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

IN RE:	NO. CEPR-AP-2018-0001
INTEGRATED RESOURCE PLAN FOR THE PUERTO RICO ELECTRIC POWER AUTHORITY	SUBJECT: FINAL BRIEF

BRIEF OF ENVIRONMENTAL DEFENSE FUND

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

COMES NOW the Environmental Defense Fund ("EDF"), which respectfully submits the following *Brief of Environmental Defense Fund*, pursuant to Regulation No. 9021 ("Regulation 9021"), known as the Regulation on Integrated Resource Plan ("IRP") for the Puerto Rico Electric Power Authority ("PREPA" or "Company"), Section 9.06 of Regulation 8543, known as the Regulation on Adjudicative, Notice of Noncompliance, Rate Review and Investigation Procedures, and Resolution, Completeness Determination of PREPA's IRP Filing and Procedural Calendar, July 3, 2019, as amended by multiple resolutions, specifically Resolution, Extension of Final Substantive and Legal Briefs and Reply to Legal Brief Deadlines, Feb. 28, 2020. EDF thanks the Puerto Rico Energy Bureau ("Energy Bureau"), its consultants, PREPA and all stakeholders for doing such a thorough review of a new energy plan for Puerto Rico.

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I. Introduction

EDF recommends that the Energy Bureau reject the IRP submitted by PREPA and approve a new IRP as modified by the Energy Bureau, just as the Energy Bureau did with PREPA's original IRP in 2016 ("2016 IRP"). The Energy Bureau should reject the PREPA IRP because it is based on several faulty assumptions and because the modeling analysis that PREPA performed was ill-suited for this task. The result was an IRP that did not align with either the Puerto Rico government's energy policy goals or consumers' expressed preference for a rapid transition to clean energy. Instead, the plan presented was overly reliant on centralized gas plants and produced an excessive 100% reserve margin, a flaw that the Energy Bureau noted in the 2016 IRP. In fact, the IRP repeats multiple shortcomings that the Energy Bureau criticized in the previous 2016 IRP with respect to transparency, modeling techniques, sensitivities, load forecasts, the assessment of existing and new resources, particularly demand-side resources, distributed generation, and renewable energy resources. To that end, there are multiple instances where the proposed IRP is non-compliant with Puerto Rico's energy laws and the regulations promulgated thereafter. In light of these shortcomings, the IRP failed to provide the fast transition to renewable energy as required by Puerto Rico's Energy Public Policy Act ("Act 17-2019" or "Act 17"), *infra*.

EDF's recommendations for a modified IRP address all of these factors. EDF recommends that the Energy Bureau's modified IRP incorporate scenario S3S2S8B (with some additional modifications discussed in this brief, *infra*) because this scenario proved out to be highly cost-effective and advances the rapid transition to renewable energy needed to meet Act 17's requirements. This modified plan includes the completion of San Juan #5 and #6, but does not include any other gas plants or infrastructure, particularly not the Mayaguez or Yabucoa plants or

any land-based LNG terminal in San Juan. Although this recommendation includes completion of the San Juan #5 and #6 plants, EDF notes that the manner in which PREPA proceeded with the plant conversions violated Act 83 of May 2, 1941, Section 6B, Subsection (a)(iii), and Regulation 8815 by secretly issuing an RFP without obtaining prior Energy Bureau approval (or even notifying the Energy Bureau). These secret RFPs also violate the legislative intent behind Act 120-2018, known as the "Puerto Rico Electric Power System Transformation Act." The Energy Bureau should therefore put PREPA on notice that it should not proceed with any future generating plant investments without the Energy Bureau's prior approval through the IRP process.

EDF recommends that the Energy Bureau use Hawaii as a good example of how a regulatory commission can direct a rapid transition to 100% renewable energy. EDF also recommends that PREPA immediately begin developing cost-effective energy efficiency and demand response programs, and commit substantial efforts toward the development of these programs. Even if the law changes and PREPA is not required to implement energy efficiency programs by law, the Energy Bureau should put PREPA on notice that it will be expected to include energy efficiency and demand response as supply resources through the IRP process. These are the most cost-effective and environmentally responsible resource options, and the Energy Bureau should demand this from PREPA as a best practice in IRP planning.

EDF also recommends that the utility empower customers to help drive the island's energy transition. To that end, PREPA needs to consider a wider range of resource options requiring less capital that are more responsive to the expressly stated customer demands. PREPA should therefore encourage and facilitate prosumer solutions, including energy efficiency, demand response and distributed generation – such as consumer-sited solar and battery storage systems being included and integrated into PREPAs long-term planning. This is key to providing clean,

reliable and affordable electricity to Puerto Rico's communities. This would also advance Act 17's objective that PREPA implement a customer-centric energy plan.

EDF also makes several additional recommendations for a path forward in this proceeding and for future IRP filings. These recommendations are designed to provide a least-cost supply plan that fulfills the requirements of Act 17, helps facilitate sound planning and decision-making, and allows for a more inclusive and transparent stakeholder engagement. Finally, EDF recommends that PREPA should follow industry best practices in preparing all future IRPs as well as IRP analysis.

II. Background

A. Background to PREPA's Current IRP

In 2014, the Puerto Rico Legislature enacted Act 57, requiring PREPA to file IRPs every three years.[1] The law requires PREPA to obtain the Energy Bureau's approval for a 20-year plan for the Company's entire electric system, including a plan for the electric generation resources needed to meet customer demand, an assessment of the transmission and distribution facilities for delivering power to customers, and programs for customers to conserve electricity usage. The plan must provide for the generation fleet and delivery system to be operated in an efficient manner and in accordance with best practices in the electric utility industry. PREPA filed its first IRP under this rule on July 7, 2015. The Energy Bureau issued an order on September 23, 2016

[1] *See* Act 57-2014, as amended, known as the Puerto Rico Energy Transformation and RELIEF Act (2014)..

rejecting the 2016 IRP and approving an alternate IRP, and requiring PREPA to file its next IRP in two (2) years instead of the three-year time frame required by law.[2]

On September 20, 2017, Hurricane María, a strong Category 4 hurricane, devastated Puerto Rico and PREPA's electric system.[3] The storm first made landfall in the southeast, near the town of Yabucoa, with winds reaching 165 miles per hour. The damage was overwhelming. Hurricane María took thousands of lives not only from the initial ferocious winds and torrential flooding, but also from later illness, disease, malnutrition, dehydration and inability to access clean water, basic medical supplies and essential medical services such as oxygen and dialysis.

Hurricane María destroyed PREPA's electric utility system, causing several billion dollars in damages. One month after the hurricane, 80% of Puerto Rico had no electricity. By the end of 2017, half of the island's citizens still had no power. In March 2018, six months after the hurricane, 100,000 citizens still lacked power. Electricity service was still sporadic in some areas in September 2018, one year after the hurricane struck.[4]

B. Puerto Rico Energy Public Policy Act, Act 17

Act 17 was signed into law on April 11, 2019. The law defines an IRP as:

> [A] plan that considers all reasonable resources to satisfy the demand for electric power services during a specific period of time, including those

[2] *See Final Resolution and Order on the First Integrated Resource Plan of the Puerto Rico Electric Power Authority*, CEPR-AP-2015-0002 (Sept. 23, 2016).

[3] This account of Hurricane Maria and the damage it caused to PREPA's electric distribution system is taken from Deibert, When the Sky Fell: Hurricane Maria and the United States in Puerto Rico (Apollo Publishers 2019).

[4] A. Kwasinski, F. Andrade, M. J. Castro-Sitiriche and E. O'Neill-Carrillo, "Hurricane Maria Effects on Puerto Rico Electric Power Infrastructure," in *IEEE Power and Energy Technology Systems Journal*, vol. 6, no. 1, pp. 85-94, March 2019, http://bit.ly/mariaPOWER (last visited March 5, 2020).

> 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 [IRP] shall be subject to the provisions of this Act and the rules established by the Bureau which shall approve the same. Every plan shall be devised with broad participation from citizens and all interested groups.[5]

Pursuant to Act 17, every IRP 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 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,

[5] Puerto Rico Energy Public Policy Act, Sec 1.2 (p), Act 17 (2019).

> 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.[6]

The law also establishes "an effective programming that allows for the setting of clear parameters and goals for energy efficiency, the Renewable Portfolio Standard, the interconnection of distributed generators and microgrids, wheeling, and the management of electricity demand."[7] The Act tightens Puerto Rico's 2010 Renewable Portfolio Standard ("RPS") by requiring that renewable generation account for 20% of PREPA's total energy production by 2022, 40% by 2025, 60% by 2040, and 100% by 2050.[8]

Act 17 requires that electricity service be "affordable, just, reasonable, and nondiscriminatory for all consumers in Puerto Rico" by requiring the [Energy Bureau] to review all proposed charges from an electric power company and "evaluate the efforts made by the electric power company to maintain such fees, rents, rates, and any other type of charge as close as possible to the twenty cent ($0.20) per kilowatt-hour goal established in the Certified Fiscal Plan for . . . [PREPA]."[9] One method for securing least-cost energy is by requiring that utilities adopt energy efficiency strategies "geared toward achieving efficiency in the generation, transmission, and distribution of electric power so as to guarantee the availability and supply thereof at an affordable, just, and reasonable cost."[10]

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[6] *Id*. at sec 1.9 (3).

[7] *Id*. at p.9, Statement of Motives (2019).

[8] *Id*.

[9] *Id*. at sec. 1.5 (1)(a).

[10] *Id*. at sec. 1.5 (2)(b).

Initially, PREPA prepared its IRP before Act 17 was passed. However, on April 26, 2019 the Energy Bureau ordered PREPA to revise its IRP to address the directives and objectives of Act 17.[11] On June 7, 2019, PREPA filed a revised IRP (known as "Revised IRP Filing"), which the Energy Bureau later determined complied with the requirements established in Regulation 9021.[12] Although the Revised IRP Filing addressed many objectives of Act 17, as we will discuss in this Brief, it did not fully comply with the mandates set forth in the Act. Compliance with Act 17 is not optional, but a legal requirement.

C. Relevant Procedural Background

On March 15, 2018, the Energy Bureau issued an order directing PREPA to file an updated IRP to reflect the damage to the electric system caused by Hurricanes Irma and María.[13] On May 29, 2018, the Energy Bureau issued an order requiring PREPA to file its updated IRP by October 31, 2018.[14]

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[11] *See Resolution and Order, PREPA's Informative Motion, Proposal Regarding Compliance Schedule and Update Question*, CEPR-AP-2018-0001 (Apr. 26, 2019).

[12] *See Resolution and Order, Completeness Determination of PREPA's IRP Filing and Procedural Calendar*, CEPR-AP-2018-0001 (July 3, 2019).

