

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

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**REVIEW OF THE PUERTO RICO
ELECTRIC POWER AUTHORITY
INTEGRATED RESOURCE PLAN**

CASE NO.: CEPR-AP-2018-0001

SUBJECT:
Final Substantive Legal Brief

**FINAL BRIEF IN SUPPORT OF THE PROPOSED
INTEGRATED RESOURCE PLAN**

TABLE OF CONTENTS

I.	INTRODUCTION	3
I.	PREPA’S INTEGRATED RESOURCE PLAN	5
a.	What is an Integrated Resource Plan?	5
b.	Necessity to Revise the Operative IRP before the Mandatory Review	5
c.	Filing of the Integrated Resource Plan	7
d.	The Proposed IRP for the Consideration of the Energy Bureau	8
II.	MISION AND VISION OF PREPA	9
III.	APPLICABLE LAWS, RULES AND REGULATIONS	11
IV.	PREPA’S COMPLIANCE WITH APPLICABLE LAWS, RULES AND REGULATIONS	14
a.	PREPA’s Compliance with Regulation 9021	15
i.	Planning Environment	15
ii.	Load Forecast	16
iii.	Existing Resources	17
iv.	Resource Needs Assessment	18
v.	New Resource Options	20
vi.	Assumptions and Forecasts	20
viii.	Caveats and Limitations	23
ix.	Transmission and Distribution Planning	24
x.	Action Plan	25
V.	CONCLUSION	33

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

The Puerto Rico Electric Power Authority (PREPA), in compliance with the Energy Bureau of the Public Service Regulatory Board (the “Energy Bureau”)’s *Resolution and Order* dated July 3, 2019¹, as amended from time to time, submits this Final Legal Brief in support of the Proposed Integrated Resource Plan.²

I. INTRODUCTION

The Integrated Resource Plan³ presented by PREPA in this proceeding offers a comprehensive and robust analysis of the challenges and opportunities PREPA faces in planning and executing on a fundamental transformation of Puerto Rico’s electric power system. The Preferred Resource Plan which has emerged from this analysis – the Action Plan – is a balanced approach to the near- and long-term reconstruction and renewal of Puerto Rico’s electric grid. The Action Plan will guide Puerto Rico as it moves toward a future of increased reliance on renewable sources of energy and improved energy efficiency in a manner that will allow PREPA, and other electric sector participants, to hedge against multiple uncertainties, including the future trajectory of electric demand, and the pace at which renewables and storage can actually be developed, financed, acquired and integrated. The Action Plan also provides leeway to manage variable future costs of generation and storage resources. If approved and implemented, the Action Plan will enable PREPA to pursue the most rapid uptake of renewable and energy storage systems ever attempted while preserving options that will permit it to procure natural gas-fired generating resources as necessary given the pace of other resource development efforts, so that it is assured

¹ Sec. II (F).

² PREPA adopts by reference the IRP Main Report, working papers, responses to interrogatories, direct and rebuttal testimonies and arguments made during the Technical Hearings held on August 13 and September 4 and 17 of 2019, and the Evidentiary Hearings held on February 3-7, 2020.

³ Capitalized terms not defined in this section shall have the meanings ascribed to them in the subsequent sections.

of its ability to meet electrical demand at all times in an efficient, environmentally responsible way.

The Integrated Resource Plan exhaustively evaluates the current state of PREPA's generation fleet and transmission and distribution systems. It also takes into account PREPA's recent experience with natural disasters and the need to enhance the reliability and resiliency of the electric grid going forward while integrating large amounts of renewable resources. The Integrated Resource Plan identifies and exhaustively assesses alternative strategies that could be pursued to meet the applicable legal requirements and PREPA's goals of reducing costs of supply, enhancing the reliability and resiliency of the system, supporting economic growth and doing all of these things in an environmentally sustainable way. PREPA herein presents an Integrated Resource Plan that complies in all material respects with the applicable requirements of the Energy Bureau's Regulation 9021 and the Act 17-2019, and other applicable laws and regulations. Also, the Integrated Resource Plan provides a sound basis on which PREPA and other energy sector stakeholders can proceed with the critically important task of reshaping Puerto Rico's energy future.

For the reasons summarized below and addressed at length in the Integrated Resource Plan and the supporting testimony of PREPA witnesses, the Energy Bureau should find that the IRP is compliant with its regulations and the applicable laws, and should conclude that the Action Plan, described in the Integrated Resource Plan should be approved as the Preferred Resource Plan.

I. PREPA'S INTEGRATED RESOURCE PLAN

a. What is an Integrated Resource Plan?

Act 83-1941⁴ directs PREPA to adopt an integrated resource plan (IRP). Pursuant to Puerto Rico laws and regulations, an IRP should incorporate a twenty (20)-year Planning Period⁵ that shall be revised every three (3) years to show changes in the energy market conditions, the environmental regulations, fuel prices, capital costs, and other factors; provided, that in the case of a substantial change in the energy demand or group of resources, such review process shall be carried out before the three (3) years provided to respond to and/or mitigate such changes. Any amendment to the integrated resource plan shall be filed for the Energy Bureau's review and approval.⁶ The IRP shall be consistent with all the mandates of Act 83-1941,⁷ Act 82-2010,⁸ Act 57-2014,⁹ Act 120-2018¹⁰ and Act 17-2019,¹¹ among other applicable laws, and shall follow the best practices in electric power industry integrated resource planning.

b. Necessity to Revise the Operative IRP before the Mandatory Review

On September 26, 2016, the Energy Bureau approved PREPA's Operative IRP.¹²

⁴ Puerto Rico Electric Power Authority Act, Act No. 83 of May 12, 1941 ("Act 83-1941").

⁵ Pursuant to *Regulation on Integrated Resource Plan for the Puerto Rico Electric Power Authority*, approved on April 24, 2018 (the "Regulation 9021") § 1.08(29), the Planning Period "shall mean the twenty (20) year period in an integrated resource plan for which resources must be planned to meet customer load requirements."

⁶ *Id.*

⁷ *Id.*

⁸ Act no. 82 of July 19, 2010, as amended, known as the *Puerto Rico Energy Diversification Policy through Sustainable and Alternative Renewable Energy Act* ("Act 82-2010").

⁹ Act no. 57 of May 27, 2014, as amended, known as the *Puerto Rico Energy Transformation and RELIEF Act* ("Act 57-2014").

¹⁰ Act no. 120 of June 21, 2018, as amended, known as the *Puerto Rico Electric Power System Transformation Act* ("Act 120-2018").

¹¹ Act no. 17 of April 11, 2019, as amended, known as the *Puerto Rico Energy Public Policy Act* ("Act 17-2019").

¹² See Final Resolution and Order on The First Integrated Resource Plan of the Puerto Rico Electric Power Authority.

Following the massive destruction resulting from hurricanes Irma and María in 2017, Puerto Rico faced the unprecedented challenge of rebuilding the electric power system.¹³ The hurricanes forced PREPA to rethink how its power supply and delivery infrastructure should be modified to ensure that the utility infrastructure was much better prepared for future weather events.¹⁴ ¹⁵ Experience accumulated in responding to and recovering from these disasters focused PREPA’s need to increase the resiliency and survivability of its systems, with due consideration to system hardening, distributed generation, decreased dependence on fuel oil, and increased reliance on renewable energy resources.¹⁶ Consequently, economics is not the only driver in PREPA’s resource planning program.¹⁷ In addition, PREPA’s current fiscal situation as a debtor under the Title III of the Puerto Rico Oversight, Management, and Economic Stability Act (PROMESA)¹⁸ requires it to identify a roadmap for the electrical system infrastructure that will support its path to comply with sound utility financial practices.¹⁹

As a result of the impact of the hurricanes, on March 15, 2018, the Energy Bureau authorized PREPA to file an updated IRP to reflect the impacts of hurricanes Irma and Maria.²⁰ On May 29, 2018, the Energy Bureau ordered PREPA to file an updated IRP for the Energy Bureau to review no later than October 31, 2018. Following that date, the Energy Bureau ordered PREPA to submit several revisions, attend technical conferences, produce responses to requests for information, complete additional runs of models, and refine the strategies and scenarios selected

¹³ Prop. IRP, Part 1.1.

