Review Proceeding and Prefiling Technical Conference for the 2024 IRP - (Phase 3) NEPR-AP-2023-0004

January 30, 2024

Please Note: All information presented in this third pre-filing IRP technical conference of 01/30/2024 is preliminary and subject to change as the 2024 IRP development and T&D studies and plans continue to progress.

Proposed Agenda

1. Introduction
2. Features of the transmission system
3. Ability of the existing system to interconnect new renewable generation and battery storage projects
4. Description of planned transmission and sub-transmission facilities
5. Ability of the system to "permit power exchange" with newly interconnecting independent power producers
6. Waivers identified thus far by LUMA of Regulation 9021 about existing or planned transmission, and transmission system analysis
7. SETPR Update

1. LUMA Introduction

1. LUMA Introduction

- This presentation is prepared in compliance with the Energy Bureau's Resolution and Order of December 20, 2023 (December 20th R&O) to discuss key elements of Regulation 9021 related to the transmission system and current plans to address Puerto Rico's need to connect new renewable resources and to integrate resources, such as battery energy storage systems. The presentation considers Regulation 9021 requirements and ongoing lessons learned through studies and processes to date –and planned –for interconnection studies for Tranches 1, 2, 3, and later tranches of renewable energy procurement in Case No. NEPR-MI-2020-0012.
- The focus of today's discussion is based on key gaps and challenges, transmission planning, reliability criteria, and industry standards and best practices.

2. Features of the Transmission System

2. Features of the Transmission System

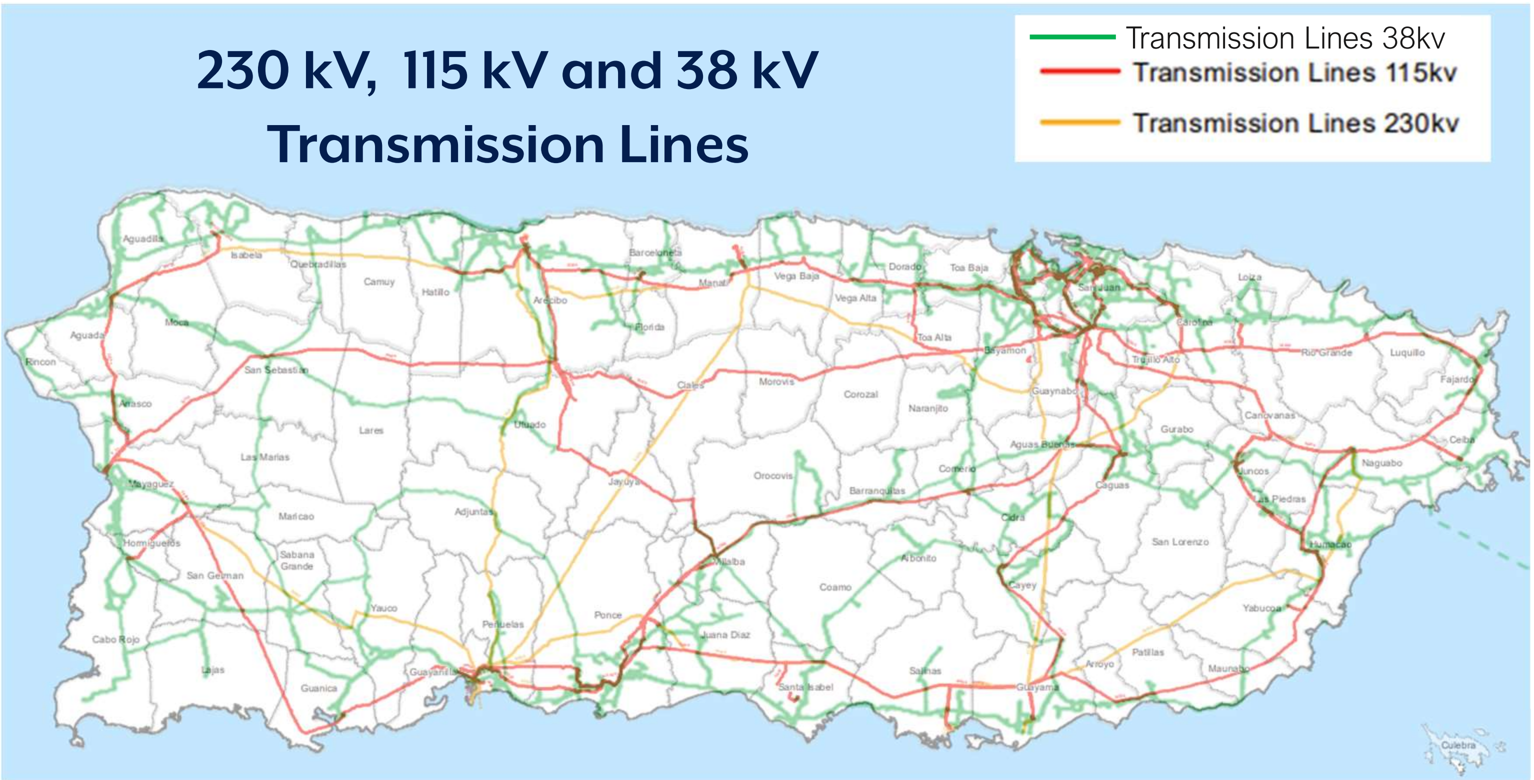
Features of the Transmission System, as described in Section 2.03 (J) (1) (a) (i):

i. A summary of the characteristics of all existing transmission and sub-transmission facilities of thirty-eight kilovolts (38 kV) or higher;

- **LUMA plans and operates a transmission system with the following characteristics:**

Voltage (kV)	Line count	Miles
38	185	1,563
115	46	711
230	12	424
Total	**243**	**2,698**

2. Features of the Transmission System (Cont.)



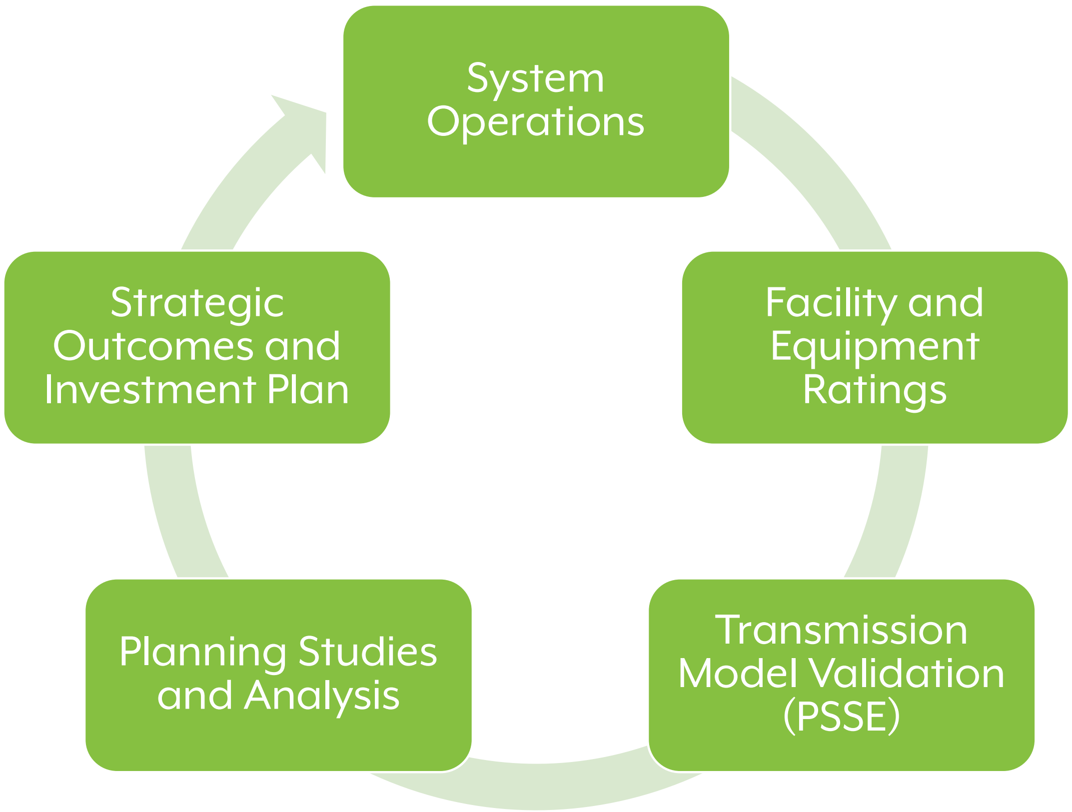
2. Features of the Transmission System (Cont.)