[13] *See Resolution and Order, Commencement of Review Proceeding and Order Commencing Review Proceeding and Order Establishing Initial Submission Timeline*, p. 3, CEPR-AP-2018-0001 (Mar. 15, 2018).

[14] *See Order, Order Pursuant to Act 83, Act 57-2014 and Regulation 9021 Directing PREPA to File an Updated IRP for Commission Review and Approval No Later Than October 31, 2018*, CEPR-AP-2018-0001 (May 29, 2018).

On July 2, 2018, the Energy Bureau issued a procedural schedule for the IRP proceeding. The procedural schedule included a requirement for PREPA to provide supplemental information to the Energy Bureau by August 1, 2018 and to attend a technical conference on August 14, 2018.[15]

The Energy Bureau held the Technical Conference on August 14, 2018 to provide an opportunity for the Energy Bureau and interested stakeholders to gather additional information regarding the IRP. On August 17, 2018, the Energy Bureau issued an order requiring PREPA to submit additional information arising from discussions at the Technical Conference. The order directed PREPA to update the IRP by evaluating additional scenarios and to provide the updated information by August 24, 2018 for some of the information and by August 31, 2018 for the remaining information.[16]

Following a review of PREPA's supplemental filings in August, the Energy Bureau issued an order on September 5, 2018 with an Appendix setting out the modeling scenarios that the Energy Bureau wanted PREPA to evaluate.[17] These scenarios covered many of the IRP's inputs, such as customer load and various types of resources, including energy efficiency and demand response. The order also directed PREPA to model these scenarios with and without dividing the grid into eight (8) minigrids, and required PREPA to file these new scenarios within seven (7) days.[18] PREPA raised some technical questions regarding the Energy Bureau's scenarios, and the

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[15] *See Order, IRP Prefiling Process (Phase 1) Procedure Before the Commission*, CEPR-AP-2018-0001 (July 2, 2018).

[16] *See Resolution and Order, Requirement of Additional Information after Technical Conference*, CEPR-AP-2018-0001 (Aug. 17, 2018).

[17] *See Resolution and Order, Evaluation of Additional Scenarios as part of the IRP Development*, CEPR-AP-2018-0001 (Sept. 5, 2018).

[18] *Id.*

Energy Bureau responded with a September 18, 2018 order that answered PREPA's questions regarding the modeling scenarios, and again requiring PREPA to file these scenarios with the Energy Bureau for review.[19]

PREPA complied with the Energy Bureau's orders in a September 26, 2018 compliance filing.[20] On September 28, 2018, the Energy Bureau issued an order stating that PREPA's IRP filing was complete, and setting out a process for determining the filing date.[21] On November 6, 2018, the Energy Bureau issued an order requiring PREPA to file its IRP by January 21, 2019.[22]

On November 2, 2018, the Energy Bureau held a technical conference to discuss the IRP. The Energy Bureau issued an order on November 9, 2018 setting out several parameters for PREPA to follow regarding how to model renewable energy in the IRP, and adjusting the scenarios that PREPA would model.[23]

PREPA neither filed its IRP by January 21, 2019, as required by the Energy Bureau, nor did it file a motion prior to that deadline seeking additional time. Instead, on January 22, 2019, PREPA filed an incomplete version of the IRP and requested additional time to file the complete

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[19] *See Resolution and Order, PREPA's request for clarification of certain aspects of the September 5, 2018 Resolution and Order*, CEPR-AP-2018-0001 (Sept. 18, 2018).

[20] *See Resolution and Order, PREPA'S (1) Compliance with the Energy Bureau's September 5th and September 18th Orders and (2) Informative Motion Regarding IRP Timeline*, CEPR-AP-2018-0001 (Sept. 26, 2018).

[21] *See Resolution and Order, PREPA's Compliance with the September 5th an 18th Orders and Informative Motion Regarding IRP Timeline*, CEPR-AP-2018-0001 (Sept. 28, 2018).

[22] *See Resolution and Order, PREPA's Compliance with the September 28th Order and IRP Timeline*, CEPR-AP-2018-0001 (Nov. 6, 2019).

[23] *See Resolution and Order regarding topics discussed at the November 2, 2018 Technical Conference*, CEPR-AP-2018-0001 (Nov. 9, 2018).

IRP by February 12, 2019.[24] The Energy Bureau issued an order on January 25, 2019 granting PREPA's motion.[25]

PREPA filed a motion on February 11, 2019 seeking a three-day extension of time to file its IRP.[26] On February 12, 2019, the Energy Bureau issued an order fining PREPA for its repeated delays in filing the IRP and granting another extension of time allowing PREPA to file the IRP by February 15, 2019.[27] PREPA filed its IRP on February 13, 2019 and the Energy Bureau issued an order acknowledging the filing on February 15, 2019.[28]

On March 14, 2019, the Energy Bureau issued an order stating that PREPA's IRP did not comply with Regulation 9021, the Energy Bureau's IRP rule, and the Energy Bureau's prior orders regarding the IRP.[29] The Energy Bureau listed the IRP's deficiencies and ordered PREPA to correct the deficiencies and to refile the IRP within 30 days.[30] On April 26, 2019, the Energy Bureau issued an order clarifying that the deadline for refiling the IRP would be May 10, 2019.[31]

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[24] *See PREPA's Motion for a Limited Extension of Time*, CEPR-AP-2018-0001 (Jan. 22, 2019).

[25] *See Resolution and Order, PREPA's Motion for Limited Extension of Time and Request for Confidential Treatment of Information*, CEPR-AP-2018-0001 (Jan. 25, 2019).

[26] *See PREPA's Motion for a 3-Day Extension of Time*, CEPR-AP-2018-0001 (Feb. 11, 2019).

[27] *See Resolution and Order, PREPA's Motion for a 3-day Extension of Time; Imposition of Administrative Fine*, CEPR-AP-2018-0001 (Feb. 12, 2019).

[28] *See Resolution and Order, PREPA's Petition and Informative Motion Regarding its Accompanying Integrated Resource Plan Filing*, CEPR-AP-2018-0001 (Feb. 15, 2019).

[29] *See Resolution and Order on the Completeness of the Puerto Rico Electric Power Authority's Integrated Resource Plan Filing, Confidential Treatment of Portions of the Integrated Resource Plan, and Requested Waivers*, CEPR-AP-2018-0001 (Mar. 14, 2019).

[30] *Id.*

[31] *See Resolution and Order, PREPA's Informative Motion, Proposal Regarding Compliance Schedule and Update Question*, CEPR-AP-2018-0001 (Apr. 26, 2019).

On May 9, 2019, the Energy Bureau issued an order extending the deadline to May 31, 2019.[32] On June 5, 2019, the Energy Bureau issued an order extending the deadline to June 7, 2019.[33]

PREPA refiled its corrected IRP on June 7, 2019 as required by the Energy Bureau's orders.[34] On June 11, 2019, the Energy Bureau issued an order requiring PREPA to correct certain deficiencies by June 14, 2019.[35] PREPA made two filings, on June 12, 2019[36] and on June 14, 2019,[37] respectively, to comply with the Energy Bureau's directive, and made another compliance filing on June 28, 2019.[38] In addition, PREPA filed an errata version of the IRP on June 19, 2019,[39] which the Energy Bureau accepted in a July 3, 2019 order.[40] The Energy Bureau issued a separate order on July 3, 2019 finding that PREPA's IRP was complete and establishing a procedural calendar that included an evidentiary hearing beginning on October 22, 2019.[41]

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[32] *See Resolution and Order, PREPA's Informative Motion and Motion to Extend Due Date for Revised IRP*, CEPR-AP-2018-0001 (May 9, 2019).

[33] *See Resolution and Order, PREPA's Motion to Extend Schedule*, CEPR-AP-2018-0001 (June 5, 2019).

[34] *See PREPA's Cover Filing for Accompanying Compliance IRP Filing Due June 7, 2019,* CEPR-AP-2018-0001 (June 7, 2019).

[35] *See Resolution and Order, PREPA's Cover Filing for Accompanying Compliance IRP Filing Due June 7, 2019*, CEPR-AP-2018-0001 (June 11, 2019).

[36] *See PREPA's Compliance Filing*, CEPR-AP-2018-0001 (June 12, 2019).

[37] *See PREPA's Cover Filing, Updated List of Documents Filed or Submitted, and Motions*, CEPR-AP-2018-0001 (June 14, 2019).

[38] *See PREPA's Compliance Filing*, CEPR-AP-2018-0001 (June 28, 2019).

[39] *See PREPA's Compliance Filing*, CEPR-AP-2018-0001 (June 19, 2019).

[40] *See Resolution and Order, PREPA's Motion for Leave to File IRP Main Report «Errata» Version*, CEPR-AP-2018-0001 (July 3, 2019).

[41] *See Resolution and Order, Completeness Determination of PREPA's IRP Filing and Procedural Calendar*, CEPR-AP-2018-0001 (July 3, 2019).

Various parties intervened in the case, exchanged discovery requests and filed initial witness testimony, rebuttal testimony and supplemental testimony. At PREPA's request, the Energy Bureau issued an order re-scheduling the evidentiary hearing to begin on December 2, 2019.[42] On October 24, 2019, the Senate passed Senate Bill 1427, which removed PREPA's obligation under Act 17 and Act 57 to meet energy efficiency targets. The Energy Bureau issued additional Requirements of Information to PREPA requiring PREPA to model additional sensitivities under the IRP where PREPA would achieve little or no energy efficiency, and issued an order re-scheduling the evidentiary hearing to begin on January 13, 2020.[43] On December 13, 2019, the Energy Bureau issued an order re-scheduling the evidentiary hearing to begin on February 3, 2020.[44]

A 6.4 magnitude earthquake struck Puerto Rico on January 7, 2020, causing loss of life and significant damage throughout the island. PREPA filed a motion on January 20, 2020 stating that the earthquake caused significant damage to the Costa Sur plants such that the IRP may be obsolete, and requesting a delay until March 31, 3030 to allow PREPA to assess whether the earthquake damage would require it to revise its IRP.[45] The Energy Bureau issued an order on

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[42] *See Resolution and Order on PREPA's Urgent Motion to Amend Procedural Calendar,* CEPR-AP-2018-0001 (Oct. 16, 2019).

[43] *See Resolution and Order, Energy Efficiency Assessment, Procedural Calendar and AES-PR Requirement of Information*, CEPR-AP-2018-0001 (Oct. 29, 2019).

[44] *See Resolution and Order, Resolution and Order to Modify the procedural calendar of the instant case; and to announce the Puerto Rico Energy Bureau's Requirement of Information No. 10*, CEPR-AP-2018-0001 (Dec, 13, 2019).