¹⁴ *Id.*

¹⁵ “In the aftermath of Hurricanes Irma and Maria, PREPA’s situation under PROEMSA Title III proceedings, the announcement by the Governor of the privatization of PREPA’s generation fleet and the concession of the Transmission and Distribution areas, an update of the IRP has become a necessity.” Dir. Test. Ortiz, Ex. 3.02, pag. 2.

¹⁶ *Id.*

¹⁷ *Id.*

¹⁸ [citation PROMESA] 48 USC §§ 2101, *et seq.*

¹⁹ Dir. Test. Ortiz, Ex. 3.02, pag. 2.

²⁰ Pursuant to Regulation 9021 at § 2.05 “[a]t any moment prior to the 3-year requirement for new IRP proposals, PREPA may submit a proposed update, amendment for review to an approved IRP.”

for the evaluation in the IRP. During the process, the Energy Bureau emphasized that it was seeking to ensure “a more robust assessment of the least-cost plan for electrical resource development of Puerto Rico.”²¹ The Energy Bureau also emphasized the need to include renewable energy resources to achieve compliance with the renewable portfolio standard (RPS) mandated included in Act 17-2019^{22, 23}

c. Filing of the Integrated Resource Plan

Finally, after substantial motion practice, discussions with stakeholders, exchanges of information and orders for revision and inclusion of substantive additional information, on February 13, 2019, PREPA filed its initial proposed IRP (the “First Proposed IRP”)²⁴.

The First Proposed IRP consisted of the IRP Main Report and was supported with attachments and appendices, workpapers and direct testimony of PREPA’s witnesses²⁵. PREPA moved the Energy Bureau to accept the First Proposed IRP and approve the Action Plan.

Pursuant to Regulation 9021²⁶, the Energy Bureau is required to review the Proposed IRP within thirty (30) days from the date on which PREPA makes the IRP filing to determine whether it complies in full with the requirements of Regulation 9021.²⁷ After the Energy Bureau reviews the IRP, it may act in different ways, including deciding on the completeness of the IRP filed or finding that the IRP is not in compliance with Regulation 9021.²⁸

²¹ See *Resolution and Order* dated September 5, 2018.

²² Act 17-2019 at § 1.6.

²³ See *Resolution and Order* dated November 9, 2018.

²⁴ The First Proposed IRP was submitted with a motion on February 13, 2019. PREPA subsequently submitted additional documents and testimonies. Both filings together constitute the First Proposed IRP.

²⁵ See *PREPA’s Petition and Informative Motion Regarding its Accompanying [IRP]*, dated February 13, 2019.

²⁶ Regulation 9021, *Regulation on Integrated Resource Plan for the Puerto Rico Electric Power Authority*, approved on April 24, 2018 (the “Regulation 9021”).

²⁷ *Id.* at § 3.02(A).

²⁸ Regulation 9021 at § 3.02(A)(1-2).

On March 14, 2019, the Energy Bureau issued a Resolution and Order (the “March 14 Order”) finding the First Proposed IRP as not [compliant] with [Regulation 9021] and prior Energy Bureau orders.”²⁹ In accordance with the provisions of Regulation 9021, section 3.02(A)(2), the Energy Bureau directed PREPA to correct the series of deficiencies that were listed and detailed in the Resolution and Order and re-file its First Proposed IRP.³⁰

The March 14 Order includes a detailed discussion of: (a) findings of deficiencies, (b) actions that the Energy Bureau ordered PREPA to take in its refiled IRP to address major deficiencies and (c) minors areas of incompleteness in the First Proposed IRP.

d. The Proposed IRP for the Consideration of the Energy Bureau

On June 7, 2019, PREPA filed the current Proposed IRP³¹, which is the second version of the IRP and is presently before the Energy Bureau for its review and approval. Subsequently, on June 14, 2019, PREPA filed the IRP Main Report, workpapers and the direct testimonies of several PREPA officers and advisors^{32, 33}. The Proposed IRP’s Main Report is divided into sections that directly respond to structure and requirements mandated by section 2.02 of Regulation 9021, to wit: Part 1: Introduction and Summary of Conclusions; Part 2: Planning Environment; Part 3: Load Forecast; Part 4: Existing Resources; Part 5: Resource Needs Assessments; Part 6: New Resource

²⁹ March 14 Order at § I, p. 2; *see also* § IV. page 10.

³⁰ *Id.*

³¹ The Proposed IRP’s Main Report was filed with the *PREPA’s Cover Filing for Accompanying Compliance IRP Filing Due June 7, 2019*, dated June 7, 2019 together with *PREPA’s Cover Filing, Updated List of Documents Filed or Submitted, and Motions* dated June 14, 2019, which included workpapers and the direct testimony. These documents together shall be considered the “Proposed IRP”.

³² The Direct Testimony of José F. Ortiz Vazquez, Chief Executive Officer; Direct Testimony of Efran Paredes Maisonet, Director, Planning and Environmental Protection Division; Direct Testimony of Todd W. Filsinger, Chief Financial Advisor, Direct Testimony of Matthew Lee, Managing Consultant, Office of the Chief Financial Advisor, Direct Testimony of Nelson Bacalao, Ph. D. Senior Consulting Manager of Siemens Power Technologies International. All the aforementioned testimonies were duly notarized and accompanied by each of the witnesses curriculum vitae or resumes. All testimonies are dated June 14, 2019.

³³ *See PREPA’s Cover Filing, Updated List of Documents Filed or Submitted, and Motions*, dated June 14, 2019.

Options; Part 7: Assumptions and Forecast; Part 8: Resource Development; Part 9: Caveats and Limitations; and, Part 10: Action Plan.³⁴ After the filing, PREPA, the Energy Bureau, intervenors and general public, thoroughly explained and reviewed, respectively, the Proposed IRP. Pursuant to the Energy Bureau's procedural calendar, PREPA has attended technical and evidentiary hearings, responded to interrogatories, request for production of documents, made additional runs and submitted additional scenarios. Throughout this process, PREPA's officers have dedicated their time and expertise to assist the Energy Bureau in understanding and reviewing the Proposed IRP, PREPA's vision, and why the Action Plan should be designated as the Preferred Action Plan and also, the best option for Puerto Rico.

II. MISION AND VISION OF PREPA

The energy public policy in Puerto Rico is that “the electric power system should be reliable and accessible, promote industrial, commercial, and community development, improve the quality of life at just and reasonable cost, and promote the economic development of the Island.”³⁵ PREPA's mission and vision, as described below, is in complete alignment with this policy.

In compliance with the Statement of Motives of Act 17-2019, the Proposed IRP is not a classical IRP designed to identify the least cost approach to address the expected gap between future load growth and resources while maintaining a desired Planning Reserve Margin.³⁶ Rather, it is essential for PREPA that the Proposed IRP satisfies the five pillars adopted by the PREPA

³⁴ See generally Prop. IRP.

³⁵ Act 17-2019 at *Statement of Motives*.

