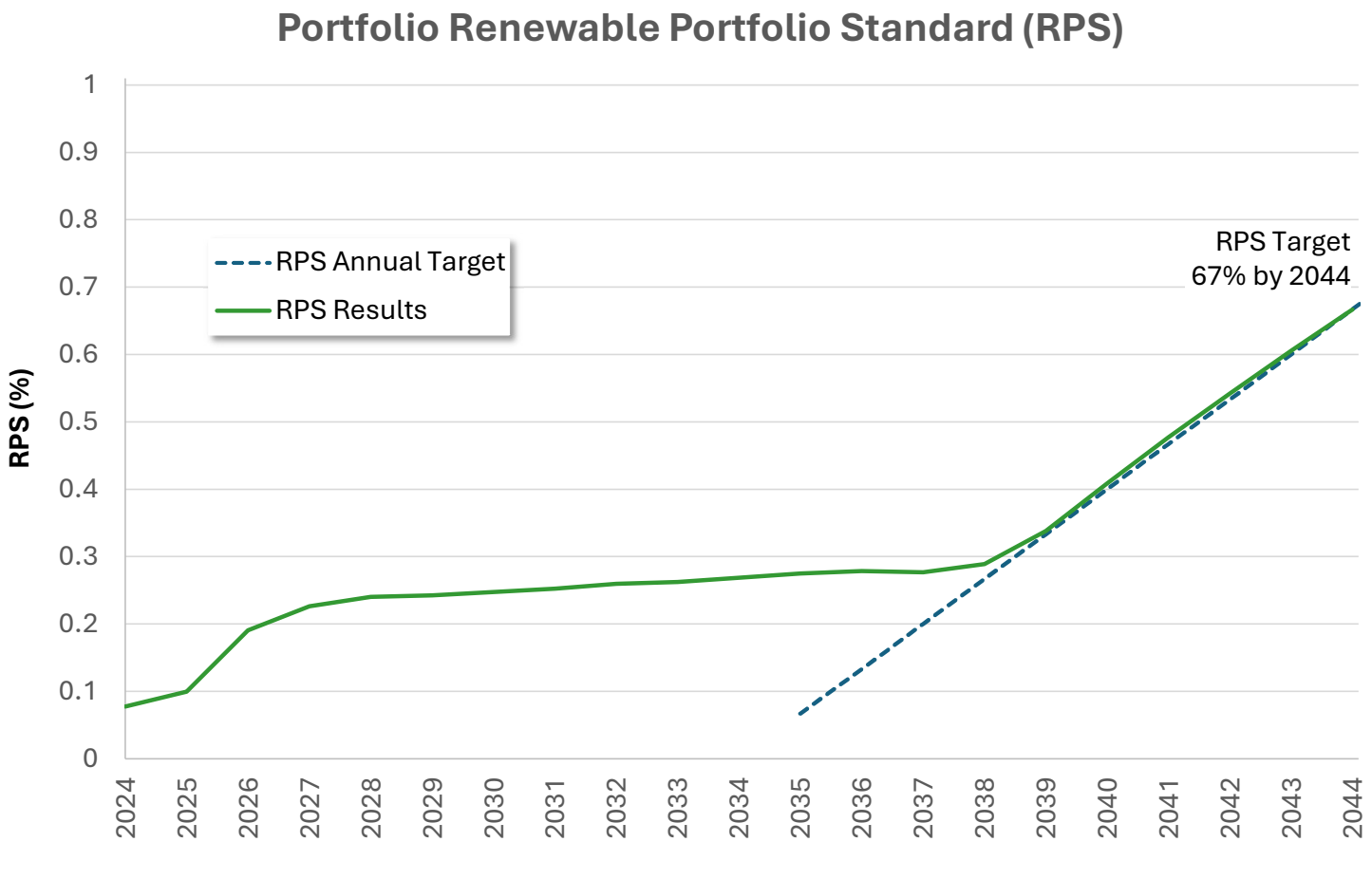
RPS Performance Chart — Preferred Resource Plan (PRP)



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Preferred Resource Plan (PRP) — New Generation Mix

Renewables

- 1,005 MW of utility-scale solar (UPV) added during first 5 years of PRP (through 2030 referred to in report as the 5-Year Action Plan) as a fixed decisions (Tranches 1 & 2 and non-tranche solar projects)
- No new UPV or wind is selected post-Action Plan; however distributed PV (DPV) is expected to expand steadily
  - UPV: 805 MW from Tranches 1 & 2, plus 200 MW from non-tranche projects
  - DPV: Significant annual growth, reaching over 2,222 MW by 2044 contributing to the energy supply