[45] *See PREPA's Urgent Request to Stay Proceedings, to Set Aside Procedural Calendar Sine Die and for Status Conference*, CEPR-AP-2018-0001 (Jan. 20, 2020).

January 24, 2020 rejecting PREPA's motion,[46] and the matter proceeded to hearing during the week of February 3-7, 2020, as previously scheduled.

D. Grid Modernization Plan

On October, 24, 2019, the office of the Governor of Puerto Rico, the Executive Director of PREPA, the President of the PREPA Governing Board, and others announced limited details of the Grid Modernization Plan for Puerto Rico. On December 13, 2019, the Central Office for Recovery, Reconstruction and Resiliency released a grid modernization plan.[47] The Not-for-Profit Intervenors moved that the grid modernization plan should be incorporated into the record of the IRP, but the Energy Bureau never approved this request. The grid modernization plan lays out a more than 20 billion dollar plan for expenditures for transmission and distribution to modernize and restore the damage to the grid from Hurricane Maria, assuming reimbursement through FEMA funds, private investment, and through rate recovery. The investments discussed in the grid modernization plan directly impact the IRP and therefore, undermine the Energy Bureau's ability to "guarantee the orderly and integrated development of our electrical system, thus ensuring the reliability, efficiency, and transparency thereof, and the provision of electric power services at reasonable prices," as envisioned by Act 57, and consistent with Act 17. For example, transmission and distribution ("T&D") systems dictate where utility-scale plants must be sited and how the power is delivered from the plants to the load centers. The availability of or

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[46] *See Resolution, PREPA's Urgent Request to Stay Proceedings, to Set Aside Procedural Calendar Sine Die and for Status Conference*, CEPR-AP-2018-0001 (Jan. 24, 2020).

[47] Central Office for Recovery, Reconstruction and Resiliency, *Grid Modernization Plan for Puerto Rico* (July 2019), https://recovery.pr/en/documents/Grid%20Modernization%20Plan_20191213%20(2).pdf (last visited March 5, 2020).

lack of transmission capacity also affects the cost of new generating resources. For these reasons, PREPA should have included the grid modernization plan as part of the IRP.

E. PREPA's Selection of Siemens as Consultant

On several occasions throughout the IRP review process, PREPA failed to follow the Energy Bureau's directives and the IRP rules. Multiple resolutions and orders by the Energy Bureau, as discussed *supra*, attest to this fact. The result is an IRP that is heavily reliant on new natural gas plants and fails to meet Act 17's objectives and the overall energy public policy of Puerto Rico. This was due in large part to how PREPA selected Siemens and how Siemens prepared the IRP. Unfortunately, these same problems also occurred with the first 2016 IRP. The Energy Bureau expressed its displeasure at that time.

In the 2016 IRP, the Energy Bureau specifically noted that the Siemens unit that had prepared the IRP was affiliated with another unit that manufactures gas power plants, and that the 2016 IRP specifically reviewed the possibility of building two Siemens power plants among the three new gas plants considered by the plan. The Energy Bureau reprimanded PREPA in the following passage for using a consultant with such as clear conflict of interest:

> Where the consultant conducting resource planning has a business interest in resource selection, there is risk of bias, intentional or unintentional. The risk rises when the modeling technique used by the consultant involves subjectivity. Given that risk, it is essentially important for the utility that hires the consultant to oversee the consultant and inject its own independent judgments. Utility deference to a consultant with a potential for bias is not a prudent practice. * * * At a time of deep citizen concern about PREPA's rates and performance, perceptions of favoritism or bias matter.[48]

[48] *See Final Resolution and Order on the First Integrated Resource Plan of the Puerto Rico Electric Power Authority*, pp. 37-38, CEPR-AP-2015-0002 (Sept. 23, 2016).

In light of the Energy Bureau's dissatisfaction with Siemens in the 2016 IRP, it is surprising that PREPA relied on Siemens again. Therefore, EDF recommends that for future IRPs, PREPA's selection of a consultant should be subject to the Energy Bureau's approval and that PREPA's publication and distribution of its RFP for hiring a consultant should include distribution to a list of consultants prepared by the Energy Bureau, and the Energy Bureau should issue a Resolution at an early date directing PREPA to begin this process.

F. Puerto Rico's Executive Order OE-2020-010

Pursuant to Puerto Rico's Executive Order OE-2020-010,[49] the executive branch, including PREPA, is exempt from procurement requirements to make viable and accelerate the recovery in Puerto Rico after the earthquake of January 7, 2020. This vague and broad executive order could arguably enable PREPA to bypass normal and transparent contacting procedures currently in place and be used to restore the grid or any generating assets, including building a new power plant. In light of this, PREPA should publicly commit in writing (as it did orally at the IRP evidentiary hearing) and the Energy Bureau should confirm in its Final IRP Order that PREPA will not use this executive order as authority to bypass the Energy Bureau's IRP rules. Further, EDF recommends that the Energy Bureau put PREPA on notice in this order that, if PREPA proceeds to use the governor's executive order to circumvent the IRP rules in this manner, then PREPA does so at its own risk .

[49] *See Puerto Rico Executive Orde*r, OE-2020-010 (Jan. 17, 2020).

III. Shortcomings with Existing IRP

Although Act 17 expressly establishes as a public policy directive "to reduce our reliance on energy sources derived from fossil fuels and to develop short-, medium-, and long-term plans that allow us to establish a well-balanced and optimum portfolio standard based on the development of renewable energy for Puerto Rico's Electrical System,"[50] PREPA submitted a proposed IRP that relies heavily on centralized fossil fuel plants and new gas plants. The plan assumes that energy efficiency will occur at unprecedented levels although the utility has neither plans nor programs in place for achieving it. And yet, despite the high energy efficiency assumptions, the IRP does not treat energy efficiency (and other demand side solutions) in the same way that it does supply-side resources and. The plan relies on an inappropriate modeling tool which, due to licensing conditions, prevented stakeholder transparency. Most importantly, PREPA did not develop the cost inputs for the modeling tool by performing an all-source, technology neutral request for proposals ("RFP") that places all resources on an equal footing. For these reasons, and as discussed in more detail below, EDF recommends that the Energy Bureau reject the IRP as it did with PREPA's initial IRP in 2016, and issue a modified plan that satisfies Act 17, IRP requirements and that serves the electricity customer's best interest.

A. Selection and Use of the Aurora Modeling Tool

In addition to the conflict of interest described above, the quality of Siemens's performance was inadequate, a trend repeated from PREPA's first IRP. In preparing both the 2016 and current

[50] Act 17, sec. 1.5 (5)(a) (2019).

IRP, Siemens chose an inappropriate modeling tool.[51] Siemens's selection of the Aurora modeling tool was a shaky foundation upon which to build the IRP.

Aurora uses a deterministic optimization process, which does not permit the best possible decision making under conditions of uncertainty. A better approach is to:

(1) use a wide range of modeling and non-modeling methods (including stakeholder input) to identify candidate resource plans; and then

(2) to subject these candidate resource plans to optimization under a variety of possible future worlds (policy environments, fuel and technology prices, load forecasts, weather and natural disaster outcomes) by modelling each scenario and subjecting the suite of scenarios to a decision analysis or real options analysis

In this way, an optimal resource portfolio may be identified that performs well across a range of uncertain futures--even though this best choice portfolio may not be the top choice under any one future circumstance.[52]

In addition, Aurora does not provide sufficient transparency for appropriate public review and detailed critique by third-party experts. Not only has Siemens failed to make Aurora available for intervenors to use to perform alternate modeling runs or to fully investigate settings used by Siemens in its own modeling runs, it is also the case that Aurora will not provide the most basic information regarding its modeling methods, assumptions and settings. Aurora refuses to provide intervenors in this and other official proceedings with its technical manual.

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[51] Siemens relied on PROMOD for 2016 IRP, which was also deemed ill-suited for the planning purposes of the IRP.

[52] *See* A. Borisin, *Uncertainty in IRP: Common Pitfalls and Best Practices*, March 22, 2016, https://www.in.gov/iurc/files/Uncertainty_in_IRP_-_20160316(1).pdf (last visited March 5, 2020)..

Opaque modelling tools like Aurora can be made to produce a very wide range of policy results based on minor modeling choices that are not made evident or expressed to stakeholders. To achieve useful and comprehensive modeling results it is crucial to avoid inadvertent exclusion of potentially useful combinations of resource selections. With Aurora's black box operation, it is impossible to gauge whether or not that has indeed happened. For example, it is impossible to identify in Siemens's modeling for PREPA to what extent resource portfolios were user-defined (rather than the result of optimization) and to what extent resulting resource portfolios were constrained in the optimization by limiting the possible amounts of a specific energy resources, such as solar, hydro and wind.

Without access to the Aurora manual, database and parameter settings, PREPA's IRP analysis cannot be subjected to the kind of rigorous third-party analysis that protects the public interest in an IRP process. This is an issue that has been raised in other utility jurisdictions. PREPA's IRP audience cannot have confidence in Siemens's modelling outputs, without a model that permits full transparency.

B. IRP Inputs and Assumptions

In addition to Siemens' conflict of interest and its questionable use of the Aurora modeling tool, the IRP has the following issues:

- As Dr. Elizabeth A. Stanton, EDF's expert witness, explained, PREPA should have issued an all resource (technology neutral) RFP for new generation and peak-shifting resources that is open to both supply- and demand-side measures. This would have allowed the market to demonstrate what the actual cost of resources

would be during the planning process which Siemens should have used in its planning process.

- Such an all resource RFP (the choice most likely to result in a least-cost plan for PREPA's customers), PREPA should have been supplemented by multiple need-specific RFPs for particular identified resource gaps, not just generation but also transmission and distribution needs. These need-specific RFPs, too, should be technology neutral to receive a least-cost set of responses. This would also enable non-conventional resources like DERs to directly compete with traditional utility solutions to meet specific system needs.
- Absent any RFP at all, PREPA should at least have relied on the most up-to-date cost assumptions and trends available. As pointed out by the Energy Bureau in the previous IRP proceeding: "An IRP is a living document. It must reflect the best knowledge available at the time it is prepared, and the best possible decisions in light of that information."[53]
- For renewable resources in particular, PREPA's cost estimates are highly conservative and do not reflect continuing cost declines and, as such. seem inappropriately high in future years. Without best possible resource price estimates, it is not apparent how the Energy System Modernization plan ("ESM"), PREPA's preferred resource portfolio, can succeed in selecting the lowest cost resource portfolio.
- It is no wonder then, that the IRP does not enable rapid transition to renewable energy as required by Act 17. The IRP does not sufficiently demonstrate why more

[53] *See Final Resolution and Order on the First Integrated Resource Plan of the Puerto Rico Electric Power Authority*, p. 10, CEPR-AP-2015-0002 (Sept. 23, 2016).

low-cost renewable generation resources (e.g., wind and hydro) are not included for selection by the model or implemented in earlier years in the ESM portfolio. At the same time, Siemens failed to offer any explanation regarding how the investments in fossil-fuel based infrastructure prepare the island to accommodate large amounts of distributed generation and variable renewable energy in the long-term.