³⁶ Dir. Test. Bacalao, 7:145-147.

Governing Board in its Vision for the Future of Power in Puerto Rico, as stated below, for a system with declining load.

The load currently served by the PREPA is projected to decline significantly over the course of the Proposed IRP's planning horizon due to a combination of expected base load reduction (driven by negative population and economic forecasts), large energy efficiency gains, and the deployment of demand side resources. Instead of focusing on the new resources required to meet load growth, the Proposed IRP is designed to address the following needs:

- a) Address the impacts of an aging generation fleet that burns costly liquid fuels (mostly heavy fuel oil), that does not meet environmental regulations (*e.g.* Mercury and Air Toxics Standards "MATS"), has poor reliability, and is inflexible, which limits the incorporation of renewable resources.
- b) Achieve a reduction of cost of supply by incorporating renewable resources which will provide a permanent reduction in expensive and volatile fuel costs, trading this off by effective capital investments.
- c) Achieve compliance with the Renewable Portfolio Standard (RPS)³⁷ mandate and exceed the mandate because the renewable cost benefits alone justify greater levels of penetration.
- d) Shift from centralized generation located in the south of the island to more decentralized generation resources distributed across the island.³⁸

The Proposed IRP recommendations are fully aligned with the five key pillars adopted by the PREPA Governing Board in its Vision for the Future of Power in Puerto Rico:

1. Customer-centric. The [Proposed] IRP includes customer participation via energy efficiency, customer side energy resources and demand response with a predominant role in the supply and consumption matrix of Puerto Rico, and empowering customers to participate and take ownership on their energy security and affordability.

³⁷ See Act 17-2019.

³⁸ Prop. IRP Part 1.1.

2. Financial Viability: Within the requirements of resiliency and reliability, the plan minimizes the cost of supply and drastically reduces the dependence on imported fuels and the associated volatility; thus, supporting affordable rates that promote financial viability at both sides of the meter.

3. Reliable and Resilient: The [Proposed] IRP is centered on the concept of MiniGrids, defined as zones of resiliency into which the system can be segregated during and after a major weather event ensuring that the load can be served using local resources. In addition, MiniGrids must support effectively preparing, managing and timely recovery from such event.

4. Model of Sustainability: The [Proposed] IRP's implementation will transition the Puerto Rico electric system from one centered on fossil fuels to one in which renewable resources play a central, if not, the predominant role. The [Proposed] IRP's implementation will drastically reduce emissions, increase the penetration of renewable generation, achieve compliance with all current regulations, and position Puerto Rico for future regulations.

5. Economic Growth Engine: The distributed nature of the new generation resources that will have to be developed, the high levels of customer participation on the energy production and the overall reduction in the system cost are expected to result in employment opportunities and economic growth for Puerto Rico. The [Proposed] IRP will support a reliable and economic system that will attract economic development in Puerto Rico.³⁹

III. APPLICABLE LAWS, RULES AND REGULATIONS

“The electric power system should be reliable and accessible[.]⁴⁰” As discussed in section II of this brief, Act 83-1941 directs PREPA to adopt an integrated resource plan (IRP).⁴¹ The IRP consist of a twenty (20)-year planning period that shall be revised every three (3) years to show changes in the energy market conditions, the environmental regulations, fuel prices, capital costs, and other factors; provided, that in the case of a substantial change in the energy demand or group

³⁹ See Prop. IRP Part 1; *see also* Prop. IRP Ex. 2.2.

⁴⁰ Act 17-2019 at *Statement of Motives*.

⁴¹ See Prop. IRP Part 1.1.

of resources, such review process shall be carried out before the three (3) years provided herein to respond to and/or mitigate such changes.⁴² Any amendment to the integrated resource plan shall also be filed for the Energy Bureau's review and approval.⁴³ The integrated resource plan shall be consistent with all the mandates of Act 83-1941 and shall follow the best practices in electric power industry integrated resource planning.⁴⁴

Long-term Electrical System planning is critical for implementing the Energy Public Policy set forth in this Act and furthering the sustainable development of the people of Puerto Rico through the Electrical System.⁴⁵

An integrated resource plan is

[a] plan that considers all reasonable resources to satisfy the demand for electric power services during a specific period of time, including those related to energy supply, whether existing, traditional, and/or new resources, and those related to energy demand, such as energy conservation and efficiency, demand response, and distributed generation by industrial, commercial, or residential customers. Every integrated resource plan (IRP) shall be subject to the provisions of this Act [17-2019] and the rules established by the [Energy] Bureau which shall approve the same. Every plan shall be devised with broad participation from citizens and all interested groups.⁴⁶

Act 17-2019 establishes several goals of Puerto Rico's energy public policy. Pursuant to said act, in order to advance achieving the energy policy goals, every integrated resource plan shall include, but not be limited to:

(A) A range of future demand forecasts established by using methods that examine the effect of economic factors on electricity consumption as well as the effect of the use of lands under the Land Use Plan for Puerto Rico in

⁴² Act 17-2019 at § 1.9(2).

⁴³ *Id.*

⁴⁴ *Id.*

⁴⁵ Act 17-2019 at § 1.9 (1).

⁴⁶ Act 17-2019 at § 1.2(p).

effect, and the changes in the direction, type, and efficiency of electricity, and its end-use.

(B) An evaluation of the conservation resources available in the market, including the electricity demand management, and an evaluation of the programs in effect and the necessary programs to improve energy conservation.

(C) An evaluation of the range of conventional and non-conventional generation technologies available in the market.

(D) An evaluation of the system's transmission capacity and reliability.

(E) A comparative evaluation of the energy supply resources, including transmission and distribution.

(F) An evaluation of the combination of resources designated to promote diversification of energy sources; stabilize energy costs; and improve the reliability and stability of the electric power grid.

(G) An evaluation of the existing electric power plants or facilities of the Authority and those in private hands or granted through concessions, that takes into account the improvements in the infrastructure and operational efficiency of the power plants, their useful life, and the retirement date and decommissioning costs thereof, if applicable.

(H) PREPA and electric power service companies' environmental impact assessments related to air emissions and water consumption, solid waste, and other factors such as climate change.

(I) An evaluation of the interconnection of distributed generation and renewable energy projects and other independent power producers to the electric power grid, to comply with Act No. 82-2010, as amended.

(J) Projections with regards to the integration of distributed generation into the electric power grid.

(K) Identification of essential service facilities across the Island and the measures to be implemented to render the electric power service delivered to such facilities more resilient, such as the establishment of microgrids, distributed generation, and underground distribution lines.

(L) An evaluation of the necessary actions to achieve the energy storage system goals established at all levels by the Energy Bureau, as provided in Section 2.12 of Act No. 82-2010.

(M) Any other requirement established by the Bureau through regulations or order.⁴⁷

The Proposed IRP must comply with demonstrating how PREPA will meet said objectives.⁴⁸

⁴⁷ Act 17-2019 at § 1.9 (3).

⁴⁸ *Id.* at § 1.6.

Act 17-2019 also establishes a revised RPS in which PREPA is directed to move away from generating power with fossil fuels “by integrating orderly and gradually alternative renewable energy while safeguarding the stability of the [e]lectrical [s]ystem and maximizing renewable energy resources.”⁴⁹ To achieve said objective, the RPS establishes the following metrics to be to achieved as a minimum of renewables: 40% on or before 2025; 60% on or before 2040; and 100% on or before 2050.⁵⁰

Pursuant to section 2.03 of Regulation 9021, the Proposed IRP shall assess and report upon: (B) Planning Environment, (C) Load Forecast, (D) Existing Resources, (E) Resource Needs Assessment, (F) New Resource Options, (G) Assumptions and Forecasts, (H) Resource Plan Development, (I) Caveats and Limitations, (J) Transmission and Distribution Planning and (K) Action Plan.