Transmission Planning Process Overview

- An overview of the transmission system
- An overview of the transmission planning process
- NERC and Reliability Standards
- Gaps to Overcome
- How LUMA incorporates NERC Standards into Transmission Planning

2. Features of the Transmission System (Cont.)

Transmission Planning Process Overview



2. Features of the Transmission System (Cont.)

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Facility Ratings (FAC)

↓

Model Validation (MOD)

↓

Transmission Planning (TPL)

↓

Voltage and Reactive (VAR)

NERC's mission

"To assure the effective and efficient reduction of risks to the reliability and security of the grid."

2. Features of the Transmission System (Cont.)
Transmission Planning Process Overview

Topic	Critical Components
System Operations	❑ Reliability operational performance ❑ Asset health and physical condition ❑ Risk and exposure (e.g. hurricane, flood, wildfire) ❑ Resilience needs
Facility and Equipment Ratings	❑ Develop ratings consistent with industry standards and best practices ❑ Routine verification of facility and equipment ratings ❑ Identifying mismatches between asset records, and actual field conditions
Transmission Model Validation (PSSE)	❑ Current-year power flow models reflect actual System Operations ❑ Generation portfolio, expected dispatch, and renewable integration ❑ Future-year power flow models incorporate planned projects
Planning Studies and Analysis	❑ With both current and predictive models, planners assess future scenarios ❑ Plan solutions for manage and maintain reliability for expected system changes ❑ Sensitivity analyses to ensure the system can handle uncertainty
Strategic Outcomes and Investment Plans	❑ Solving for multiple objectives: the future scenarios ❑ IRP guides generation resource mix decisions ❑ Strategic grid focus to improve reliability, increase resilience, modernize T&D infrastructure, integrate clean energy, enable customer choice, reduce risks like wildfire

2. Features of the Transmission System (Cont.)

Gaps to Overcome

- Puerto Rico's transmission grid does not meet industry standards today
  - Evidenced by the history of poor reliability and performance
- Asset Records and Data Are Inaccurate and Inadequate for Planning
  - Adopting Facility Ratings (NERC - FAC) standards will provide LUMA consistent methodology to establish, manage, and maintain accurate data and records
  - Adopting Transmission Models (NERC - MOD) standards will provide LUMA with quality digital power flow models that match the physical grid, and creating confidence in analysis and proposed mitigation solutions
- Existing Grid Conditions
  - Transmission Planning and Reliability Criteria (TPL) standards set clear guidelines for acceptable reliability performance of the Transmission Grid
  - Plans for transmission and substation rebuilds are addressing critical weaknesses that do not meet industry standards today
- We can improve by voluntary adoption of industry standards and best practices
  - NERC and industry standards like it provide a practical roadmap to improve PR's Transmission Grid
  - LUMA is driving towards adherence to industry standards and best practices

3. Ability of the existing system to interconnect new renewable generation and battery storage projects

3. Ability of the existing system to interconnect new renewable generation and battery storage projects

The ability of the existing system to interconnect new renewable generation and battery storage projects, as described in Section 2.03 (J) (1) (a) (ii):

ii. A discussion of whether the transmission system constrains the transfer of electricity from existing projects, potential new projects, or projects under development or consideration, including a description of its ability to interconnect intermittent renewable generation projects and microgrids, as applicable, and with as much specificity as practical

3. Ability of the existing system to interconnect new renewable generation and battery storage projects (Cont.)

ii. A discussion of whether the transmission system constrains the transfer of electricity from existing projects, potential new projects, or projects under development or consideration [...]

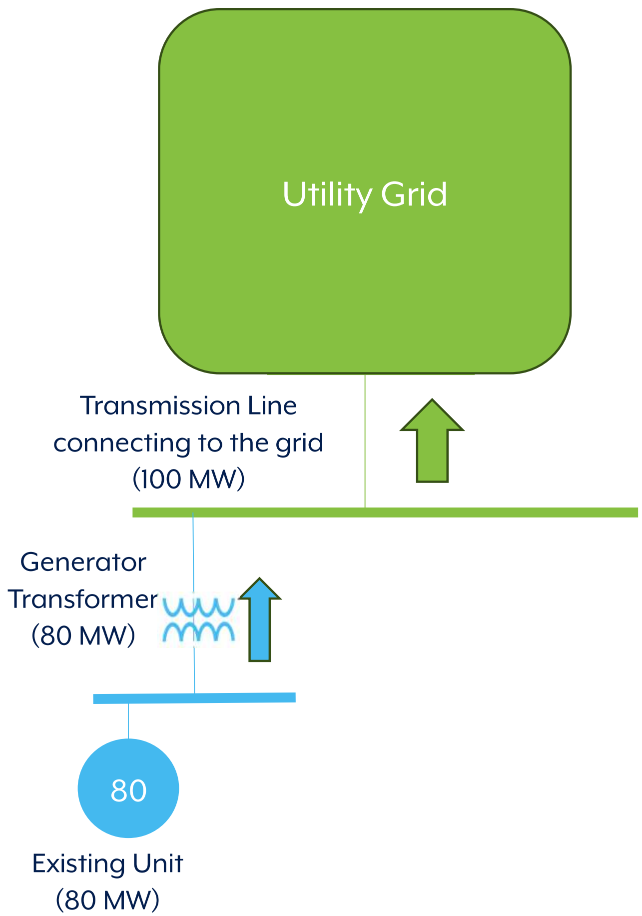
- Generation integration capacity is size and location dependent
  - Each injection point's characteristics must be analyzed individually
  - Grid capacity and constraints change with each successive interconnection
- Multiple variables impact the final recommendation
  - The grid has available capacity – but the grid does not have unlimited available capacity
  - As renewables and other generation interconnect, grid conditions change
  - Each new interconnection affects future available capacity for all others
  - A project's size, physical location and timing of the individual interconnection matters
- LUMA's focus is on safety, reliability, and affordability, also with interconnections
  - Methodologies and adherence to industry standards (facility ratings, models, studies)
  - Ensure that existing projects, potential new projects, or projects under development or consideration can be interconnected safely, at a reasonable cost
  - All while maintaining a reliable, safe, and secure transmission grid

3. Ability of the existing system to interconnect new renewable generation and battery storage projects (Cont.)

Illustrative Example

- The following example will illustrate possible interconnection scenarios :
  - Scenario A: the grid interconnection capacity, base case
  - Scenario B: the grid with available interconnection capacity, possible constraints
  - Scenario C: the grid with available interconnection capacity, no constraints
  - Scenario D: the grid constrains interconnection capacity, and possible solutions

3. Ability of the existing system to interconnect new renewable generation and battery storage projects (Cont.)

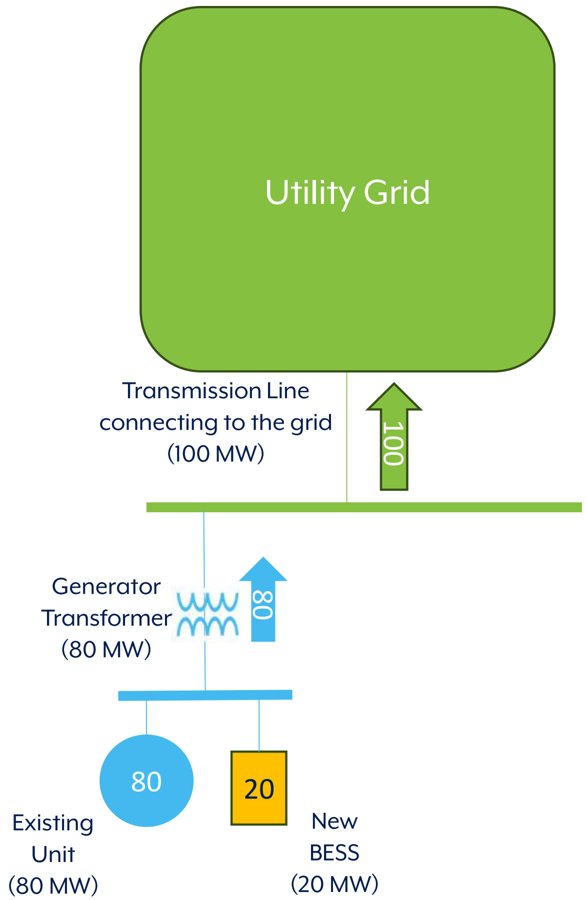


Illustrative Example

Scenario A Description

1. An existing generator (80 MW) connected through a generator step-up transformer (80 MW), connected to the utility grid via a transmission line (100 MW).
2. There are no transmission constraints to this system.