- The IRP recommends "integrating the maximum amount of renewable generation that is practical to interconnect in the first four years of the planning period,"[54] yet Siemens's modeling subjects the amounts and types of renewable energy resources that could substantially contribute to a cost-effective resource mix to unsubstantiated assumptions that severely restrict their availability. As Dr. Stanton and others pointed out, the IRP places unjustified annual capacity expansion constraints on solar and battery storage, without placing similar limitations on fossil fuel resource expansion. Siemens's justifications for these restrictions are unsubstantiated and it remains unclear as to what, if any, formal analysis Siemens has performed to assess the technical and financial performance constraints that may limit or delay the commercial maturity of these technologies. This is particularly disconcerting given the fact that the IRP only assigned a technology risk to a single resource type, solar energy, of 30%, in its scorecard. EDF recognizes that the scorecard does not impact the analysis, nevertheless the choice to highlight and subjectively penalize a renewable resource in this way points to an alarming

[54] Puerto Rico Integrated Resource Plan, pp 1-5, CEPR-AP-2018-0001 (2019).

bias against alternative, non-conventional resources that is pervasive throughout the IRP.

- Relying on renewable energy resource deployment to occur late in the planning period short-changes renewable energy even further. Delaying renewable resource deployment not only threatens RPS compliance generally, it also leads to a more expensive resource plan, by not taking advantage of currently available federal tax incentives and crowding renewables out with early gas capacity expansion.
- Solar and batteries were treated as two separate resources rather than analyzing them in combination, which would have reduced the overall cost and improved their performance, making this resource more competitive with other resources.
- The IRP did not reflect realistic amounts of energy efficiency, a flaw that was pointed out in the previous IRP. Siemens assumed that PREPA would meet or exceed the Act 17 energy efficiency targets even though PREPA has no energy efficiency programs in place or under development, and even though PREPA opined that a no energy efficiency or low energy efficiency scenario was the likeliest one to occur. Yet, despite the obvious improbability for the energy efficiency levels to materialize, Siemens did not test its modeling results for their sensitivity to changes in forecasted energy efficiency.
- Relying on implausibly high energy efficiency assumptions jeopardizes the IRP's ability to comply with Act 17 in several ways. The high energy efficiency forecasts significantly reduce overall energy demand, which is a key determinant of whether Siemens's modeling runs comply with Act 17. Curiously, Siemens's base, high, and low load forecasts all anticipate an almost 50 percent reduction in energy

demand levels by 2038. This is a cause for concern because this assumption in turn significantly reduces the amount of renewable generation that Siemens assumed PREPA needs to procure to comply with Act 17 (with lower load, less renewables are needed to make up the same share of load); yet another example of how Siemen's modeling diminishes the role renewable energy can play towards advancing public policy goals.

- Siemens's assumption that energy demand will fall to half its current levels is also based on other similarly improbable assumptions. Siemens's forecasts expect that customer-sited distributed energy generation will comprise 30 percent of PREPA's total renewable energy requirement by 2038 even though no policy incentives or market mechanisms exist to incentivize this trend nor does the filed IRP include any plans for market mechanisms to achieve this level of distributed generation.
- In contrast, while Siemens's assumptions on energy efficiency savings and customer-sited generation were bullish yet unsubstantiated, Siemens was conservative in assessing opportunities for load growth that would have resulted in larger RPS obligations for PREPA. At the evidentiary hearing, Dr. Nelson Bacalao of Siemens acknowledged giving a 2018 industry presentation on IRP best practices where he stated that electric vehicles and distributed generation will soon have a dramatic impact on electric utilities, yet Siemens submitted an IRP that omitted potential load growth from electric vehicles and procurement plans for distributed generation;

- The IRP did not comply with the requirement to assess existing demand-side resources. Siemens did not identify or evaluate potential demand-side management ("DSM") solutions - energy efficiency programs, demand response programs and distributed generation - with or without the availability of smart grid technologies, although Act 17, Act 57-2014, the IRP Rules and Energy Bureau's previous IRP Order clearly directed PREPA to take into account DSM's potential. For example, Siemens was unaware of the energy savings potential of solar water heaters in Puerto Rico despite a successful and popular weatherization assistance program conducted by the U.S. Department of Energy including more than 15,000 homes in Puerto Rico. Similarly, the IRP didn't analyze whether residential energy demand had been impacted by replacing home appliances destroyed by Hurricane Maria with new, energy efficient appliances;
- Siemens treated resources such as energy efficiency and distributed generation as fixed inputs to the IRP, rather than treating these resources on an equal footing with fossil fuel resources and allowing the model to optimize for these resources as part of a least cost plan;
- The superficial treatment of behind the meter assets and other DSM solutions points to a related and equally troubling shortcoming in the IRP. The IRP states that it promotes a customer-centric vision, a key pillar adopted by the PREPA Governing Board. EDF commends Siemens for highlighting the importance of keeping customers at the center of any long-term energy planning vision. Empowered customers are paramount to Puerto Rico's renewable energy future, that harnesses an electric system that is more distributed, efficient, and responsive to expanding

customer demand. Resource planning is increasingly gravitating to the demand side of the equation significantly altering the traditional utility-customer relationship. Yet as Eric Ackerman, one of the expert witnesses of the Not-For-Profit Intervenors concluded, the IRP offers no strategy or vision of enabling customers to partake, much less accelerate, the energy transition as envisioned by Act 17.[55]

- Not only is the lack of any customer-focused strategies at odds with the customer-centric objectives of Act 17, this omission also indicates that Siemens is under-estimating the potential for grid defection when evaluating energy supply strategies. As we heard from several witnesses at the hearing, multiple circumstances could give rise to a feedback loop whereby a growing number of customers are seeking alternatives that increasingly compete with the grid market. Technological improvements and cost reductions for solar and battery storage are quickly improving the economic viability of off-grid solutions especially in Puerto Rico. As Siemens shows in the IRP, the cost of customer-sited generation, including customer-sited solar rooftop generation, is less expensive than PREPA's own generation.[56] Ratepayers in Puerto Rico already pay higher electricity bills than their counterparts in any state in the continental U.S. and could face even higher rates as a result of the impending restructuring agreement. At the same time customers have experienced prolonged power outages following hurricanes Irma and Maria and the January earthquake.

[55] *Motion Submitting Expert Witness Statements*, Not For Profit Intervenors, p. 10-1, CEPR-AP-2018-0001 (Oct. 22, 2019).

[56] *See supra* note 54 at 40, Ex. 8-37 at Fig. 6.

If households leave the grid because they are able to supply their own electricity demands at lower cost, fewer customers will share the burden of covering PREPA's total costs of grid maintenance, enhancement, and other investments necessary to ensure system reliability, affordability and environmental performance. Customers disconnecting from the grid would also exacerbate the stranded cost risk that is explained in more detail further below.

EDF recommends that PREPA develop a customer engagement plan that is responsive to and leverages the growing demand for decentralized, customer-sited solutions.

- As EDF and Local Environmental Organizations ("LEOs")[57] described in our motion,[58] the secret contract awarded to New Fortress Energy for the conversion of the San Juan units #5 and #6 plants[59] not only eroded public trust in the utility but they also violated Law 83 of May 2, 1941, Section 6B, Subsection (a)(iii) and Regulation 8815 by secretly issuing a RFP without obtaining prior Energy Bureau approval or notifying the Energy Bureau. Regulation 8815 sets forth a rigorous procedure intended to ensure that each RFP is a good use of Puerto Ricans'

[57] The Local Environmental Organizations consist of: Comité Diálogo Ambiental, Inc., El Puente de Williamsburg, Inc. - Enlace Latino de Acción Climática, Comité Yabucoeño Pro-Calidad de Vida, Inc., Alianza Comunitaria Ambientalista del Sureste, Inc., Sierra Club and its Puerto Rico chapter, Mayagüezanos por la Salud y el Ambiente, Inc., Coalición de Organizaciones Anti-Incineración, Inc., Amigos del Río Guaynabo, Inc., Campamento Contra las Cenizas en Peñuelas, Inc., and CAMBIO Puerto Rico.

[58] *Joint Motion from EDF and Local Environmental Organizations Concerning PREPA's Secret Requests for Proposals,* CEPR-AP-2018-0001 (Oct. 16, 2019).

[59] That illegal RFP is the subject of Energy Bureau's Case No. CEPR-AI-2018-0001.

ratepayer dollars and that local contractors are favored to carry out this ratepayer-funded work.

- Secret RFPs also undermine the objectives of the IRP and the plan's ability to ensure a transparent, cost-effective and integrated approach to resource analysis, planning, and procurement. No evidence was offered to the public to show that this was the least cost supply option at the time the contract was awarded and PREPA presented the contract as a fait accompli that the Energy Bureau and stakeholders had no opportunity to review, not to mention analyze prior to the awarding of the contract.
- The startup costs for the new gas plants and fuel delivery costs were not reflected in the plan. This would have significantly increased costs for the plants and made the gas plants more costly supply options relative to other types of resources. This skewed the IRP's results in favor of gas plants and prevented a full and fair analysis of all the supply options on an apples-to-apples basis.
- The IRP divided the island into eight minigrids and assumed that each one would have its energy needs met 100% by thermal resources and 80% by local resources, without any basis for these arbitrary, gas-friendly restrictions – resulting in an excessive reserve margin of 100% by the end of the planning period. It is unclear to what extent this solution was preceded by any investigation as to how reliability can be ensured without 100% thermal generation resources and to what extent non-thermal generation (such as solar plus storage) could have helped lower costs while maintaining reliability even though Dr. Bacalao confirmed at the hearing that some critical load could be served by solar and storage systems.