The main purpose of the Proposed IRP is to identify an Action Plan that is viable. The Action Plan is a “plan that identifies the specific actions that PREPA will perform during the first five (5) years of the Planning Period in order to implement the Preferred Resource Plan.”⁵¹ The Preferred Resource Plan is the “portfolio of resource additions selected by PREPA from amongst those evaluated in the IRP representing the best performing resource mix to be implemented in the Action Plan.”⁵²

IV. PREPA’S COMPLIANCE WITH APPLICABLE LAWS, RULES AND REGULATIONS

The Proposed IRP, as supported by PREPA’s direct and rebuttal written testimony, working papers, responses to requirements for information (in the form of interrogatories, requests

⁴⁹ *Id.* at § 1.6(7).

⁵⁰ *Id.*

⁵¹ Regulation 9021 at § 1.08(B)(1).

⁵² *Id.* at § 1.08(B)(33).

for production of documents and request for production of model runs, among others) and, live testimony during technical and evidentiary hearings, fully compliant with the applicable regulations and directives of the Energy Bureau.

a. PREPA’s Compliance with Regulation 9021

As discussed in section II of this brief, PREPA has complied with the analysis and reporting requirements set forth in section 2.03 of Regulation 9021. PREPA herein discusses in detail how it has complied with each of the applicable requirements.

i. Planning Environment

Regulation 9021 Planning Environment requirement makes PREPA consider a number of questions. These include: How will the governing laws and regulations (*e.g.*, environmental laws and regulations that constrain the operation PREPA’s aging generation fleet and regulations limiting carbon emissions) evolve? How (and when) will PREPA emerge from Title III and the debt restructuring process and regain its credit-worthy counterparty status? How rapidly will renewable generation costs continue to decline? There are many other fundamental questions that bear upon the future of Puerto Rico’s electric power sector. The planning environment in which the Proposed IRP was developed is, accordingly, one of marked uncertainty.

In developing the Proposed IRP and attempting to address the many uncertainties it faces, PREPA reviewed the standards and regulations that would have a significant impact on the Proposed IRP. These standards are summarized in the Proposed IRP.⁵³

⁵³ See *e.g.*, Prop. IRP Part 2.1 of the IRP Main report: Environmental and Energy Standards and Regulations Applicable to PREPA and Section 2.2 laws and regulations changed since last IRP that include Regulation 9021, *Regulation on Microgrid Development*, Regulation 9028 dated May 18, 2018, Act 4-2016, PROMESA, Act 120-2018, and Act 17-2019.

In addition to existing regulations and potential changes in regulations, there are other externalities that have an important impact on the development of a robust IRP and were considered in the definition of the Planning Environment. These externalities include the observed decline in the costs of solar photovoltaic generating facilities and battery energy storage systems,⁵⁴ the impacts of recent hurricanes and other natural disasters, and the resulting need for the RFP to account for resiliency,⁵⁵ the provisions of PROMESA, including Title III and the expedited permitting of projects under Title V,⁵⁶ the requirement for approved Fiscal Plans that identify planned investments,⁵⁷ PREPA's Governing Board vision⁵⁸ and the planned outsourcing of transmission and distribution operation and maintenance activities as well as the mandate that PREPA not own any new generation assets but rather contract for generation resources that would be developed by third parties.

The Proposed IRP and its recommendation of an Action Plan that preserves options to deal with uncertainty is a reflection of the Planning Environment in which it was conceptualized.

ii. Load Forecast

The size, shape and rate of change of the loads PREPA must be prepared to serve presents one of the major uncertainties under which the Proposed IRP was developed.

The Proposed IRP describes the methodology and the fundamental drivers for the gross demand forecast.⁵⁹ Part 3 of the Proposed IRP details the rationale for developing the high and low load scenarios used in the sensitivities, and Appendix 4 covers the assumptions for Demand Side

⁵⁴ Prop. IRP Part 2.3.

⁵⁵ *Id.* at 2.4.

⁵⁶ *Id.* at 3.5.

⁵⁷ *Id.* at 2.6.

⁵⁸ *Id.* at 2.7.

⁵⁹ *Id.* at 3.

Resources. The Proposed IRP base load forecast assumes over 30% cumulative Energy Efficiency savings by 2038, which would result in load reductions of about 2% per year. Additional sensitivities around the Energy Efficiency assumptions were addressed under the Energy Bureau's Requests for Information No. 9 and No. 10. Two sensitivities were evaluated for all scenarios, one with a third of the Energy Efficiency savings of the base case (the Low EE Case), another with no Energy Efficiency savings through the study period, only naturally recurring Energy Efficiency savings (the No EE Case).

The various levels of growth in electricity demand levels analyzed had a significant impact on the quantities of renewable capacity additions, the selection of new gas additions and location and the timing for retirements shown in the various IRP model runs. Assumptions regarding electric demand growth (or the lack thereof) have a significant impact on system costs. The ESM case, for example, shows lower costs under higher load levels, compared to Scenario 4, confirming PREPA's recommendation to the Energy Bureau that the Action Plan be the Preferred Resource Plan because it maintains flexibility to adapt to the possible higher load scenarios.⁶⁰

iii. Existing Resources

The Proposed IRP discusses Existing Supply Resources.⁶¹ This discussion provides a detailed account of existing resources in PREPA's system, including owned generation and resources under long term contracts. The discussion also provides detail regarding the historical

⁶⁰ Other requirements were met as follows: Regulation 9021, sec. 2.03, C(1)(a) and (b) are addressed in the Prop. IRP Part 3.1.5, 3.1.6, 3.1.7 and 3.1.8; Regulation 9021, sec. 2.03 C(1)(c) is addressed in the Prop. IRP Part 3.1.1; Regulation 9021, sec. 2.03 C(1)(d) is addressed in Prop. IRP Part 3.1.2 and 3.1.3; Regulation 9021, sec. 2.03 (C)(2)(a) is addressed in section 3.1.9 Stochastic Distribution, and 3.1.12 Base Case Load Forecast Selection; Regulation 9021, sec. 2.03 C(2)(b) and (c) are addressed in the Prop. IRP Part 3.1.3 and 3.1.4; Regulation 9021, sec. 2.03 C(2)(d)-C(2)(g) are addressed in Prop. IRP Appx. 4 and Prop. IRP Part 3.1.6, 10.3.5 and 10.3.6; Regulation 9021, sec. 2.03 C(2)(h)-C(2)(i) Numeral 2h) and 2i) are addressed in Prop. IRP Part 3.1.5.

⁶¹ Prop. IRP Part 4.

performance of these assets, capital expenditures, and planned retirements. It also describes the approach taken to the modeling of existing resources.

PREPA has an aging and inefficient generation fleet mostly comprised of thermal units burning heavy fuel oil (most of which are not MATS compliant), diesel and natural gas. These units are expected to retire during the early stages of the Proposed IRP planning horizon under all scenarios as new, more efficient fossil generation and renewable generation resources are added to the system.⁶²

iv. Resource Needs Assessment

The Proposed IRP analyses agree that most of PREPA's existing owned generation should be retired in the near to medium term. This is not true for the current power and purchase operating agreements with AES and EcoEléctrica, nor of the San Juan 5&6 units once they are converted to be fueled primarily by natural gas and for some of the peaking generation. Therefore, in Part 5 of the Proposed IRP Main Report (Resource Needs), the scenarios and strategies to be used in the formulation of the optimal Long-Term Capacity Expansion (LTCE) plans were provided. These are further described in Part 8 together with the results of the assessments of various plans.