3. Ability of the existing system to interconnect new renewable generation and battery storage projects (Cont.)



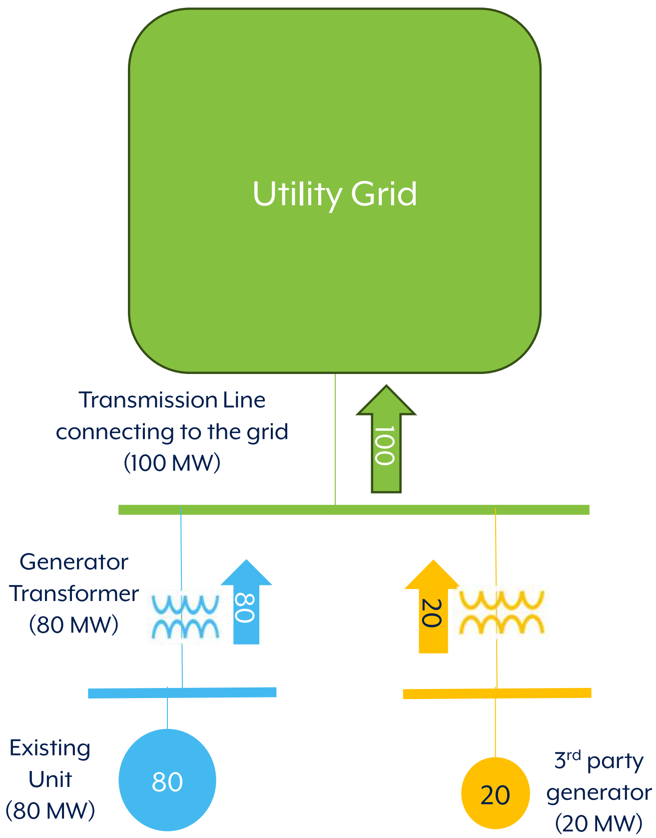
Illustrative Example

Scenario B Description

1. An existing generator (80 MW) connected through a generator step-up transformer (80 MW), connected to the utility grid via a transmission line (100 MW).
2. The generator applies to connect a 20 MW battery.
3. The generator step-up transformer is a constraint limiting total injection to 80 MW. The battery can still interconnect, but combined output is limited to 80 MW.
4. The generator step-up transformer can be upgraded to 100 MW, to eliminate any constraints on injection capacity.
5. The utility transmission line rated at 100 MW does not constrain generator or battery injection.

3. Ability of the existing system to interconnect new renewable generation and battery storage projects (Cont.)

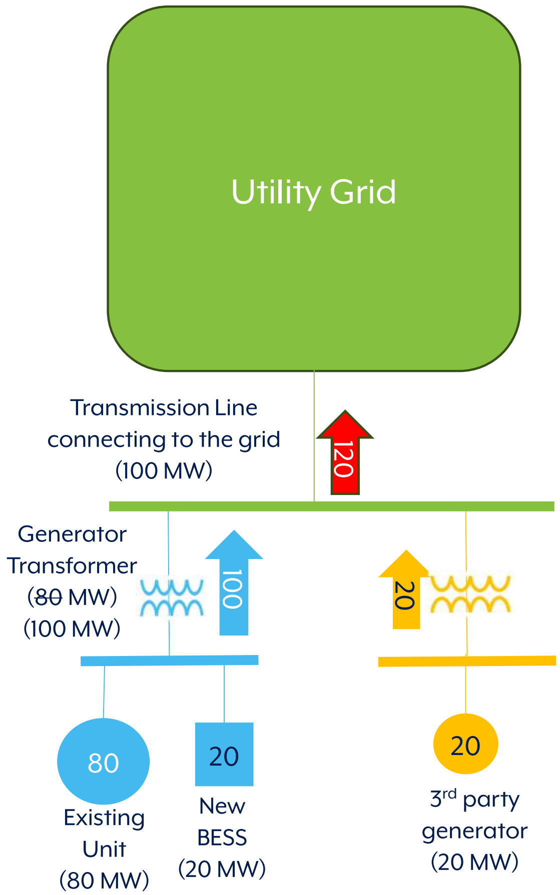
Illustrative Example



Scenario C Description

1. An existing generator (80 MW) connected through a generator step-up transformer (80 MW), connected to the utility grid via a transmission line (100 MW).
2. A new 3rd party developer applies to connect a 20 MW PV or battery close to the existing plant.
3. There are no utility transmission constraints to this system. Both existing unit (80 MW) and 3rd party generator (20 MW) can inject at maximum capacity for total injection of 100 MW.

3. Ability of the existing system to interconnect new renewable generation and battery storage projects (Cont.)



Illustrative Example

Scenario D Description

1. An existing generator (80 MW) connected through a generator step-up transformer (80 MW), connected to the utility grid via a transmission line (100 MW).
2. The existing generator applies to connect a 20 MW battery.
3. A new 3^{rd} party developer applies to connect a 20 MW PV or battery close to the existing plant.
4. The combined maximum output of existing unit (80 MW), generator battery (20 MW) and 3^{rd} party generator (20 MW) exceeds the rating of the utility transmission line (100 MW).
   a) Note: until the generator transformer is upgraded, the transmission does not constrain the output of the plant. If the generator transformer is upgraded, then the utility transmission line may constrain output.
   b) Option 1: operating agreements to limit total injection to 100 MW.
   c) Option 2: upgrade the line to increase capacity to at least 120 MW.

3. Ability of the existing system to interconnect new renewable generation and battery storage projects (Cont.)

- Accurate asset data and models are required
  - The system is dynamic and constantly changing
    - Daily and weekly load and generation variations are managed by Grid Operators
    - Seasonal and long-term load and generation variations are evaluated in Transmission Planning
  - When one aspect of the system changes (e.g. a new generator interconnects), all others change
  - Accurate asset data and quality transmission models are needed
    - Both operating time-scales, and planning time scales, require accurate data and model
    - No two operating points are ever the same
- Transmission models must be improved
  - The ideal transmission digital model matches the physical grid
    - LUMA's operating experience shows that asset data and records still have gaps, and are being improved
  - Accurate models, and clean data are essential
    - Line, transformer, and equipment ratings, along with electrical parameters must be modeled accurately
    - Simulations identify constraints in the model, and then these must be manually verified, then are mitigated
    - Upgrade decisions are made based on simulation results only after field verification of constraints occurs
  - Models are updated to include expected future planned projects (future state)
    - Planned projects, load forecasts, and renewables integration (all are IRP inputs)