Preferred Resource Plan (PRP) — New Generation Mix

- **Thermal Generation**
  - LNG dominates generation additions in the PRP
  - New thermal units are added, with a strong emphasis on biodiesel compatibility
    - 1,652 MW of new thermal capacity added (not including the 800 MW of temporary emergency generation that is added and then removed by 2029)
    - 65% (1,069 MW) of this new capacity is either converted to biodiesel or begins operation as a biodiesel unit

Preferred Resource Plan (PRP) — New Generation Mix

- **Fuel Transition**
  - Recommends **transitioning from fossil fuels to biodiesel, assuming forecasted capital costs for fuel and generation remain as forecasted**
    - Biodiesel is favored as the lowest cost option to meet renewable requirements
    - PRP includes biodiesel conversion of existing LNG units begin in 2035 to support achieving RPS of 100% renewable energy by 2050
    - Meeting the RPS targets is the primary driver behind the recommendation to use biodiesel
    - Specific timing of biodiesel conversions can be adjusted based on actual conditions

Preferred Resource Plan (PRP) — New Generation Mix

- **Transmission Considerations**
  - New generation is primarily sited near existing infrastructure (e.g., San Juan, Costa Sur), reducing fuel infrastructure and grid upgrade needs
- **Long-Term Planning**
  - PRP can support achieving 100% renewable energy by 2050
  - PRP provides flexibility to adapt to future uncertainties in load, fuel costs, and technology

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The presented results are preliminary and subject to change.

Preferred Resource Plan (PRP) — Economic Additions Summary

Technology	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
New Gas Generation							105		373												**478**
Biodiesel Conversions											111		452		172	373				36	**1,144**
BESS							419						7								**426**
Total							**524**		**373**		**111**		**459**		**172**	**373**				**36**	**2,048**

- Table of economic additions does not include fixed decisions
- 75 MW of biodiesel conversion are existing units
- 373 MW of new gas generation are converted to biodiesel and are doubled counted as both new units and converted units

Preferred Resource Plan (PRP) — Retirement Recommendations

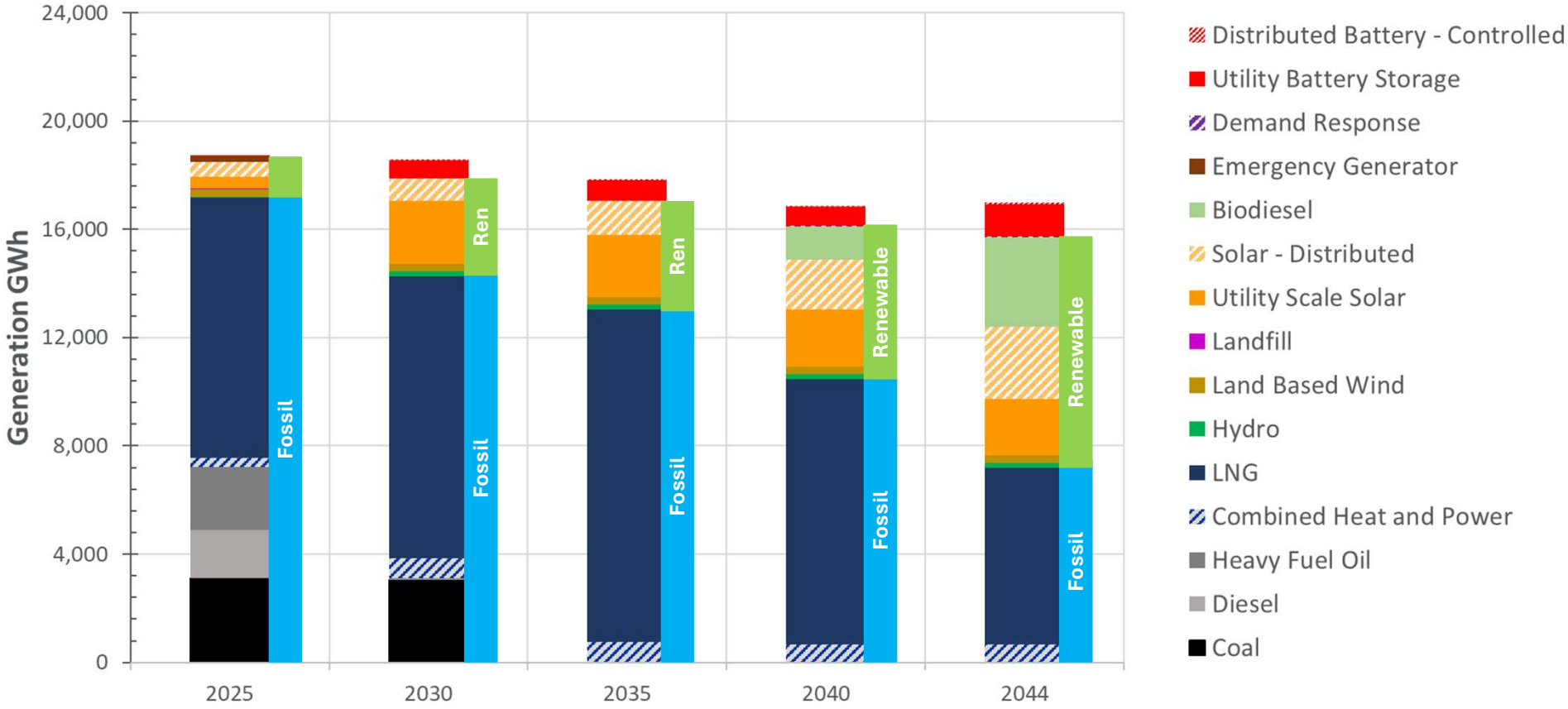
- As part of the transition to a more modern, resilient, and cleaner electric system, the PRP outlines a series of strategic retirements of aging and less efficient generation assets. These retirements are carefully timed and contingent on the successful addition or conversion of new capacity, ensuring that system reliability is not compromised during the transition
- In total, the PRP anticipates the retirement of **1,239 MW** of generation capacity by the end of 2030 including fixed decisions and economically retired units