In Proposed IRP Part 5, following a brief overview of the needs (Section 5.1), three strategies for formulation of the LTCE were presented (Section 5.2). This is followed by a presentation of the key uncertainties to be considered in the Scenarios (Section 5.4) as well as the sensitivities (Section 5.5). Then, in Part 8, where the resulting LTCE plans are presented, the

⁶² Other requirements were met as follows: Regulation 9021, sec. 2.03D(1)(a) is addressed in IRP Prop. Part 4.1, 4.2 and 4.2.1; Regulation 9021, sec. 2.03D(1)(b) is addressed in IRP Prop. Part 4.1; Regulation 9021, sec. 2.03D(1)(c) is addressed in IRP Prop. Ex. 4.2, Ex. 4.4 and Appx. 5 and IRP2019-Appendix 5 - Additional Existing Supplemental Data.xlsx; Regulation 9021, sec. 2.03D(1)(c)(viii) is addressed in IRP Prop. Part 8.2.9 and 8.3.7; Regulation 9021, sec. 2.03D(2) is addressed in Prop. IRP Appx. 4.

requested information on Load and Resource Balance is provided, along with other relevant metrics as, for example, RPS compliance, cost, emissions, dispatch levels, etc. PREPA assumed for purposes of LTCE plan formulation, a Planning Reserve Margin (PRM) of 30% at a global level; for resiliency, two of the 3 strategies presented in Part 5 also included local reserve margin requirements. The 30% PRM, which represents twice the largest unit in the system, was identified in the First Proposed IRP as adequate and it is consistent with the smaller size of the PREPA system as compared with utility systems found on the mainland.

PREPA's approach in evaluating alternative LTCE plans was to adjust the reserve margin if it was found to be driving the expansion plan, seeking a balance between cost and reliability. However, as is has been observed in other systems, as future supply shifts from thermal to renewable resources (energy constrained), new resource additions are driven by economics and not by a need to maintain 30% PRM. That is, the target PRM of 30% was rarely binding and, in few cases, achieving this target required the addition of generation resources. This was the case in the LTCE plans considered in PREPA's assessment, with only a few exceptions, and these exceptions (*i.e.*, periods in which the 30% PRM would be a binding constraint) are limited to couple of years in a few cases. To confirm that the 30% PRM was adequate, the Proposed IRP Main Report, in subsection 8.7.3, includes a sensitivity analysis to the PRM. That analysis shows that the PRM of 30% does not impose a binding constraint in most years in almost all cases, and that a PRM reduced to levels lower than 30%, *e.g.*, 20%, would not significantly affect planned generating resource additions.

v. New Resource Options

The Proposed IRP discusses the new resource options provided for the LTCE expansion simulations based on resource availability, costs and projected performance.⁶³ New resources evaluated covered solar PV, battery storage, onshore wind and gas-fired combined cycle and simple cycle technologies and reciprocating internal combustion engines (RICE), among others. Within these general selections of technologies, a more detailed range of options were evaluated for each technology, including different types of combined cycles turbines and simple cycle (peaker) plants, as well as some RICE units. Other technologies were also evaluated, including offshore wind and small hydroelectrics, but were not included in the simulations due to their low potential availability for the island. The Proposed IRP also provides a detailed description of future generation resources characteristics, projected capital costs, levelized cost of energy, development timeline, and the modeling of renewable resources.⁶⁴

vi. Assumptions and Forecasts

Assumptions and Forecasts were addressed in various sections of the Proposed IRP. Part 7, Assumptions and Forecasts, discusses the fuel forecast by fuel type as delivered to the different

⁶³ Prop. IRP. Appx. 5.

⁶⁴ Other requirements were met as follows: Regulation 9021, sec. 2.03(F)(1)(a) is addressed in Prop. IRP Part 6.1, 6.3.1 and 6.3.2; Regulation 9021, sec. 2.03(F)(1)(b) is addressed in Prop. IRP Part Appx. 5 and Appx. 5 Additional Existing Supplemental Data.xlsx; Regulation 9021, sec. 2.03(F)(2) is addressed in Prop. IRP Appx. 4; Regulation 9021, sec. 2.03(F)(3) is addressed in Prop. IRP Appx. 4 and Resp. to PREB ROI 10-05; Regulation 9021, sec. 2.03(F)(4)(a) and (b) is addressed in Prop. IRP Part 6.5.

power plants in the island, and includes a discussion on assumed infrastructure, commodities forecast.⁶⁵

In the Proposed IRP, PREPA did not assume carbon emission prices in the IRP analysis but, in Section 4.3 (Environmental Considerations) and subsection 4.3.7, a forecast of Carbon Price is provided. Also, in this section and in subsection 4.3.8, the RPS is presented. In responses to ROIs a sensitivity to CO₂ pricing was provided.

As the Proposed IRP assumes that all supply side resources will not be developed by PREPA but by third parties, financial assumptions applicable to those third parties are important inputs to the Proposed IRP analysis. Thus, in Section 6.2 of Part 6 of the IRP, the weighted average cost of capital used for the costing of supply side resources to be developed by third parties is presented, as are all corresponding assumptions with respect to cost of debt, cost of equity, beta, etc. This section also provides the economic life and cost of capital recovery factor by asset class (thermal, renewable and batteries). In Section 6.4, other assumptions for renewable resources are presented, including construction time and investment tax credit.

Load forecasts, including a high and a low case and cases and extreme cases encompassing fifth (5th) and ninety-fifth (95th) percentile, are presented in Part 3 (Load Forecast), subsection 3.5.11. This section also provides the base or reference case used in the formulation of the long term capacity expansion plans as well as the High and the Low case. Part 7, subsection 7.2.5, presents the corresponding values for fuel price forecast used in the IRP are provided, as is the reference case.

⁶⁵ Prop. IRP Part 7.1, 7.2.5.

Environmental regulations and their impacts on generation resource additions and retirements are presented in Section 4.3 (Environmental Considerations). Customer side generation forecasts are provided in Appendix 4. Customer side generation was modeled as a resource separated from the load in the Proposed IRP.

The capital costs considered in the IRP are provided in Section 6.3 (New Fossil-Fired Generation Resources) for thermal resources and Sections 6.4 (Solar Photovoltaic (PV) Projects), 6.5 (Battery Storage) and 6.6 (Wind Projects) for renewable generation resources, including batteries. In subsection 4.2.1.4 the Proposed IRP Main Report presents a discussion of hydroelectric generating facility rehabilitation and a high-level capital investment estimate for such activities is provided.

Part 5 (Resource Needs Assessment) presents the main uncertainties and the resulting scenarios and sensitivities that were used in the formulation of the Proposed IRP.

vii. Resource Plan Development

Resource Plan Development is discussed in several sections of the Proposed IRP (*e.g.*, Part 1, Part 5 and parts 8 and 9). The resource needs assessment in Part 5 is focused on the three strategies for formulation of the LTCE plans, the key uncertainties considered in the Planning Scenarios, and the sensitivities that were evaluated.⁶⁶ The resource plan development describes in detail the results of all the planning scenarios and sensitivities evaluated, including new capacity additions and retirements, system costs, RPS and environmental compliance, resiliency (MiniGrid considerations) and high-level rate impacts.⁶⁷ This discussion also provides comparisons across

⁶⁶ See generally Prop. IRP Part 5.