- In its current form, with its reliance on thermal generation (both centralized and the smaller peakers that Siemens has apocryphally dubbed "distributed") instead of clean and (behind-the-meter) distributed energy resources ("DERs"), it is unclear how much more resilient PREPA's proposed minigrids are compared to alternative strategies. PREPA's conception of minigrids further integrates neither renewable energy nor demand-side solutions, missing critical opportunities to improve overall economics and resilience and accelerate compliance with Act 17.
- The IRP fails to provide for resource diversity for flexibility and balance and fails to address existing assets, e.g., hydro resources. This is an important consideration because using different types of renewable resources together can improve the efficiency of both. For example, wind resources tend to reach their highest capacity factor later in the afternoon, as solar resources are scaling back. The hydro resources should have been an important consideration because they are already in place and merely needed to be restored, and this would have provided an important flexible resource that would have helped meet the Act 17 renewable energy target.
- Siemens missed another opportunity to leverage resource diversity by failing to perform a feasibility study for off-shore wind resources (even though this was also requested in the first IRP) and the IRP assigned an unreasonably low capacity value for wind resources.[60] The previous IRP similarly under-estimated the benefits wind resources could provide to a resource plan. This effectively excluded wind resources from the supply plan and calls the IRP results into question because wind is generally one of the lowest cost resources and one would have expected the IRP to include a

[60] *Motion Submitting Expert Witness Statements*, Not for Profit Intervenors, *Testimony of Dr. Eric Woychik*, pp. 10-11, CEPR-AP-2018-0001 (Oct. 22, 2019).

significant amount of wind resources, given Act 17's renewable energy requirements and the high avoided cost of energy in Puerto Rico. In addition, the testimony established that wind is a highly complementary resource to solar and procuring these resources in tandem would have increased the effectiveness of both and their ability to ensure reliable electricity supply.

- The IRP did not comply with the requirement to develop a range of viable alternatives as required by sec. 1.9 of Act 17 and ch. II, art. II of Regulation 9021. Only some of the IRP's modeling runs comply with the level of renewables mandated in Act 17. It is therefore impossible to determine time how PREPA's other proposed portfolios would perform if required to comply with PREPA's RPS obligations. This severely limits the set of viable scenarios to vet and raises questions regarding whether Siemens's scenario selection was an adequate risk assessment and whether it can actually chart a path towards PREPA's Act 17 compliance.
- The IRP does not include a penalty cost for noncompliance with Act 17's renewable energy requirements and the carbon pricing methodology was not transparent because it offered no information on implications for the resource portfolios. It is an increasingly common practice for utilities to include a carbon price in their IRP plans. PREPA was not transparent in how it modeled the price of carbon for its IRP even though future CO2 prices are uncertain. More specifically, the IRP should have laid out the assumptions and inputs that PREPA used to develop the carbon price, so that other stakeholders could examine the reasonableness of these assumptions and inputs, and tried to replicate PREPA's calculation.

- PREPA's IRP acknowledges the importance of exploring the model's sensitivity to a price on carbon and suggests a schedule of potential prices that could be included in future modeling--but were not included in this IRP.[61] A growing number of utilities include carbon prices in modeling, and most, if not all, electric dispatch and resource expansion models have the capability to include a carbon price (or other emissions price mechanism).[62]

  The inclusion of a carbon price can serve as a hedge against future environmental regulation, more importantly it's an important foundation for good, transparent decision-making, based on long-standing, common-sense economic principles. By properly accounting for the damages caused by carbon pollution, stakeholders can properly evaluate energy investments and policies that affect greenhouse gas emissions. As Synapse observed, utilities in particular "make important resource decisions involving a great deal of capital investment. The long lifetimes of these assets … create the need for good planning based on reasonable projections of future prices."[63] Incorporating a cost for each ton of carbon dioxide emitted can improve decision-making about investments in energy systems by properly accounting for the value of low carbon fuels and technologies. The cost of carbon also monetizes the economic harm from climate change impacts (and the measures necessary to avoid

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[61] *See supra* note 53 at p. 4-28.

[62] Written Statement of Bruce E. Biewald, U.S. Subcommittee on Energy and Power hearing: "Benefits of and Challenges to Energy Access in the 21st Century: Electricity" (Feb. 27, 2014), https://www.synapse-energy.com/sites/default/files/Benefits%20of%20and%20Challenges%20to%20Energy%20Access%20in%20the%2021st%20Century%20Electricity.14-019.pdf (last visited March 5, 2020).

[63] *Id*.

these damages) in the modeling. This type of cost adder places a value on the protections against the kind of devastations associated with climate change including hurricanes, floods, sea-level rise, droughts and heat waves. By "augmenting" the computer modelling to include not just the costs to buy, delivery, and burn fuel, but also the harm from climate change impacts that can cost businesses, families, governments hundreds of billions of dollars through rising health care costs, destruction of property, increased food prices, the human, community, and environmental costs, the results of electric sector modelling can better reflect shared social values.

- PREPA's IRP also fails to include costs related to methane leakage. Methane, the main ingredient in natural gas, is a potent greenhouse gas, with more than 80 times the climate warming impact of carbon dioxide over a 20-year timespan. Methane leakage occurs during the production, transport, delivery and storage processes. A recent study found that the U.S. oil and gas industry emits 13 million metric tons of methane from its operations each year—nearly 60 percent more than currently estimated by the U.S. Environmental Protection Agency ("EPA").[64] The gas plants therefore would cause significant environmental damage that is not reflected in PREPA's evaluation of the least cost supply plan. While we cannot place a quantitative cost on this factor, this is a qualitative factor that should tend to favor clean energy resources in the supply plan, all else equal.

[64] *Assessment of methane emissions from the U.S. oil and gas supply chain*, Science, Vol. 361, Issue 6398, pp. 186-188, (July 13, 2018), http://science.sciencemag.org/cgi/doi/10.1126/science.aar7204 (last visited March 5, 2020).

C. Stakeholder Process

As established in Act 17, every process related to electric power service shall promote transparency and public participation.[65] In addition, the IRP shall be devised with broad participation from citizens and all interested groups.[66] While current stakeholder practices offered a good starting point, the Energy Bureau could augment the existing opportunities for stakeholder review and comment and facilitate the best development and exchange of ideas and information before, during, and after each IRP's modeling and reporting.

EDF recommends that the stakeholder engagement begin prior to the formal filing of the resource plan - a common practice in IRP proceedings throughout the United States. Convening stakeholder groups, workshops, and technical conferences early in the development of the IRP benefits all stakeholders (including Energy Bureau's own staff or consultants) not least because it is "useful both to provide information and invite feedback on the input assumptions and the process that the utility is using in its resource planning, and to help ensure that the resulting plan is relevant and reflects the interests of ratepayers and the general public."[67] IRP stakeholder groups, workshops, and technical conferences - transcribed in both Spanish and English to maximize the utility of the oral testimonies and further facilitate access to the public - serve to engage all interested parties in the development of key assumptions, such as fuel and technology cost forecasts, resource potentials, and appropriate risk categories and parameters. Seeking early input

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[65] *See* Act 17, sec. 1.5 (10)(c) (2019).

[66] *See supra* note 4.

[67] Regulatory Assistance Project, *Best Practices in Utility Integrated Resource Planning* (June 2013), https://www.raponline.org/wp-content/uploads/2016/05/rapsynapse-wilsonbiewald-bestpracticesinirp-2013-jun-21.pdf (last visited March 5, 2020).

improves the quality of the submitted IRP and allows intervenors the opportunity to request candidate resource portfolios, sensitivities to explore uncertain forecasted values, and more complete explanations of modelling techniques and parameter settings.

Affording interested parties opportunities to provide input and stay informed regarding assumptions, scenarios, and sensitivities of a resource plan early in the IRP process further fosters a collaborative environment that can prevent unnecessary confusion and delays, and ultimately benefit customers. As the Energy Bureau stated in the Final Order for the previous IRP, "[a]ctive , vigorous, efficient participation by intervenors will benefit the Commission, the public and PREPA."[68]

PREPA's repeated delays in filing the IRP and in producing the modelling re-runs required by the Energy Bureau both in 2018 and 2019, that ultimately don't comply with Act 17 and IRP rules underscore the value that meaningful, transparent, and participatory stakeholder engagement throughout the IRP process can provide.

D. The IRP Did Not Consider All Non-Conventional Resources

Essentially, the IRP only analyzed two types of conventional supply resources - gas and utility-scale solar plants. The plan did not evaluate other types of resources that have been gaining greater acceptance as IRP supply resources and would have improved the grid's reliability, resilience and flexibility in a cost-effective manner. These other types of supply resources that PREPA should have evaluated in the IRP include energy efficiency, demand response, virtual power plants and batteries combined with solar.

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[68] *Final Resolution and Order on the First Integrated Resource Plan of the Puerto Rico Power Authority*, CEPR-AP-2015-0002 (Sept. 26, 2016) at p. 49.

These other types of resources fit the industry definition of DERs. It was pointed out at the hearing that Dr. Bacalao did an industry presentation on IRP best practices in 2018 where he pointed out that these types of DERs will play a prominent role on the grid in coming years. It is regrettable that PREPA failed to account for these types of resources in its IRP. PREPA tried to explain this away by stating at the hearing that when it referred to DERs, this meant small gas peaking plants. This explanation was unpersuasive and was contrary to the standard industry definition of DERs, and inconsistent with the way in which Dr. Bacalao used the term in his 2018 industry presentation on IRPs.[69]

E. Grid Modernization Plan was Not Included in the IRP Process

On December 13th, 2019, the Central Office for Recovery, Reconstruction, and Resiliency ("COR3") released Puerto Rico's Grid Modernization Planwhich was meant to develop a roadmap to guide Puerto Rico working with FEMA to repair and reconstruct its energy sector in alignment with the PREPA IRP plan.[70] The total investment of this plan exceeds $20 billion, coming from FEMA, private investment, philanthropic sources, as well as through PREPA ratepayer revenues. This grid modernization plan was developed in collaboration with PREPA and the COR3 engaged stakeholders such as the New York Power Authority ("NYPA"), Department of Energy ("DOE"), and various national labs. While the plan does acknowledge a need for modification pending the final IRP, there was no open stakeholder process. For such a large investment hedged partially

[69] N. Bacalao, *Integration of Renewable Generation: Maintaining Reliability and Economics* (2018), https://www.ccaps.umn.edu/documents/CPE-Conferences/MIPSYCON-PowerPoints/2018/IntegrationofRenewableGeneration.pdf (last visited March 5, 2020).

[70] *See supra* note 47.

through rate recovery, as well as impacting PREPA's ability to comply with ACT 17, the grid modernization plan should have been included in the IRP process. Decisions regarding infrastructure investment, such as gas infrastructure, can result in stranded assets and exacerbates PREPA's dependence on fossil fuels. All major investments that impact ratepayers as well as generation resource selection should be included in IRP development and an open stakeholder process.