3. Ability of the existing system to interconnect new renewable generation and battery storage projects (Cont.)

- Characteristics of a well-planned system
  - A reliable design, fault-tolerant, and flexible to accommodate both generation and load
    - Load and generation can have both temporal and spatial variability
    - The experiences of real-time grid operations are factored into modeling and planning scenarios
  - Operators require constant situational awareness
    - Tools like power flow studies, EMS, SCADA RTUs, line sensors
    - Response to events and disturbances require quick action, operational adjustments are available
- Available capacity today changes as developers confirm project status
  - There is capacity on LUMA's grid to integrate renewables
    - Tranche 1 and 2 studies completed, Genera BESS interconnection plans, other interconnection requests
    - Constraints will exist, but mitigation solutions are developed to enable interconnections to proceed
  - Available capacity for load and generation evolves as the grid is rebuilt
- Fault-tolerant

3. Ability of the existing system to interconnect new renewable generation and battery storage projects (Cont.)

- Proactive Transmission Planning Activities
  - FEMA Funded Transmission Line Rebuild Projects
    - Will provide resilient, hurricane-resistant infrastructure designed to handle 160+ mph winds
    - Will upgrade and standardize conductor sizes for improved grid performance
  - FEMA Funded Substation Rebuild Projects
    - Will provide resilient, high-reliability designs at critical substations
    - Will provide for easily expandable configurations to support renewable integration
  - Renewable Interconnections
    - Rigorous process to study and evaluate all proposed interconnectors
    - Network upgrades are proposed, after verifying field conditions and equipment data, to ensure reliable grid operations
  - Standardization
    - Will provide known and confirmed capacity across the system

4. Description of planned transmission and sub-transmission facilities

4. Description of planned transmission and sub-transmission facilities

For potential planned transmission facilities, a detailed narrative description of planned transmission and sub-transmission facilities, over the next ten years as described in Section 2.03 (J) (1) (d), including i. through iv.:

i. New lines, including any requirements of new rights-of way;

ii. Lines in which changes in capacity, either in terms of current, voltage or both, are scheduled to take place; and

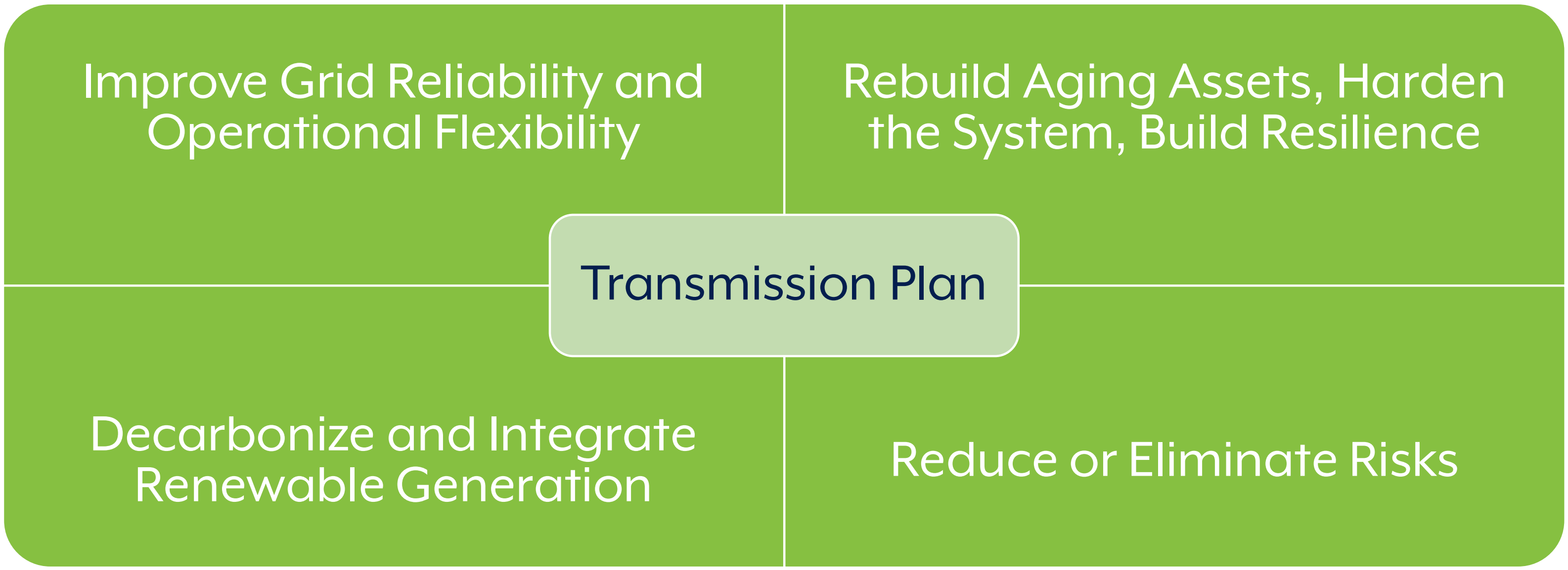
iii. Other changes in transmission lines or rights-of-way, which would be considered as substantial additions.

iv. A listing of all proposed substations including size and location

4. Description of planned transmission and sub-transmission facilities

- LUMA Transmission Planning has undertaken various improvement initiatives
  - Consistent with NERC FAC criteria, improved field validation of facility ratings including conductor types and sizes and substation transformer nameplate information
  - Consistent with NERC MOD criteria, corrections and improvements to the transmission models are occurring consistently, as asset data is evaluated and validated, models are created and updated
  - Examples include validating and adding much of the 38kV network to transmission models
- LUMA Transmission Planning models form the basis for analysis
  - With improved transmission models (constantly being refined) additional gaps and risks are identified
  - Consistent with NERC Transmission Planning Criteria (TPL) and CIP standards LUMA continues to evaluate the T&D infrastructure using standards and industry best practices

4. Description of planned transmission and sub-transmission facilities (Cont.)



- Transmission Planning projects are proposed to solve multiple objectives
- Investments support these strategic goals to support all customers and stakeholders
- These plans are in development as the various IRP assumptions are refined, and improvements to asset data quality and simulation models support our transmission plan development
- LUMA expects projects to be proposed reported in the IRP

4. Description of planned transmission and sub-transmission facilities (Cont.)

A listing of all proposed substations including size and location are included in December 2023, FEMA 90-Day Plan (see December 14, 2023, filing in Case No. NEPR-MI-2021-0002)

- LUMA's T&D Planning and Engineering approach to substation investments
  - Replace damaged and out-of-service equipment
    - Examples include recent transformers energized at Conquistador, Sabana Llana, and Venezuela that have already been completed and additional sites that are in progress
  - Relocation or rebuilds of substations in floodways and flood zones
    - FEMA maps
  - Rebuilds to industry standards based on NERC TPL and CIP studies
    - These studies have identified reliability and resilience gaps that lead to the development of improved and modernized substation reliability designs

4. Description of planned transmission and sub-transmission facilities (Cont.)

- See FEMA 90-Day Plan with proposed Substations projects @

https://energia.pr.gov/wp-content/uploads/sites/7/2023/12/20231214-MI20210002-Motion-Submitting-Update-TD.pdf.

Including below substations projects as examples:

FEMA Project #	Project Name	Obligation Status
174422	FAASt- Catano-Rebuilt 1808 (Substation)	$23,255,049
550910	FAASt [Physical Security – Group 1] (Substation)	$6,691,229
668669	Mayaguez TC	Pending Obligation
169266	FAASt Centro Medico 1327/1359 Equipment Repair & Replacement (Substation)	$21,332,361

4. Description of planned transmission and sub-transmission facilities (Cont.)

- See FEMA 90-Day Plan with proposed Transmission projects @

https://energia.pr.gov/wp-content/uploads/sites/7/2023/12/20231214-MI20210002-Motion-Submitting-Update-TD.pdf.

Including below Transmission projects as examples:

FEMA Project #1	Project Name	Obligation Status
166860	37800 – Jobos- Caguas	Pending Obligation
180326	Existing 115 kV – Line 36800 Palmer Fajardo to Sabana Llana	Pending Obligation
180052	Existing 38kV – Line 100, Line 200 Ponce TC to Jobos TC	Pending Obligation

5. Ability of the system to "permit power exchange" with newly interconnecting independent power producers

5. For potential planned transmission facilities, the ability of the system to "permit power exchange" with newly interconnecting independent power producers, especially those contracted or under contract consideration for the tranches of renewable energy and battery storage projects, and as described in Section 2.03 (J) (1) (d) (ix):

ix. A high-level analysis of PREPA's transmission system's ability to permit power interchange with microgrids and other independent power producers. PREPA should provide examples of interconnection studies from recent renewable integration projects.