⁶⁷ *Id.* at Part 8.

all scenarios, showing that Scenario 3 appears to be the least cost plan but with operational and implementation challenges, and that Scenario 4 and the ESM are the most comprehensive options to meet with the objectives of the Proposed IRP. Further, the Overview of Scenario Results in Section 8.1 and, in particular, Exhibit 8-1, offer a summary description of the “no regret”/ “minimum regret” decisions (*i.e.*, the decisions that would provide the best possible solution over the broadest range of potential future conditions) which are reflected in the Action Plan.⁶⁸

viii. Caveats and Limitations

Part 9 of the Proposed IRP outlines the Caveats and Limitations that should be considered when reading the IRP. This section highlights the effect that key uncertainties, such as those related to load and fuel forecasts, environmental regulations, capital costs, timeline for construction of projects, etc., may have on the development of the resources envisioned in the Proposed IRP and the dates when existing generation resources can be retired. PREPA recognizes that there are important uncertainties under which the Proposed IRP is to be developed and implemented, and hence proposes a plan - the Action Plan – with flexibility built in to deal with these uncertainties.

⁶⁸ Other requirements were met as follows: Regulation 9021, sec. 2.03(H)(1)(a)(i) and (ii) is addressed in Prop. IRP Part 5; Regulation 9021, sec. 2.03(H)(1)(a)(iii) is addressed in Prop. IRP Part 1.3 and 8.1; Regulation 9021, sec. 2.03(H)(1)(a)(iv) and (v) is addressed in Prop. IRP Part 8.1 and 9; Regulation 9021, sec. 2.03(H)(1)(b) is addressed in Prop. IRP Part 8.2 Scenario 4 Results, Part 8.3, 8.4 Scenario 1 Results, 8.5 Scenario 3 Base Case Results, 8.6 Scenario 5 Base Case Results, the associated Metrix files for each case and for ROI 10 for EE sensitivities; Regulation 9021, sec. 2.03(H)(2)(a) is addressed in the Aurora Methodology and Hourly Dispatch Considerations.doc, Appendix AB and Prop. IRP. Part 5; Regulation 9021, sec. 2.03(H)(2)(b) is addressed in Prop. IRP. Part 5 and the results of sensitivities are presented on Part 8 for each of the Resource Plans; Regulation 9021, sec. 2.03(H)(2)(c) is addressed in Prop. IRP. Part 9; and Regulation 9021, sec. 2.03(H)(2)(d) is addressed in Prop. IRP. Part 8 and 9.

ix. Transmission and Distribution Planning

The Proposed IRP presents transmission and distribution planning considerations in Appendix 1 to the IRP Main Report.

Appendix 1, Section 2.1 and associated workpapers, provide a description of PREPA's transmission system. Various detailed maps of the system are provided as workpapers and the Appendix 1 itself has high level maps.

Appendix 1, Sections 2.2 to 2.12, provides the analysis supporting the manner in which PREPA proposes to segment the system into MiniGrids and Microgrids which can be separated and operated independently during emergency conditions. These sections contain the justification for and a detailed description of the necessary investments, including expected costs, and maps showing the location of the relevant transmission projects. Section 2.13 provides a summary of these investments by technical justification and location.

Appendix 1, Section 3, presents the steady state analysis for future conditions with new generation resources deployed and demonstrates the ability of the system to connect those resources. In subsection 3.6, an assessment is made for the interconnection of large new thermal resources without the transmission expansions identified for resiliency, so as to assess the requirements for resiliency-driven additions on a standalone basis. No constraints on transfer limits were identified as a result of a combination of lower load and better redistribution of generating resources.

The system requirements to integrate intermittent inertialess generation (solar PV) are discussed in Appendix 1, Section 4 (Dynamic Analysis), where the importance of battery energy

storage resources for frequency regulation and the conversion of certain generator to synchronous condensers to increase short circuit level is shown.

Appendix 1, Section 5, provides a description and analysis of the distribution system. This Section provides details on distribution system design and performance, complemented by selected illustrative load flow studies (subsection 5.2.2) and observations and recommendations (subsection 5.2.3).

Appendix 1, Section 5, presents the distribution system's current limitations constraining its ability to integrate customer side generation, and an illustrative load flow analysis as well as a screening of all feeders is provided in Section 5.3.

Appendix 1, Section 5.4, provides a description of the investments required at the distribution level for resiliency enhancements and complements the MiniGrid analysis performed at the transmission level. This section describes resiliency-driven investments at the substation and feeder levels, together with justifications and priorities.

x. Action Plan

The Action Plan is a “plan that identifies the specific actions that PREPA will perform during the first five (5) years of the Planning Period in order to implement the Preferred Resource Plan”.⁶⁹ The Preferred Resource Plan is the “portfolio of resource additions selected by PREPA from amongst those evaluated in the IRP representing the best performing resource mix to be implemented in the Action Plan.”⁷⁰

1. Basis for Recommending the Action Plan as the Preferred Resource Plan

⁶⁹ Regulation 9021 at § 1.08(B)(1).

⁷⁰ *Id.* at § 1.08(B)(33).

The Action Plan remains PREPA’s Preferred Resource Plan.⁷¹ As presented in the Proposed IRP’s Main Report, the Action Plan is the plan that, among the scenario and strategy combinations examined in the Proposed IRP, provides the most robust approach to transforming Puerto Rico’s electric generation resource mix and accelerating renewables penetration toward the goal of achieving compliance with the energy policy goal of 100% renewables.⁷² PREPA’s Action Plan is the most robust because it accommodates the most rapid uptake of renewable generation resources and battery energy storage systems achieved to date anywhere in the world, while giving PREPA a series of “hedgies” against the possibility that renewable and storage resources will not be developed and deployed as quickly as hoped, or demand ends up being greater than anticipated. These “hedgies” take the form of gas-fired generating facility additions that can be planned and developed over a predictable time frame and, if necessary, constructed over a similarly predictable time frame to address possible generating resource shortfalls in time to avoid potentially serious generation deficiencies.

PREPA officers and experts support the selection of the Action Plan as its Preferred Plan.⁷³ The Action Plan offers a set of recommendations for actions that can be implemented over the next five-year period (2019-2024) that generally follow the ESM Plan and are specifically tailored to the need to address uncertainties in load forecasts and the future costs of generation and storage.⁷⁴ That is, the Action Plan contemplates that PREPA will follow the resource plan actions identified in the ESM Plan and the Scenario 4 Strategy 2 (“S4S2”) optimization process, but will preserve the flexibility to take “off ramps” relating to specific resource additions (generally gas-fired generating facilities) if actual conditions (*e.g.*, low load growth, low cost of renewables, and substantial increases in energy efficiency gains) make it unnecessary to execute on those resource additions.⁷⁵ At the same time, the

⁷¹ José F. Ortiz Vázquez, PREPA’s Chief Executive Officer, confirms that the Action Plan is PREPA’s Preferred Resource Plan, and as such has been endorsed by PREPA’s Governing Board. *See* Dir. Test. Ortiz, 10:197-201.

⁷² *See* Prop. IRP Part 10; *see also* PREPA Resp. PREB ROI 9, sec. 4, which confirms this statement.

⁷³ *See generally* Dir. Test. Ortiz; *see also* Dir. Test. Bacalao; *see also* Dir. Test. Filsinger; *see also* Dir. Test. Lee.

⁷⁴ Dir. Test. Bacalao, 28:457-461; 28:473-29:484.

⁷⁵ *Id.* at 28:476 – 29:481; 30:497-510.