Further, PREPA developed a minigrid concept which configures the transmission and distribution grid into eight minigrid islands to support resilience. This novel approach was a commonality in both PREPA's IRP as well as the grid modernization plan. While EDF does support a decentralized approach to advance reliability and resilience, the decision process which PREPA used in making its determination that the minigrid approach was the most cost-effective or most compatible solution for Puerto Rico did not include any stakeholder engagement perspective and nor was it part of the filed IRP. As was identified in the testimony of expert witness, Ronny Sandoval,[71] the IRP committed to a pre-determined specific solution and approach with large expenditures without clearly defining what constitutes resilient design or considering alternate, potentially lower cost solutions. By not defining a common and transparent process or metrics to measure resilience progress, it is impossible to determine if PREPA's minigrid investment approach will actually result in a more resilient grid. Clear metrics not only offers the IRP audience a context for comparing and evaluating the proposed portfolios, tied to desired policy outcomes and increased system functionality, they also enable all stakeholders to track and assess the progress of investments related to resilience.

[71] *Local Environmental Organizations Motion to Submit Expert Testimony, Testimony of Ronny Sandoval,* p. 7, CEPR-AP-2018-0001 (Oct. 23, 2019).

F. Risks

Siemens neglected to model key risk factors that would have significantly impacted the outcomes. Below EDF outlines the most significant risk omissions observed in the modelling process.

i. *Environmental* Compliance Requirements

PREPA's preferred scenario, the ESM, invests in five new natural gas terminals as well as 2,172 MW of new gas generation capacity by 2025. Further, the renewable portfolio standard is only 67% of the Act 17 requirement in 2038, leaving a large gap to comply with Act 17, which calls for 100% renewable energy generation by 2050. By continuing to invest in new natural gas generation and not rapidly expediting investment in renewable energy resources, PREPA is at risk of not complying with Act 17.

As required by Act 17 and Regulation 9021, an IRP shall include environmental impact assessments related to air emissions and water consumption, solid waste, and other factors such as climate change.[72] Although the Revised IRP Filing did a better job than the first IRP by including a discussion on National Ambient Air Quality Standards, it failed to discuss impact assessments related to water consumption, solid waste, and climate change as required by law. Furthermore, as admitted by PREPA in EDF Request of Information ("ROI") No. 1, there appears to be an issue of non-compliance with the U.S. Environmental Protection Agency's ("EPA") Mercury and Air Toxic Standards ("MATS"). PREPA's Head of Environmental Protection and Quality Assurance Division, Luisette Ríos Castañer, certified that "[t]he Units at each Plant that are subject to MATS

[72] *See supra* note 5.

are in compliance with the major MATS obligations . . . [but that] PREPA is in negotiations with EPA and the Department of Justice to resolve issues regarding its MATS compliance, and to develop and implement an extensive Clean Air Act Compliance Program."[73]

Although we requested in the same ROI, *supra*, information related to other environmental non-compliance issues with other state and federal agencies with jurisdiction on these matters, PREPA's response was vague and argued that they "[did] not see the relevance of requesting this type of information and how it may be related to the evaluation of the IRP."[74] PREPA should understand that our request was based on a legal requirement for the developed IRP and, therefore, the plan should include a comprehensive environmental impact assessment beyond air quality impacts regulated by EPA. Considering the above, these environmental impact assessments serve as a basis for selecting optimal resources that meet environmental standards and that are less reliant on fossil fuels as required by Act 17.

ii. *Climate* Change Impacts

Understanding climate change risks is also important in understanding how to best avoid saddling customers with unnecessary costs. To that end it is unclear to what extent Siemens has analyzed climate change impacts or to what extent the proposed investments will be able to withstand floods, heat waves and other anticipated extreme weather events. This is disconcerting because islands are at the front line of climate change and Puerto Rico's energy infrastructure is particularly susceptible to hurricanes as the experience of Maria underscored. The grid

[73] *See PREPA's Response to EDF First Set of ROIs*, Response No. 15, CEPR-AP-2015-0002, (Oct. 4, 2019).

[74] *Id*. at Response No. 17.

modernization plan released by "COR3 only confirms the fragility of the electric system, pointing to basic yet substantial rebuild and repair that is still required. The plan painted a dire picture of the current assets. To provide one of many examples, only 15% of transmission is built to be able to withstand a category 4 storm.[75] To make matters worse, the bulk of the hurricane damage is concentrated on the north-south transmission line which connects a significant portion of generation in the southwest to major load centers in the north.

To ensure that resilience and recovery investments are risk-tolerant in the near and long-term, EDF recommends that Energy Bureau task PREPA with undertaking a study together with climate experts and stakeholders to analyze climate change, extreme weather, and other natural disaster risks and impacts to the utility's infrastructure. For reference, to offer a template for how a utility could plan for the climate of the future, New York's Consolidated Edison ("ConEd"), one of the largest investor-owned utilities in the U.S., embarked on landmark study in response to hurricane Sandy. Together with Columbia University, climate experts, ICF, and stakeholders, ConEd assessed the utility's vulnerabilities to climate change impacts. Analyzing the effects of sea level rise, storms and hurricanes, and heat waves, the recently completed report provides a road map for what type of upgrades and maintenance investments the utility could make to better withstand increasingly frequent and intense weather events. One of the findings of the report was that some of the infrastructure that ConEd invested in after Hurricane Sandy may not be sufficient to withstand extreme weather impacts as early as 2030 depending on whether greenhouse emissions continue their current trends.[76]

PREPA's IRP also fails to include all costs related to methane leakage. Methane leakage

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[75] *See supra* note 47.

[76] Con Edison, *Climate Change Vulnerability Study* (December 2019), https://www.coned.com/-/media/files/coned/documents/our-energy-future/our-energy-projects/climate-change-resiliency-plan/climate-change-vulnerability-study.pdf (last visited March 5, 2020).

occurs during the production, transport, delivery and storage processes. In the first two decades after its release, methane is over 80 times more potent than carbon dioxide in terms of trapping heat in the atmosphere. The gas plants therefore could cause significant environmental damage that is not reflected in PREPA's evaluation of the least cost supply plan. While we cannot place a quantitative cost on this factor, this is a qualitative factor that should tend to favor clean energy resources in the supply plan, all else equal.

iii. *Stranded Costs*

While the IRP imposes predetermined and unsubstantiated limits on renewable energy resources, it is significantly less conservative in its modeling of fossil fuel resources. The IRP plan's modeling of stranded costs from new gas plants was opaque, inconsistent and poorly documented. PREPA claimed that the IRP analysis showed that all costs for new gas plants would be recovered from ratepayers prior to 2050. EDF questioned this during the discovery process and PREPA's explanation was unconvincing as to how these costs were modeled in the IRP. To the extent the model failed to recover these costs by 2050, the IRP did not reflect the full costs of the new gas plants and these resources would have had an unfair advantage over clean energy resources which do not face this same challenge of becoming stranded assets in 2050, when the island must be served by 100% renewable energy.

In this context, it is worth mentioning that non-emitting electric generation which is available and useful is unlikely to become stranded as Hawaii's example demonstrates that aggressive build-out of renewable energy, if cost-effective, poses very little risk of stranded costs because renewable fuels (i.e., wind, the sun, running water) are, and will continue to be free.

G. "No Regrets" Approach

The information presented to the Energy Bureau in PREPA's IRP cannot be used to develop a 20-year energy supply portfolio due to the plan's multiple flaws as described below. In addition to these clear errors and oversights on Siemens's part, several key unknowns affect PREPA's energy supply planning, including:

- How will PREPA's bankruptcy under Title III of the Puerto Rico Oversight, Management, and Economic Stability Act ("PROMESA") be resolved?
- How much will the securitization charge be and how will it be assessed?
- What was the extent of the recent earthquake damage to PREPA's gas plants?
- How much Federal Emergency Management Agency ("FEMA") aid will be distributed to PREPA and how will it be applied?
- How will structural changes affect energy supply and demand, such as retail wheeling, interconnection rules, microgrid rules, and renewable energy credit rules?
- How will energy supply and demand be impacted by selecting a third-party energy efficiency administrator and third-party operators for the power plants and transmission and distribution system?
- How will grid modernization be implemented and how will this impact energy supply and demand?

Under these multiple layers of uncertainty, EDF recommends that the Energy Bureau develop a "no regrets" approach to system planning that produces outcomes that are clearly needed, while avoiding any long-term commitments that could lead to high costs and stranded assets, based on better modeling in the future and events that cannot yet be forecast. One way to approach this would be to follow certain lessons learned from Hawaii, as Dr. Stanton discussed in her written testimony and at the evidentiary hearing:

- Develop low-cost renewable resources and battery storage;

- Pursue renewables with the highest certainty of deployment early in the planning period;
- Ensure lowest costs for ratepayers by considering renewables on equal footing with fossil fuels;
- Shift from centralized to distributed energy resources;
- Assess all types of distributed energy resources on equal footing with other capacity expansion opportunities;
- Consider grid services and risk reduction from distributed energy resources relative to other capacity expansion opportunities;
- Reduce generation costs by retiring aging fossil fuel plants;
- Place renewable energy, energy efficiency, demand response and battery storage on equal footing with fossil fuel generation for capacity expansion; and
- Assess the risks of stranded costs, uncertainties, and rate impacts of imported LNG fuels and new fossil generation.[77]

PREPA's responses to the Energy Bureau's Requirements of Information Nos. 9 and 10 show Siemen's modeling under low energy efficiency and no energy efficiency assumptions. The scenarios modeled were all very similar in cost. The most reasonable scenario appeared to be S3S2S8B, which shows large additions of renewables at "base" renewables prices (4,100 MW of combined solar and battery capacity by 2025) and no new combined cycle gas plants or peaking plants under the low energy efficiency/no energy efficiency assumption. This would be consistent with a "no regrets" approach and a least cost approach. As such it represents the best action PREPA could take in developing a supply plan as the subsequent sections below will elaborate.

[77] *Motion Submitting Expert Witness Testimony*, CEPR-AP-2015-0002 (Oct. 23, 2019).

IV. EDF's Proposed Path Forward for Current IRP

The "Action Plan" is defined as the "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."[78] For its development, the Action Plan shall also account for environmental impacts and discuss actions to meet environmental regulatory requirements at existing resources, and comply with all laws and regulations enacted that address requirements of demand-side resources and supply-side resources.[79] Since the ESM, PREPA's Preferred Resource Plan, is flawed and not compliant with Act 17 directives, EDF recommends that the following proposed actions be considered by the Energy Bureau in order to meet the goals outlined in the law and the Energy Bureau's regulations related to resource planning.

A. Reject the IRP and Approve a Modified IRP

EDF recommends that the Energy Bureau reject the IRP for all the reasons discussed herein. PREPA has provided insufficient information to approve a traditional 20-year least-cost resource plan in its formal IRP filing, discovery process, and during cross-examination at the evidentiary hearings. The Energy Bureau should therefore approve a modified IRP that is limited to action items that PREPA should undertake during the next few years.