5. Ability of the system to "permit power exchange" with newly interconnecting independent power producers (Cont.)

Baseline Transmission Transfer Capacity

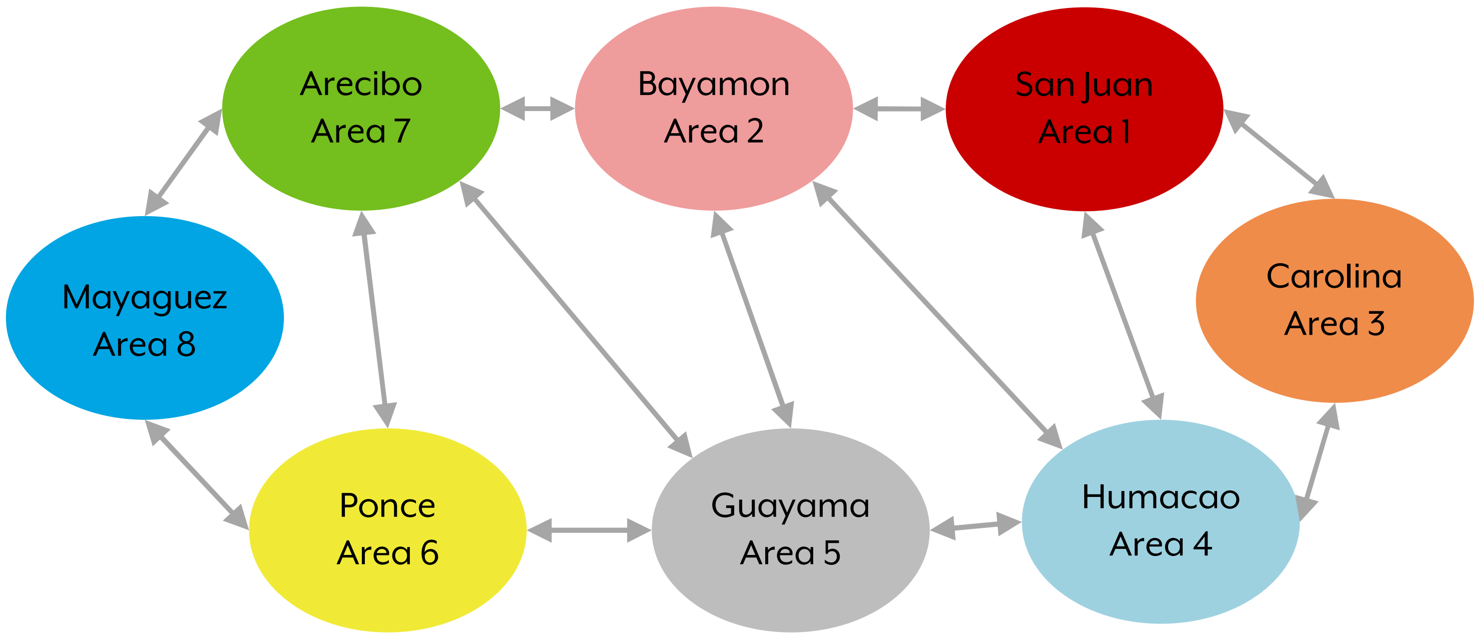
- Define inter-regional, transmission and sub-transmission transfer capability for each inter-regional interface (total of 13 interfaces across 8 regions (districts)

LUMA

5. Ability of the system to "permit power exchange" with newly interconnecting independent power producers (Cont.)

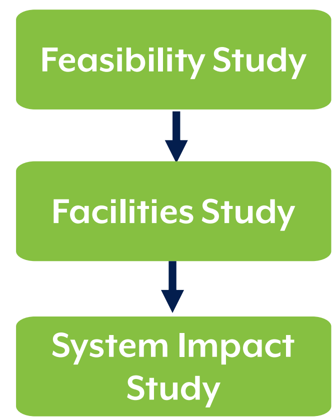
Baseline Transmission Transfer Capacity

- With the 8 Planning Regions identified below, Transmission Planning is supporting the assessment of IRP scenarios with varied load forecasts, generation integration and operational characteristics



5. Ability of the system to "permit power exchange" with newly interconnecting independent power producers (Cont.)

- LUMA's assessment of the potential interconnection of a new generator includes a series of standard industry analyses.
- The primary phases of LUMA's interconnection analyses include:
  - Feasibility Study – a high-level analysis of facility and system level interconnection requirements and costs
  - Facilities Study – an assessment of the requirements for the generator's point of interconnection with the grid
  - System Impact – an assessment of the generator's impact to the remaining power grid
- Each of these phases is further described in the following slides



5. Ability of the system to "permit power exchange" with newly interconnecting independent power producers (Cont.)

Feasibility Study: Scope and Deliverables

Feasibility Study

Purpose
Model and assess integration capacity for proposed projects without causing violations in the grid

Provide preliminary estimates of interconnection facilities
Necessary equipment required to interconnect the project and required network upgrades to the grid

Perform steady-state contingency analysis
LUMA studies the Day peak and Night peak power flow cases using industry standard Transmission Planning software

Identify thermal and voltage violations and required network upgrades
Proposed interconnection projects that cause impact to the grid are required to mitigate the impact

Perform field verification of proposed point of interconnection
Verify the substation and transmission locations proposed for Point of Interconnection (POIs)

Create conceptual single-line diagrams and general arrangement drawings of the POIs
Created specific to each project

Prepare high-level cost estimates (AACE Class 5) and schedule for project completion
Developed for both the POI locations and identified Network Upgrades to resolve violations

5. Ability of the system to "permit power exchange" with newly interconnecting independent power producers (Cont.)

Facilities Study: Scope and Deliverables

Facilities Study

Purpose

Define the required POI upgrades and network upgrades needed for a safe and reliable interconnection.

Identify POI upgrades

Document the physical improvements required to existing stations to connect a proposed project. This includes any and all substation or grid infrastructure.

- **Perform detailed field visit** to each station POI to assess conditions and required upgrades.
- **Create a final POI facilities study report** which includes required scope of work plus preliminary design, materials list, construction cost estimate (AACE level-3 accuracy), and construction schedule.

Identify network upgrades

Identify any and all grid infrastructure improvements (outside the POI) required to allow the proposed interconnection to operate at full-rated output.

- **High Level Assessment (HLAs) field visits** for T-lines and stations identified in need for upgrade is performed.
- **Create a final Network Upgrade study report** which includes scope of work, materials list, documentation and cost estimate (AACE level-5 accuracy), and estimated construction schedule.

5. Ability of the system to "permit power exchange" with newly interconnecting independent power producers (Cont.)

System Impact Study: Scope and Deliverables

System Impact Study

Purpose

Model and analyze the impact of projects to identify network upgrades, any additional new infrastructure needed to alleviate equipment violations, and allocate projects responsibilities.

Define Cost allocation

Cost allocation for identified network upgrades is developed based on System Impact Study result and individual project contribution to the required network upgrade.

This is achieved by performing Day and Night peak conditions analysis of:

- Thermal and voltage analysis: Detailed analysis under normal and contingency scenarios is performed where all new projects connecting are studied together case to evaluate aggregate impacts to the transmission grid.
- Short-circuit analysis and short-circuit ratio analysis: A short-circuit analysis is conducted to evaluate the impact of the proposed projects on the fault current levels on the grid, and to ensure that circuit breakers and protective devices operate as designed to ensure public safety, equipment safety, grid stability, and reliability.
- Dynamic modeling Minimum Technical Requirements compliance: To check if each proposed facility model complies with the Minimum Technical Requirements (MTRs) specified within the Request For Proposal. This analysis includes project compliance on voltage and frequency regulation and ride-thru, reactive power capabilities, and power factor requirements, among others.