Action Plan will preserve for PREPA the ability to complete the development and secure the construction of resources that may be needed if load growth is higher than projected, renewables and energy storage cost more than expected, or energy efficiency gains are not as great as modeled.⁷⁶ The Action Plan will enable PREPA to begin long-lead project development activities (chiefly focused on gas-fired generating facilities) in the near term, while postponing major contractual commitments to the construction of the projects until it is clearer whether they will in fact be needed.⁷⁷

The Action Plan envisions the implementation of elements of two least-cost scenarios developed through the IRP process – the ESM Plan and S4S2 – in a manner that will position PREPA to respond to deviations in IRP assumptions (such as those relating to load forecasts and future costs of generation and storage resources) that can be reevaluated near the end of project development activities and before making any large contractual commitments for equipment or construction.⁷⁸ PREPA’s Action Plan builds on the options identified in the ESM Plan and S4S2, is designed to be flexible, low cost and practical, and if implemented can be expected to enhance significantly the resiliency of Puerto Rico’s electric utility system.⁷⁹

As PREPA’s experts describe:

The Action Plan sets forth PREPA’s preferred implementation strategy considering all other plans that were evaluated during the IRP process. It draws primarily on the ESM Plan and the S4S2 scenario, and it offers a low cost, practical option for achieving PREPA’s stated objectives of improving system resiliency through the integration of MiniGrids and distributed generation. The Action Plan envisions the deployment of distributed generation technologies that conform to RPS requirements, as they have been modified by the recently-enacted Puerto Rico Electric Public Policy Act, Act No. 17-2019. The Action Plan also takes into account specific Energy Bureau directives, including the requirement that all IRP scenarios assume the conversion of PREPA’s San Juan Units 5 & 6 to be fueled primarily by natural gas. It includes flexibility that will enable PREPA to alter course and either increase or decrease the amount of natural gas-fired generating capacity, and modify the locations of gas-fired capacity additions, to respond to permitting or renewable resource procurement

⁷⁶ *Id.* at 29:482-484; 30:506-510.

⁷⁷ *Id.* at 29:485-484.

⁷⁸ Dir. Test. Filsinger, 6:135-7:143; Dir. Test. Lee, 6:116-7:132.

⁷⁹ Dir. Test. Filsinger, 8:163-175.

and installation delays or changes in electric demand projections. It contemplates the commencement of permitting processes as soon as possible, so that it will be possible for PREPA or developers of generating resources to address uncertainty and bring resources online as they are needed.

Dir. Test. Lee, 6:116 – 7:132.

Mr. Lee explains that the Action Plan is PREPA's Preferred Resource Plan

because it is designed to mitigate future potential disasters by emphasizing a MiniGrid solution with sufficient distributed generation to serve critical loads. It also incorporates enough large-scale, centralized generation to provide the cost effective, efficient, base load capacity that will be required to supplement growing amounts of renewable generation that will be available only intermittently, even with large amounts of battery energy storage.

Id. at 7:137-143.

At the same time, the Action Plan will afford PREPA the flexibility it will need to deal with the many uncertainties it currently confronts:

The resource options presented in the IRP are based on estimated costs and assumptions regarding siting and overall project feasibility which eventually must be tested in the real world. We do not know today whether the cost estimates reflected in the IRP analyses are accurate or whether particular evaluated project development alternatives are feasible. The Action Plan preserves flexibility and optionality in the face of this uncertainty. It provides alternatives that may be pursued in the event that certain resource options cannot be developed or procured as expected as a result of site-specific evaluations or responses of prospective resource developers on the basis of then-current market conditions.

Id. at 9:180-188.

2. The Action Plan and Its Relationship with the ESM Plan

The Action Plan incorporates most elements of the ESM Plan, which was undertaken to identify implementation options that will support generation diversity, promote grid resiliency, and achieve cost efficiency, and that have the best chance of success.⁸⁰ The ESM Plan was developed in collaboration with a team of experts led by the Central Office for Recovery, Reconstruction, and

⁸⁰ Dir. Test. Filsinger, 10:209-217; Dir Test. Lee, 8:174-9:179.

Resiliency (“COR3”) to address generation project development execution risk and to incorporate lessons learned from hurricane response activities.⁸¹ At the Energy Bureau’s direction, the ESM Plan was examined as a separate scenario in the IRP.

The ESM Plan is based on the S4S2 LTCE plan with some modifications, referred to as “fixed decisions”, designed to mitigate execution risk.⁸² That is, the ESM Plan is a derivative of Scenario 4, Strategy 2 that incorporates feedback from stakeholders, utilizes potential procurement options provided by the Public Private Partnership Act⁸³, and preserves optionality – the “hedges” discussed above and described below – through the assumption that specified generation development and permitting efforts would be commenced early and pursued to completion if demand, the pace of renewable resource additions or other circumstances warrant.⁸⁴

The ESM Plan includes the following fixed decisions: (1) replace all 18 existing General Electric Frame 5 gas turbines, (2) develop an LNG terminal and F-Class CCGT at Yabucoa, (3) develop an F-Class CCGT at Palo Seco, and (4) develop a new ship-based LNG terminal and convert the Mayaguez power plant to be dual fuel.⁸⁵ In addition, the ESM Plan provides for the development of a new F-Class CCGT at Mayaguez.⁸⁶

The ESM Plan’s fixed decisions would take advantage of existing infrastructure, provide additional generation resources in areas of Puerto Rico that were severely impacted by the hurricanes, and support grid resiliency by anchoring or supporting the establishment of MiniGrids. These fixed decisions are not merely theoretical constructs – each reflects options that have actually been formulated and presented in some detail in the form of unsolicited proposals received pursuant to the

⁸¹ Dir. Test. Filsinger, 7:154-159; Dir. Test. Lee, 5:101-6:110.

⁸² See Prop. IRP Part 8.3.

⁸³ Public Private Partnership Act, Act 29 of June 8, 2009, as amended.

⁸⁴ Dir. Test. Filsinger, 7:161-9:189; Dir. Test. Lee, 5:89-99 and 6:112-8:172.

⁸⁵ See Prop. IRP Part 8.3.

⁸⁶ *Id.*

Public Private Partnership Act.⁸⁷

Siemens used established and accepted models to test the ESM Plan's fixed decisions and evaluate their reliability and cost implications. On the basis of this analysis, Siemens has concluded, and PREPA has determined, that pursuit of an action plan incorporating the S4S2 strategy/scenario combination, as modified to reflect certain generation resource additions and resource locations identified in the ESM Plan, would increase the likelihood that PREPA customers will actually benefit from the planned transformation of Puerto Rico's generation fleet, with no material difference in rate impacts relative to S4S2.

3. Origin of the Energy System Modernization Plan

COR3 managed a collaborative process to assess alternative approaches to rebuilding the Puerto Rico power system to achieve industry standard levels of reliability and resiliency. It assembled an ESM Working Group comprised of energy industry, utility, and federal agency representatives. The results of this collaborative effort are presented in the Energy System Modernization Plan as published by COR3 in February 2019.⁸⁸

The Working Group agreed that the ESM Plan should be based on five key principles:

1. Repair and harden to current codes and standards in Transmission & Distribution for critical infrastructure and high-risk areas.
2. Decentralize generation and move to cleaner, more sustainable energy sources.
3. Deploy islandable grids to increase grid flexibility and resiliency across the island.
4. Transform IT/OT systems to enable operation of distributed energy resources.
5. Adopt and Implement an Emergency Preparedness Plan.

To develop the ESM Plan, the Working Group agreed to take advantage of work already

⁸⁷ See PREPA Resp. LEO ROI 2; *see also* PREPA Resp. LEO ROI 2, ¶ 15.