Preferred Resource Plan (PRP) — Total Retirements Summary

Technology	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
Land Fill Gas Gen																	2	2			**4**
Emergency Generator					800																**800**
Thermal Gen		63	84			300	100	180	454		100	165		360	380						**2,186**
Solar								2	20			30	55								**107**
Total		**63**	**84**		**800**	**300**	**100**	**182**	**474**		**100**	**195**	**55**	**360**	**380**		**2**	**2**			**3,097**

The presented results are preliminary and subject to change.

Preferred Resource Plan (PRP) – Generation (GWh)



The presented results are preliminary and subject to change.

Generation Chart — Preferred Resource Plan (PRP)

Diversity of Generation

Year	Fossil	Solar	Wind	Biodiesel	Other Generation	RPS
2025	90%	8%	2%	0%	0%	10%
2030	74%	22%	2%	0%	1%	25%
2035	75%	22%	2%	0%	1%	27%
2040	64%	26%	2%	8%	1%	41%
2044	44%	32%	2%	22%	1%	67%

- Fossil generation includes coal, diesel, Heavy Fuel Oil and Liquefied Natural Gas
- Solar generation includes distributed solar
- Other generation includes hydro and landfill generation
- BESS is not included in this table as generation since the Energy Bureau has not defined them as generation nor capacity

Present Value of Revenue Requirements (PVRR)

- PVRR is the calculation method used to add all costs over the Study Period (2025-2044) to a single value that accounts for the time value of money

	2025	2026	2027	2028	2029	… 2044
Energy Costs	$	$	$	$	$	$
System fuel Costs	$	$	$	$	$	$
System Variable O&M	$	$	$	$	$	$
Fixed Costs	$	$	$	$	$	$
Fixed O&M	$	$	$	$	$	$
Capital Cost, New Generation	$	$	$	$	$	$
Total Incremental Annual Cost	$	$	$	$	$	$

PVRR $ ←

- PVRR is the primary cost metric for selecting the least cost resource plan, reliability and other objectives