6. LUMA waivers for Regulation 9021 about existing or planned transmission facilities, and transmission system analysis

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- Any waivers LUMA may be aware of at this time, to consider particular requirements of Regulation 9021 as they pertain to sections about existing or planned transmission, and transmission system analysis.

- Potential LUMA waivers
  - LUMA may request a partial waiver for sections 2.03 J 1. b) i. B. and 1.e) i.B. which reference voltage variations on distribution circuits that do not comply with the current version of ANSI C 84.1.
    - A partial waiver may be requested because of known data deficiencies from lack of adequate circuit level metering (only one of three phases at the substation) and lack of AMI data to ascertain voltage measurements at customer premise without manual data gathering. Information available will be provided at the time of IRP filing.
  - LUMA may request a partial waiver for section 2.03 J 1.d) which references ten years of transmission planning facilities being developed, and all associated project details and descriptions.
    - While LUMA has project plans and details out to ten years, the focus of LUMAs transmission planning efforts to initiate rebuilds and projects is mainly centered on the 5-year horizon, which involves the asset data cleansing, modeling improvements and other industry-standard best practice implementation as discussed in today's Technical Conference
    - Ten-year project plans that are developed will be provided but additional projects and plans will develop as analyses are completed, and the full project list is subject to change.

6. LUMA waivers for Regulation 9021 about existing or planned transmission facilities, and transmission system analysis

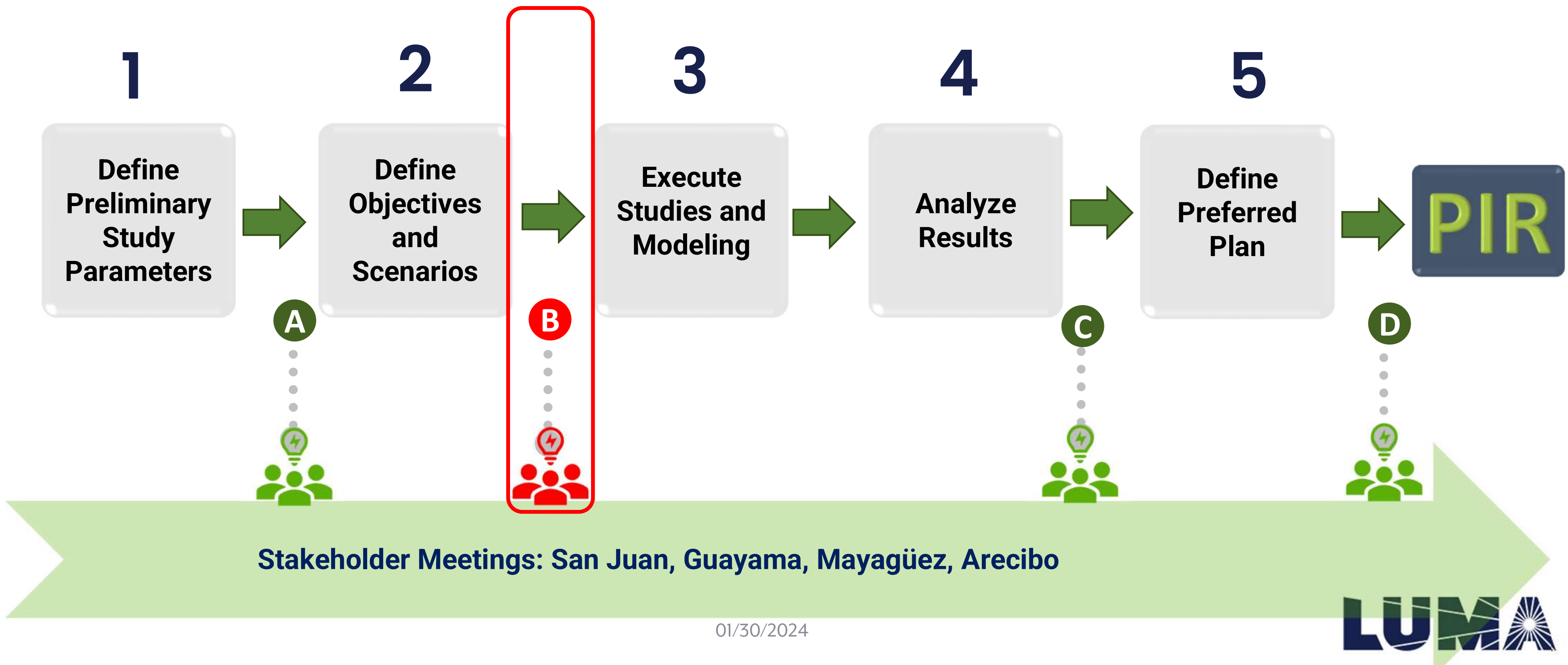
- Similarly applicable to Section 2.03 J. 1. e) – Distribution Upgrade plans for 10 years
  - LUMA's schedule for executing Distribution Area Plans will extend past the IRP filing deadline.
  - Any distribution projects in the 10-year project plan will be provided, but this list will continue to grow as studies are completed, and the full project list is expected to change.

- These are the waivers that LUMA has identified at this stage of the IRP process on requirements of Regulation 9021 on planned transmission projects and analysis of the Transmission system. Other waivers may be identified and requested as they become known throughout the development of the IRP.

7. SETPR Update

7. SETPR Update

Prefiling IRP Process



7. SETPR Update (Cont.)

IRP / SETPR Projected Schedule

Workshops SETPR Meeting | Objectives & Scenarios SETPR Meetings | IRP Filing | Technical Conference

October 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

November 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

December 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

January 2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

February 2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29		

Workshop SETPR Objectives and Scenarios

- 10/10/23 San Juan CAPR (2)
- 10/11/23 San Juan CAPR (1)
- 10/12/23 San Juan CAPR (2)
- 10/18/23 Dorado Iglesia Cristiana Discípulos de Cristo
- 10/19/23 Castañer Esc. Julia Lebrón Soto
- 10/24/23 PRMA- cancelada
- 10/26/23 Humacao CIAPR
- 11/1/23 Guayama CIAPR
- 11/2/23 Ponce CIAPR
- 11/3/23 Arecibo CIAPR
- 11/8/23 San Juan SESAPR
- 11/9/23 Mayagüez CIAPR
- 11/16 y 17 /23 Virtual Workshop

SETPR Meeting Objectives and Scenarios

- 1/15/2024 Arecibo CIAPR
- 1/16/24 Guayama CIAPR
- 1/17/24 San Juan CIAPR
- 1/18/24 Mayagüez CIAPR
- 2/8/24 Virtual Meeting

CIAPR - Colegio de Ingenieros y Agrimensores de Puerto Rico
CAPR - Colegio de Abogados y Abogadas de Puerto Rico

7. SETPR Update (Cont.)

First Round of Meetings / Workshops

140 Participants / 17 Workshops

Private Companies	Government	Social Interest Groups	Commercial and Professional Associations	Individuals	Generators	Students
50	38	22	12	12	3	3

MAYAGUEZ · PONCE · ARECIBO · CASTAÑER · GUAYAMA · DORADO · SAN JUAN · HUMACAO · VIRTUAL

7. SETPR Update (Cont.)

7. SETPR Update (Cont.)

Second Round of Meetings

33 Participants/ 4 Meetings

Private Companies	Government	Social Interest Groups	Commercial/ Professional Associations	Individuals	Generators
14	1	3	6	5	4