Puerto Rico's energy needs are urgent and relying on the utility to fix its proposed IRP is likely to result in further delays and without guaranteeing an IRP that Puerto Rico's citizens deserve. To facilitate more rapid actions to improve current-day reliability and resilience, EDF

[78] *Regulation on Integrated Resource Plan for the Puerto Rico Electric Power Authority*, sec. 1.08 (B)(1), Regulation No. 9021 (2018).

[79] *Id*. at sec. 2.03 (K)(2).

recommends that the Energy Bureau approve a modified IRP based on the S2S2S8B scenario. PREPA's IRP has numerous flaws but the questions raised by the Energy Bureau's consultants and the intervenors during the technical conference, the discovery process, and the hearing helped elucidate the facts and developed enough information to form the basis for a modified plan. The best way to proceed would be to use PREPA's proposed IRP as a starting point, but to modify it in a way that rapidly and cost-effectively accelerates the transition to renewable energy, while avoiding the risks associated with over-building new gas plants.

Absent an approved IRP, all stakeholders – including PREPA, residential customers, businesses, industry, merchant power plant companies, clean energy advocates, renewable energy developers – will face uncertainty about Puerto Rico's future energy supply and cost of electricity. There is also a risk that PREPA may attempt to build new generation without the Energy Bureau's approval, as it did with San Juan #5 and #6, and that improperly vetted new generation could prove to be too costly and out of compliance with air quality regulations and Act 17. An approved IRP (even if truncated to a clear list of required actions) will make it possible for PREPA to move forward in its compliance with Act 17's renewable energy and energy efficiency standards while adding protections for customers to address their high risk of supply disruptions from extreme weather events. Without a modified IRP, PREPA could face fines from the EPA for violating air quality standards and from the Energy Bureau for violating Act 17. For these reasons, EDF recommends that the Energy Bureau approve a modified IRP as discussed in more detail in this brief.

RMI, in its *Amicus Curiae* brief, identified scenario S3S2S8B as a desirable outcome in this case, when it filed its preliminary amicus brief on September 20, 2019.[80] RMI reiterated this position in its regular brief on December 20, 2019.[81] EDF agrees with RMI's recommendation.

RMI's briefs point out several flaws in the IRP analysis. EDF agrees with RMI's explanation of these flaws and RMI's observation that "the proposed IRP relies on flawed logic to support a predetermined outcome, is overly biased toward natural gas, and fails to fully consider customer-centric solutions."[82] EDF also agrees with RMI's conclusion that the IRP fails to adequately support PREPA's proposed investments in gas infrastructure at Mayagüez and Yabucoa. Together with the recommendations in RMI's conclusions, EDF recommends the following modification to the approved action plan.

B. PREPA Should Build or Contract for 3,900 MW of Renewables and 1,640 MW of Battery Storage by 2025

In order to comply with the RPS requirements of Act 17, PREPA must move quickly and encourage a timely, transparent and successful procurement process for cost-effective renewable energy resources. PREPA should issue an all resource RFP to identify up-to-date, least-cost renewable resources to meet the 3,900 MW of renewables and 1,640 MW of battery storage requirement.

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[80] *RMI Amicus Curiae Brie*f, CEPR-AP-2018-0001 (Sept. 20 , 2019).

[81] *RMI Amicus Curiae Brief,* CEPR-AP-2018-0001 (Dec. 20, 2019).

[82] *RMI Amicus Curiae Brief,* p. 2, CEPR-AP-2018-0001) (Sept. 20, 2019).

C. PREPA Should Not Limit Capacity Expansion of Renewables and Storage

As mentioned above, the IRP places unsubstantiated annual capacity expansion constraints on solar and battery storage, without limiting fossil fuel resources. EDF recommends renewable energy, and battery storage be placed on equal footing with fossil fuel generation for capacity expansion, and no arbitrary limits be placed on these resources.

D. Retire all Steam Units by 2025 Except the Eco Eléctrica Plant

PREPA should retire all steam units by 2025, to comply with the EPA's MATS standards, except for the Eco Eléctrica plant, which S3S2S8B shows as remaining open beyond 2025. The status of this plant can be re-visited when the next IRP is filed in two years using better modeling, inputs and assumptions.

E. No New Gas Plants or Gas Peaking Plants

PREPA should not build, or perform any site planning and engineering for any new gas plants or gas peaking plants during the five-year action item period – consistent with the information in ROI 9.

F. Develop Tariffs or Issue RFPs for Distributed Generation and Acquire 700 MW by 2025

S3S2S8B for the no energy efficiency scenario in ROI 9 shows a need for 1,176 MW of new customer-sited distributed generation by 2038. PREPA should develop tariffs or other incentives and issue RFPs to acquire this generation through aggregators, allowing customers to

be compensated for the services they provide to the grid. It would be most cost-effective to acquire this distributed generation early on in the planning period rather than waiting until 2038. This would give PREPA more experience with this form of generation and should drive costs down in the long run.

G. File Report on Earthquake Impacts

The earthquake impact information presented at the evidentiary hearing was limited and very general in nature. The parties intervening in this case were not able to examine detailed studies and/or assessments that could attest to the damages claimed by PREPA. Therefore, EDF recommends that within two months from the IRP hearing, as promised by PREPA, the Energy Bureaus should require PREPA to file a report detailing the earthquake damage to its generating plants and PREPA's plan for coping with this. When considering refurbishment of the Costa Sur plants, it is essential that investments to repair or rebuild should be compared to alternative, potentially, lower cost solutions. For future IRPs, the Energy Bureau should also require that an earthquake assessment be included as part of the requirements for planning development. Lastly, future IRPs should provide a specific description of how PREPA should address natural hazards including storms, storm-surge flooding, tsunamis and earthquakes.

H. Immediately Pursue a Technology Neutral RFP

During the IRP hearing PREPA presented a high-level overview of damages to Costa Sur as well as the grid as a result of the January 7th earthquake in Puerto Rico. While there is not a complete picture of the totality of the damages there will undoubtedly be a significant reserve

margin shortage for the upcoming summer peak. Considering this reserve margin shortage, a technology neutral RFP for specific grid services such peak capacity should be issued immediately. This RFP should be inclusive of all solutions and technologies and be open to both supply- and demand-side measures such as demand response programs, virtual power plants, solar and storage, to ensure PREPA is procuring the least-cost solution for each service. Further, this and all future RFP processes should be administered by an Energy Bureau-approved independent third party.

I. Develop Energy Efficiency and Demand Response Programs Budgeted at $300 Million or More

EDF recommends PREPA pursue less capital intensive resources particularly given the utility's financial constraints. Because of PREPA's high cost of electric supply--higher than any jurisdiction in the 50 U.S. states--demand-side measures like energy efficiency and demand response can be extremely cost-effective for Puerto Rico. (The avoided cost of supply (20 cents per kwh) is higher than the costs of most energy efficiency programs and demand response incentives (1 to 6 cents per kwh). PREPA's testimony established that these programs would be cost-effective at least within the budget of $300 million, if not well in excess of this amount. A third-party administrator will eventually operate these programs but PREPA should get started investing in these least-cost resources as soon as possible and incorporate in the Action Plan the actions needed to accomplish Act 17's energy efficiency goals.

Perhaps the most important program would be an interruptible load program for large commercial and industrial customers. According to the IRP filing, June 7th, 2019, at p.32 section 3.1.1 part A, the combined commercial and industrial load accounts for 60% of total sales in FY17. PREPA should pursue DR programs with this customer class as it has proven to be a least cost and

low effort solution for managing load. For example, Con Edison's commercial system relief program ("CSRP")[83] which gives a large commercial load 21 hours' notice for load shedding during peak hours and in 2017 was evaluated to have a $163 million net benefit over a 10-year period and during event testing yielded a 100% response of 217 MW load reduction.[84] This type of program is common at mainland utility companies and is a very effective way to reduce peak demand. This is especially important in light of the earthquake damage to PREPA's power plants and resulting challenges for the Summer 2020 peak.

Further, while electric vehicles have not been included in PREPA's forecast despite national uptake in electric vehicles,[85] they can offer a significant benefit to utilities for load flexibility. Utilities such as Pacific Gas and Electric ("PG&E") offer a number of time of use ("TOU") rates to EV drivers to lower peak load and leverage load flexibility.[86] This same practice can be applied to whole homes by educating consumers on load-shifting technologies such as the thermal load (e.g. pre-cooling and heating), and smart charging. Investing in these technologies will not only drive rates down due to lowering capital investment cost, it will also provide added resilience by developing distributed, controllable grid assets.

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[83] Con Edison, *Smart Usage Rewards for Reducing Electric Demand*, https://www.coned.com/en/save-money/rebates-incentives-tax-credits/rebates-incentives-tax-credits-for-commercial-industrial-buildings-customers/smart-usage-rewards/smart-usage-rewards-for-reducing-electric-demand (last visited March 5, 2020).

[84] *Consolidated Edison Company of New York, Inc. Report on Program Performance and Cost Effectiveness of Damand Response Programs - 2017*, N.Y. PSC Case No. 09-E-0115 (Dec. 1, 2017), http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B9DFA1D2A-F2C4-4C0F-AA58-AF45EB4ED704%7D (last visited March 5, 2020).

[85] IEA, *Global EV Outlook 2019* (May 2019), available at: https://www.iea.org/reports/global-ev-outlook-2019 (last visited March 5, 2020).

[86] PG&E, *Electric Vehicle Rate Plans*, https://www.pge.com/en_US/residential/rate-plans/rate-plan-options/electric-vehicle-base-plan/electric-vehicle-base-plan.page (last visited March 5, 2020).

J. Develop Tools to Engage Customers and Leverage Customer-Sited Assets

In PREPA's June 7, 2019 IRP Siemens explains that the "cost of customer-sited generation is significantly lower than the PREPA owned and operated total rate."[87] Specifically, Siemens stated that the expected cost of customer-sited solar rooftop generation would be significantly less expensive than PREPA's own generation. PREPA is at risk of significant customer defection as further detailed below, resulting in extremely high rates for customers who are unable go off the grid. Despite this risk and Act 17's objective to encourage customer-sited systems, PREPA neglected to include any procurement programs for such assets.

In its comments submitted for the Energy Bureau workshop on Renewable Energy Credits (RECS) in July 2019, the Solar and Energy Storage Association of Puerto Rico ("SESA") cites a PREPA report indicating a distributed generation growth seen in PR from 88 MW in June 2017 to 172.75 MW June 2019.[88] Further, the RMI Amicus brief filed on December 20, 2019[89] refers to reports from solar companies active on the island, that the overwhelming majority (~90 percent) of new solar installations since Hurricane Maria are coupled with a battery. PREPA should take advantage of this growth in consumer-sited systems and leverage these less capital-intensive existing assets to develop least-cost, least-risk path for serving customers' needs and meeting public policy goals.