⁸⁸ *Energy System Modernization Plan*, Central Office for Recovery, Reconstruction and Resiliency (February 6, 2019); LEO-PREPA ROI_2 Request_15_Attach 1.pdf

completed and lessons learned from hurricane response activities. This work included the Governor’s Recovery Plan⁸⁹, the Build Back Better report⁹⁰, DOE Energy Resiliency Solutions for Puerto Rico⁹¹, and the NYPA and Federal Emergency Management Agency After-Action Reports⁹². Each of these reports incorporates input from the working groups, government laboratories, industry experts, and PREPA staff.

An “ESM Scenario” developed by the COR3 Working Group was introduced into PREPA’s IRP development process in late November 2018. Shortly thereafter, Siemens began modeling the options presented by the ESM Scenarios to test its economic and reliability merits. The results of early analyses indicated that locational alternatives for new base-load generation resources yielded economic results similar to those observed in S4S2. Additionally, PREPA staff worked closely with Siemens to optimize the locations of peak generation resources to support MiniGrid operations.

On the basis of the professional judgment of the members of the ESM Working Group and Siemens’ modeling results, PREPA formulated the Action Plan, which favors the S4S2 results with the locational alternatives provided in the ESM Plan. The outcome and results of the ESM Plan’s development process are described in the COR3 ESM Plan⁹³.

4. Adaptation of the ESM Plan and Its Incorporation into the Action Plan

⁸⁹ *Transformation and Innovation in the Wake of Devastation, An Economic Disaster Recovery Plan* (August 8, 2018); LEO-PREPA ROI_2 Request 15 Attach 2.pdf

⁹⁰ *Request for Federal Assistance for Disaster Recovery, Build Back Better Puerto Rico* (November 2017); LEO-PREPA ROI_2 Request 15 Attach 3.pdf; https://media.noticel.com/o2com-noti-media-us-east-1/document_dev/2017/11/13/Build%20back%20better%20Puerto%20Rico_1510595877623_9313474_ver1.0.pdf

⁹¹ *Energy Resilience Solutions for the Puerto Rico Grid, Final Report*, U.S. Department of Energy (June 2018); LEO-PREPA ROI_2 Request 15 Attach 4.pdf
https://www.energy.gov/sites/prod/files/2018/06/f53/DOE%20Report_Energy%20Resilience%20Solutions%20for%20the%20PR%20Grid%20Final%20June%202018.pdf

⁹² *After Action Report, New York State Utility Contingent Emergency Response to Hurricane Maria*, NY Power Authority (August 2018); LEO-PREPA ROI_2 Request 15 Attach 5.pdf and LEO-PREPA ROI_2 Request 15 Attach 6.pdf; <https://www.nypa.gov/-/media/nypa/documents/document-library/news/2018-after-action-report-hurricane-maria.pdf>.

⁹³ LEO-PREPA ROI_2 Request 15 Attach 1.pdf.

The objective of the ESM Plan is to “rebuild and transform the system to one that is hardened, smarter, more efficient, cleaner, and less dependent on fossil fuel imports... designed and constructed using current power system codes and standards with modern grid technologies.”⁹⁴ The ESM Plan is consistent with the goal of transforming the energy system “to ensure customer-centric, affordable, resilient, reliable, and scalable electricity that incorporates more renewables, microgrids, and distributed energy resources (DER); can drive new businesses and employment opportunities; and can support residents’ well-being.” In other words, the ESM Plan was designed to align with PREPA’s Five Key Pillars in its Vision for the Future of Power in Puerto Rico.⁹⁵

The ESM Plan has been adjusted since its initial formulation to reflect changes in public policy (Act 17-2019), the Energy Bureau’s resolutions and orders and changes in Siemens’ LTCE model results. It has been adapted to reflect rapid integration of renewable energy resources, enhanced reliance on distributed generation, and improvements in energy efficiency, all of which, if realized, would reduce demand on the PREPA system and thus would reduce forecasted resource requirements. But because the degree to which renewable generation and storage resources, distributed generation and energy efficiency improvements will actually be developed and achieved is uncertain, the ESM Plan includes resource alternatives that could be pursued if necessary to bridge any gaps between demand and the available generation resources. This is no small point, because *PREPA must have sufficient resources available to serve load in a resilient and reliable manner, even if the deployment of renewable and storage resources and improvements in energy efficiency do not go as planned.* The ESM Plan addresses this uncertainty by including resources – “hedges” – that could be pursued through early-stage development activities that would permit actual construction if necessary. Capital expenditures associated with equipment procurement and construction of each of these resources would be deferred until the additional resource(s) is required. PREPA would confer with the Energy

⁹⁴ COR3 ESM Plan, page i.

⁹⁵ See detailed discussion of Five Key Pillars in its Vision for the Future of Power in Puerto Rico in section II.

Bureau and other stakeholders before making any such capital commitments.

5. Rationale Supporting Selection of the Action Plan as PREPA's Preferred Resource Plan

Developing new generation resources takes time – on the order of several years – and the ESM Plan is designed with a view towards retaining at all times the flexibility that PREPA will need in order to react to changing circumstances. The Action Plan, building on the ESM Plan, contemplates that project development opportunities will be initiated for specified new generation resources, but that these resources would only be constructed if load deviates from the Proposed IRP's forecast or renewable generation and storage resources are not actually available to the extent required to satisfy the load. By proceeding in this way with preliminary permitting and planning activities for new generation options, the Action Plan preserves for PREPA the ability to react in time to accommodate changes in load and available resources relative to forecasts. In this way, the Action Plan, relative to other alternatives examined in the IRP, will enable PREPA to ensure that adequate generation resources are developed and deployed as and when needed, on a cost-effective basis, to meet the needs of Puerto Rico's electricity consumers.

V. CONCLUSION

WHEREFORE, the Puerto Rico Electric Power Authority requests the Energy Bureau to note the Proposed IRP and approve the Action Plan as the Preferred Resource Plan.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 6th day of March 2020.

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CERTIFICATE OF SERVICE

It is hereby certified that, on this same date I have filed the above motion using the Energy Bureau's Electronic Filing System, at the following address: <http://radicacion.energia.pr.gov> and that a courtesy copy of the filing was sent via e-mail to: sierra@arctas.com; tonytorres2366@gmail.com; cfl@mcvpr.com; gnr@mcvpr.com; info@liga.coop; amaneser2020@gmail.com; hrivera@oipc.pr.gov; jrivera@cnslpr.com; carlos.reyes@ecoelectrica.com; ccf@tcmrslaw.com; manuelgabrielfernandez@gmail.com; acarbo@edf.org; pedrosaade5@gmail.com; rmurthy@earthjustice.org; rstgo2@gmail.com; larroyo@earthjustice.org; jluebkmann@earthjustice.org; acasellas@amgprlaw.com; loliver@amgprlaw.com; epo@amgprlaw.com; robert.berezin@weil.com; marcia.goldstein@weil.com; jonathan.polkes@weil.com; gregory.silbert@weil.com; agraitfe@agraitlawpr.com; maortiz@lvprlaw.com; rnegron@dnlawpr.com; castrodieppalaw@gmail.com; voxpopulix@gmail.com; paul.demoudt@shell.com; javier.ruajovet@sunrun.com; escott@ferraiuoli.com; SProctor@huntonak.com; GiaCribbs@huntonak.com; mgrpcorp@gmail.com; aconer.pr@gmail.com; axel.colon@aes.com; rtorbert@rmi.org; apagan@mpmlawpr.com; sboxerman@sidley.com; bmundel@sidley.com.

In San Juan, Puerto Rico, this 6th day of March 2020.

s/ Katuska Bolaños
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