MAYAGUEZ ✓
ARECIBO ✓
GUAYAMA ✓
SAN JUAN ✓
VIRTUAL

✓ Complete

February 8, 2024 / 10:00 am

01/30/2024

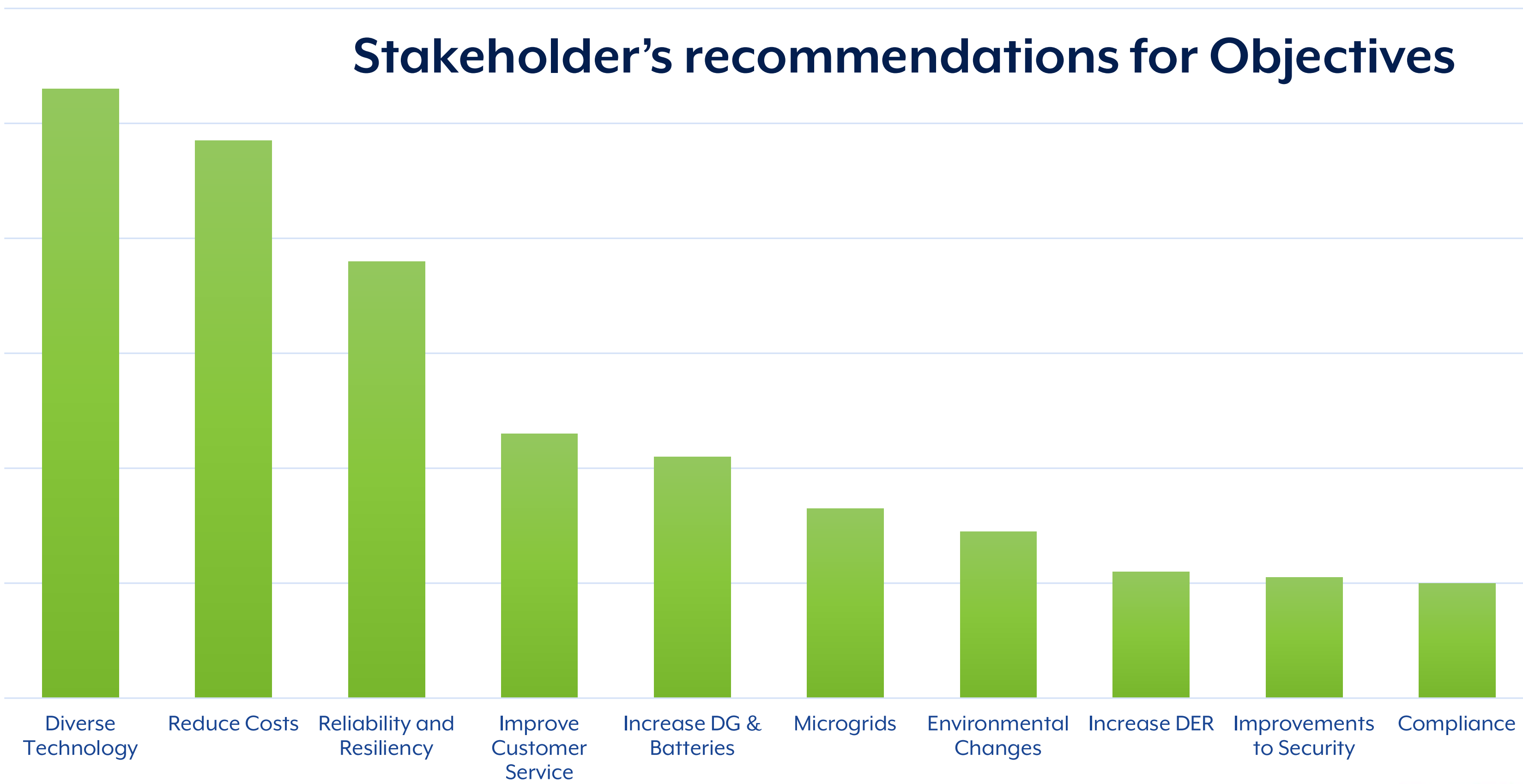
10 Participated on the first round of meeting / workshop

23 First time participating

LUMA

7. SETPR Update (Cont.)

7. SETPR Update (Cont.)



7. SETPR Update (Cont.)

Stakeholder's Objectives Recommendations

Diverse technology

Stakeholders want diverse technologies for the generation of clean and renewable energy, from hydroelectric to nuclear energy – not only solar

Increase DG & Batteries

Increase the amount of DG and batteries in PR to comply with Law 17

Reduce Costs

Cost reduction / Rate stability was the second main objective for stakeholders

Reliability and Resiliency

Improve reliability and resiliency of the system to resolve voltage and frequency issues and reconnect clients after a major event

Improve Customer Service

Improve communication and outreach with clients; Clients are not receiving information about LUMA

7. SETPR Update (Cont.)

Costs

1. Least cost Portfolio
2. Reduce nominal costs of energy supply
3. Reduce and stabilize customer's rate

Environment

1. Reduce emissions
2. Increase renewable energy
3. Improve the capacity of the system to allow greater penetration of renewables
4. Increase EV's and infrastructure

Reliability and Resiliency

1. Maximize transmission of load served by generation
2. Maximize critical load served by generation
3. Necessary restorations to stabilize the system.
4. Develop new projects to provide reliable service to customers during and after emergencies.

Distributed Energy Resources

1. Enable distributed energy resources growth
2. Customers without distributed energy should not be impacted

7. SETPR Update (Cont.)

Selected Objectives

ENVIRONMENT	• Reduce and minimize carbon emission of energy supply and EPA Regulation
COSTS	• Reduce nominal costs of energy supply
COMPLIANCE	• Define least cost, least risk plan to achieve RPS targets required by Act 17 as reasonably possible given current grid conditions
DIVERSITY OF GENERATION	• Define supply-side generation portfolio with adequate diversity to optimize costs and risk for feasible technology solutions
RELIABILITY AND RESILIENCY	• Define plan to enable decentralized generation, adoption of micro-grids, VPPs and residential prosumers • Minimize time to achieve industry standard of 1 day in 10yr Loss Of Load Expectation (LOLE, i.e., Resource Adequacy)