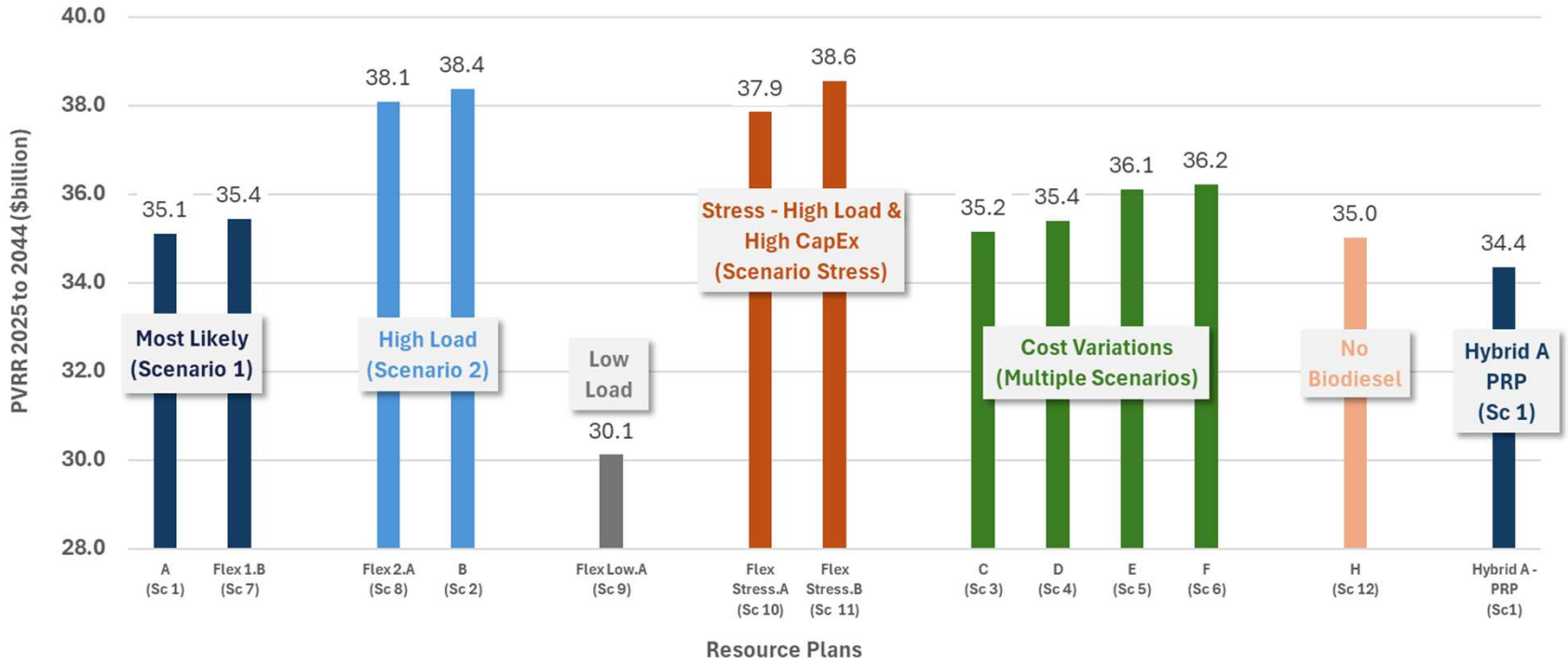
PVRR and Average Annual Cost for Preferred Resource Plan (PRP)

- Present Value Revenue Requirement (PVRR) and Average Annual Costs for PRP from 2025 to 2044

Cost ($M)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Total System Cost ($M)	3,287	3,142	3,422	3,620	3,691	3,704	3,864	3,881	3,862	3,883	3,921	3,870	3,987	4,000	4,122	4,251	4,622	4,522	4,626	4,760
PVRR ($M)	2,818	5,313	7,828	10,292	12,618	14,779	16,867	18,808	20,597	22,262	23,819	25,242	26,600	27,861	29,064	30,213	31,370	32,417	33,410	34,356
Production Cost ($/kWh)	0.166	0.153	0.157	0.160	0.161	0.162	0.170	0.173	0.167	0.171	0.174	0.175	0.176	0.178	0.186	0.194	0.203	0.209	0.216	0.225
System Cost ($/kWh)	0.177	0.173	0.189	0.201	0.206	0.209	0.219	0.223	0.224	0.227	0.232	0.232	0.242	0.246	0.256	0.266	0.290	0.288	0.296	0.307

The presented results are preliminary and subject to change.

PVRR for Primary Scenarios and Preferred Resource Plan (PRP)



- LUMA recommends that all future solicitations for new generation be technology agnostic and include biodiesel, renewable diesel, wind, and solar generation as options with the final selection of the technology based on evaluated costs

The presented results are preliminary and subject to change.

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Questions and Discussion


La gente primero.
La seguridad siempre.
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