Additional Indicators to be tracked that are not considered objective

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

7. SETPR UPDATE (Cont.)

Scenarios recommended by Stakeholders

BASE
Expected Conditions remain the same

DER Growth
Base and High

Cost of Renewables
Base, Low and High

Cost of Storage
Base, Low and High

Limit Use of Ag Land
Minimal

Fossil Fuel Costs
Base and High

Load Growth
Base, Low and High

Population
Decrease

Economic Conditions
Low

New Gas Units
Base and High

Climate Change
Increase

Increase EV
Base and High

7. SETPR Update (Cont.)

Selected Scenarios and Characteristics

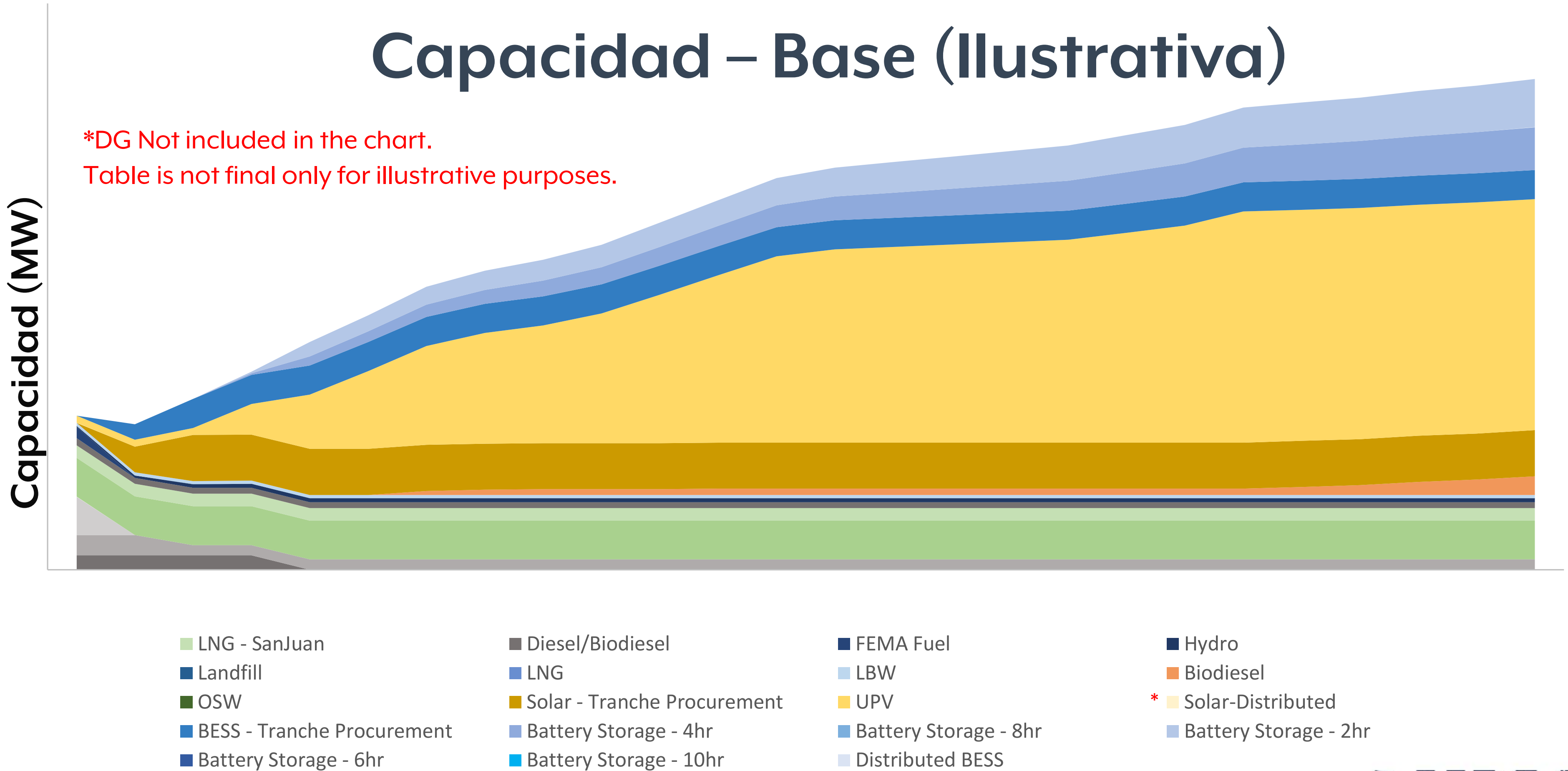
#	Scenario Name	Characteristics										
		Load Growth	PV Cost	DER Growth	% Distributed Storage Control	Storage Cost	New Gas Units Allowed	Fossil Fuel Cost	Biodiesel Fuel Cost	EV Growth	EE Forecast	Land Use
	Base Assumptions	Base	Base	Base	0%	Base	Yes	Base	Base	Adjusted PR100- Base	PR100- Base	PR100- More Land
	Plentiful Biodiesel at Cost of Diesel	Base	Base	Base	0%	Base	Yes	Base	Low	Adjusted PR100- Base	PR100- Base	PR100- More Land
	High Distributed Solar and Storage Growth	Base	Base	High	20%	Low	Yes	Base	Base	Original PR100- High	PR100- Base	PR100- More Land
	Accelerated Load Loss	Low	Base	Base	0%	Base	No	High	Base	Adjusted PR100- Base	PR100- Base	PR100- More Land
	Optimistic load growth and costs	High	Low	High	20%	Low	Yes	Low	Base	Original PR100- High	PR100- Base	PR100- More Land
	Less Ag land use	Base	Base	Base	0%	Base	Yes	Base	Base	Adjusted PR100- Base	PR100- Base	PR100-Less Land
	Act 17 EE	Base	Base	Base	0%	Base	Yes	Base	Base	Adjusted PR100- Base	PR100 Act 17	PR100- More Land
	Marine Cable	Base	Base	Base	0%	Base	Yes	Base	Base	Adjusted PR100- Base	PR100- Base	PR100- More Land

7. SETPR Update (Cont.)

Sensitivity Runs

#	Category 1	Category 2	Objectives	Sensitivity
1	Environment	Cost	Assess Value of different levels of EE as compared to Scenario 1 results	• PVRR with no EE • PVRR with Act 17 EE
2	Reliability	Cost	Assess projections cost/ benefit of control of distributed Storage	Assess control of 40% and 80% of incremental additions from 2030 and thereafter
3	Environment	Cost	Access cost of portfolios with no RPS	PVRR & LCOE
4	Cost		Assess impact of loss of eligible customers to wheeling	PVRR, and LCOE for loss of 50% and 100% of eligible customers
5	Reliability		Changes to further improve reliability in Vieques, Culebra, and central area of PR Island	Will serve as viable plan to customers in these areas

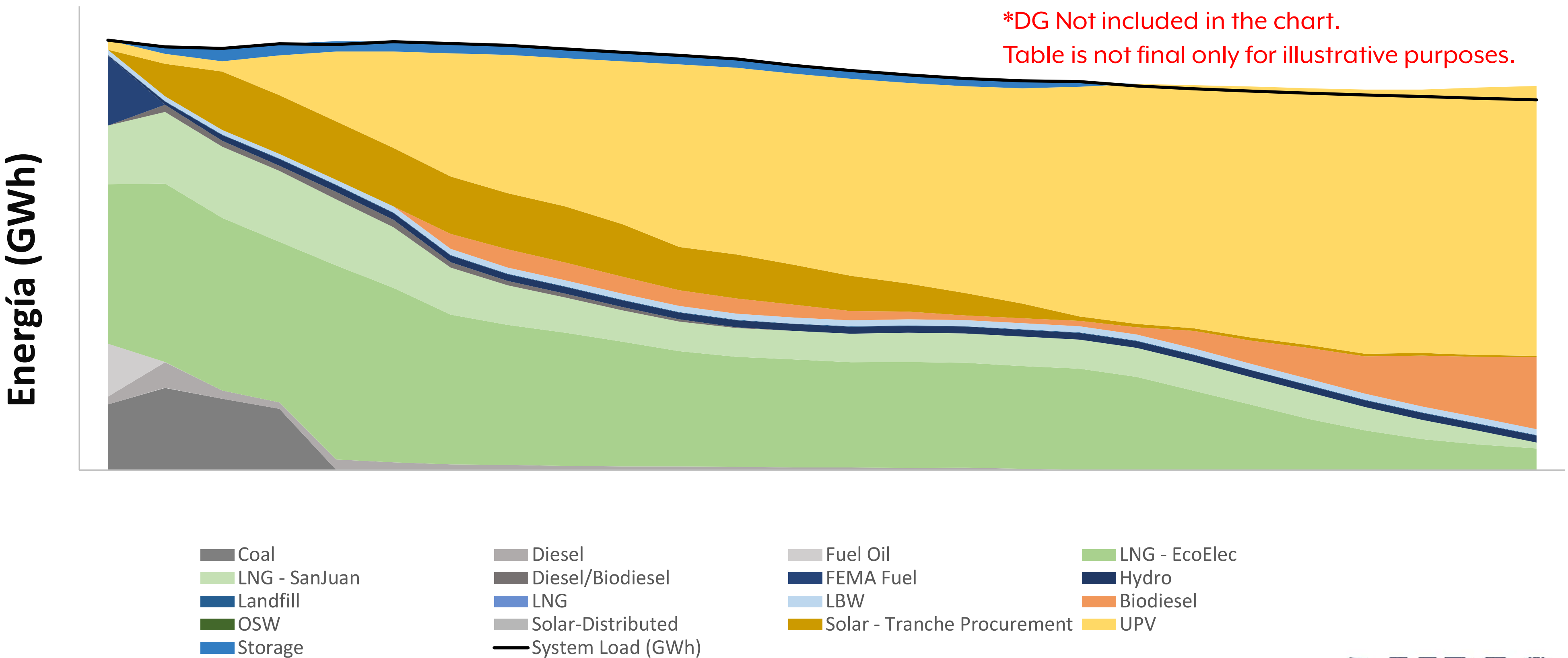
7. SETPR Update (Cont.)



LUMA

7. SETPR Update (Cont.)

Generación – Base (Ilustrativa)



Thank You