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[87] *See supra* note 54 at 40, Ex. 8-37, Fig. 6.

[88] *Comments of the Solar and Energy Storage Association of Puerto Rico (SESA-PR),* NEPR-MI-2019-00010 (July 15, 2019).

[89] *See supra* note 81.

One way to maximize customer and system benefits associated with customer-sited systems is to aggregate them into virtual power plants ("VPPs"). VPPs can provide grid services on behalf of individual DERs owners that would otherwise not be eligible. For example, Hawaii's aggregated residential solar-storage systems help address Hawaii's unique grid challenges via a Grid Services Purchase Agreement.[90]

While the VPP market is still maturing and new VPP models continue to emerge, Sun Run's expert witness, Christopher Rauscher, explained during the hearing that currently no technology barrier exists for virtual power plants to become a reality in Puerto Rico. The barrier, he stated, lies solely in the lack of market mechanisms for third-party companies to develop VPPs.[91] Further, in his written testimony, Mr. Rauscher expressed the need for VPPs to be considered as part of utility planning processes to ensure that they are considered as a resource that can provide grid benefits as well as avoid or defer investment in infrastructure and capacity.[92]

Yet, despite the above-cited growth in customer-sited solar and battery storage, there currently exists no incentive or procurement process to engage customers or third parties to aggregate their resources into VPPs. This is also true for less complex aggregation programs that do not require full development of VPPs and do not involve a cluster of many diverse DERs or participation electricity markets. For example, programs such a Green Mount Power's Bring Your

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[90] HECO, *RFP for Grid Services from Customer-Sited Distributed Energy Resources*, https://www.hawaiianelectric.com/products-and-services/demand-response/rfp-for-grid-services-from-customer-sited-distributed-energy-resources (last visited March 5, 2020).

[91] For example, Sunrun's VPP is providing demand response in National Grid's service region as well as for capacity services for ISO-NE. *See* Sunrun Grid Services, *Planning for a Changing Energy Landscape*, https://www.sunrun.com/grid-services (last visited March 5, 2020).

[92] *Motion Submitting Expert Witness Pre-filed Testimony*, p. 9, CEPR-AP-2018-0001 (Oct. 23, 2019).

Own Device program[93] has been successful in driving value from consumer-sited batteries. Here the customer invests in their own battery, usually coupled with solar, to provide added personal resiliency. The utility reduces the cost of investment of this battery by either offering an upfront payment for access to the battery for demand response peak load reduction services or ongoing performance-based bill credits. EDF recommends that PREPA investigate these and other existing utility programs to evaluate and encourage the role of VPPs and behind-the-meter assets in the least-cost path towards RPS compliance.

K. Approve One Minigrid to Investigate Resiliency Solutions

EDF agrees with the Grid Modernization Plan's recommendation that minigrids should be deployed gradually since this type of system is the first of its kind.[94] Therefore, EDF recommends that the Energy Bureau grant conditional approval to develop one minigrid. It is not reasonable or prudent to carry out an expansion of the minigrid concept, as contemplated in the IRP, prior to determining whether a minigrid is capable of functioning as planned.

The approval should further be conditioned on PREPA developing an acceptable plan, to be approved by the Energy Bureau following comments by interested stakeholders, for the type and location of resources and the amount of reserve margin for the minigrid.

At a minimum, any new generation resources selected for use in the trial minigrid should only be approved after careful and fair vetting against cost-effective alternatives including

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[93] Green Mountain Power, *Bring Your Own Device*, https://greenmountainpower.com/bring-your-own-device/ (last visited March 5, 2020).

[94] *See supra* note 47.

distributed generation and load management options that can offer resilience benefits in a timely fashion.

Any minigrid proposal should further include a description of how cost-effective resources like load management are leveraged to reduce load to reduce overall costs. Such cost savings considerations are particularly crucial for investments intended to serve load during islanding events.

Additionally, any minigrids to be approved should be designed to deliver knowledge and experience relevant to advancing Puerto Rico's decentralized renewable energy future. More specifically, they should focus on the integration of a high penetration of distributed renewable energy resources, testing smart technologies and services including smart inverters, and crucially how those investments can be leveraged to provide reliability and resiliency in the face of broader grid outages on the island. When questioned about whether Siemens saw an opportunity to leverage the minigrid design to gain insight about the integration of high levels of renewables and how Siemens used DSM solutions to reduce the overall cast of the minigrid, Dr. Bacalao was not able to provide an affirming response.

EDF cautions that through the new law, Puerto Rico will require significant investments in new renewable energy resources and demand-side management, including energy efficiency, demand response and DERs.

Rather than focusing on expanding fossil generation and existing technology, it is only practical for the Energy Bureau to authorize forward-looking investigations and pilots to determine how best to leverage those investments to further the goals of Act 17.

L. Re-Evaluate the Reserve Margin and Conditions for Serving Critical Load Exclusively with Thermal Resources

PREPA should be required to obtain the Energy Bureau's approval for its supply mix and reserve margin assumptions for serving critical load before it begins modeling of its next IRP. This will avoid the need to re-run modeling and re-write the IRP with acceptable assumptions after the IRP has been filed. In the present case, PREPA assumed that all critical load within each of the eight minigrids must be served by 100% thermal resources. There was insufficient evidentiary basis for this assumption and Dr. Bacalao acknowledged, when impeached by EDF at the hearing with a prior industry presentation he delivered, that solar and storage can be used to serve critical load. Using acceptable supply mix/reserve margin assumptions at the outset of the IRP process will lead to a more robust plan.

M. Do a Technical Potential Study for Wind and Refurbishing Hydro Facilities Prior to Next IRP

The study should examine the technical potential of on-shore and off-shore wind, and should be completed and released to the public well in advance of PREPA's issuance of the RFPs that it will use to develop inputs for the next IRP.

N. Require PREPA to Determine Optimal Renewable Resource Mix

Puerto Rico's electric system will need to incorporate substantial amounts of intermittent renewable generation resources. Yet, as noted above the IRP does not anticipate or plan for any specific insights to be derived from the proposed investments that could be instructive in

facilitating higher levels of variable renewable energy resources while maintaining system reliability and cost-effectiveness.

EDF recommends that PREPA, in collaboration with stakeholders, investigate and identify the optimal, least-cost, diverse portfolio of renewable energy resources to meet Act 17. That exercise should also explore to what extent coupling resources like storage and solar or solar and wind can aid in lowering costs and addressing potential intermittency issues in Puerto Rico. The determination for the optimal renewable energy resource mix should further consider, in a transparent manner, the necessary system integration costs - such as ancillary services, required system operation upgrades, energy storage - to integrate different levels, portfolios and locations of renewable energy resources. Lastly, EDF recommends that this exercise be streamlined with the distribution resource planning proceeding[95] to ensure that insights and decisions made in these different forums work in harmony rather than, potentially, against each other.

O. Require PREPA to file New IRP in Two Years

When the Energy Bureau approved PREPA's first IRP in 2016, it required PREPA to file a new IRP in two years, even though the rule contemplates a normal period of three years between IRPs. The Energy Bureau should do the same thing here. The IRP presented insufficient information to develop a true least cost plan, and too many uncertainties exist at this time that undermine the credibility of Siemens's resource decisions.

[95] *See generally* Energy Bureau, Distribution Resource Planning Process, NEPR-MI-2019-0011 (2019).

V. Process for Future IRP's

This is PREPA's second IRP and PREPA has shown a pattern in both cases of failing to follow best practices for IRP modeling, in particular regarding stakeholder transparency, and presenting a plan with flawed and obscure modeling techniques, unreasonable assumptions regarding the modeling inputs, and exclusion of non-conventional consumer-centric resources. In light of PREPA's failings, EDF recommends that the Energy Bureau establish a number of steps for PREPA to follow for future IRPs. This will help ensure that future IRPs reach a reasonable, well-informed decision on a least cost supply plan that complies with the Energy Bureau's policies.

A. Selection of Consultant for Next IRP

As stated above, given PREPA's imprudent selection of Siemens and its repeated failure to comply with the Energy Bureau's directives and best practices, EDF recommends that the Energy Bureau require PREPA to obtain prior approval of the consultant for future IRPs and that PREPA's publication and distribution of its RFP for hiring a consultant should include distribution to a list of consultants prepared by the Energy Bureau. Finally, the Energy Bureau should include a date certain in the Final Order for this IRP for PREPA to begin this process for the next IRP.

B. Stakeholder Participation Process

During the development of its 2016 IRP, the Hawaiian Electric Companies ("HECO") provided a stakeholder engagement process that is worth emulating for three main reasons:

(1) Stakeholders were engaged before and during IRP development;

(2) Stakeholders were provided access to IRP modeling assumptions and data inputs and outputs; and

(3) Stakeholder feedback, information and input was utilized during IRP development and transparently incorporated into the final IRP.

HECO's stakeholder process included inviting stakeholders to HECO's internal planning meetings, a HECO stakeholder conference, and two Commission technical conferences before the draft IRP was even released. After filing the draft IRP, HECO continued its stakeholder engagement by holding two more HECO conferences, two more Commission technical conferences, four structured stakeholder meetings, inviting stakeholders to additional internal planning meetings, holding impromptu meetings as needed, and responding to three sets of stakeholder information requests.[96] With the exception of "certain confidential information covered by the Commission's protective order, [HECO] shared *all* information with the Parties through a web interface" and considered all stakeholder input and commentary.[97] HECO's final IRP includes detailed information on its stakeholder process, including input from stakeholders that was used to develop, update and refine the datasets utilized in the IRP modeling as well as the scenarios and sensitivities analyzed.[98] As stated by one stakeholder—Earthjustice—HECO made good-faith "attempts to incorporate stakeholder input in the form of running several sensitivity analyses."[99]

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[96] HECO, *Integrated Grid Planning: Power Supply Improvement Plan* at 2016 PSIP, Book 2, App. B-2 and B-3, https://cca.hawaii.gov/dca/hecos-psip-update-december-2016/ (last visited March 5, 2020).

[97] *Id.*

[98] *Id,* at 2016 PSIP, Book 2, App. B: Party Commentary and Input.

[99] Sierra Club's, Distributed Energy Resources Council of Hawaii's, Hawaii Solar Energy Association's, and SunPower Corporation's Statement of Position Re. Hawaii Electric Companies' PSIP Update Report, p.3, Docket No. 2014-0183 (Dec. 23, 2016).

To offer another example, in Indiana, the state utility commission requires an all-inclusive IRP stakeholder engagement process that includes: stakeholder participation before the utility submits its draft IRP, at least three public stakeholder meetings, and frequent communication between the utility, stakeholders, utility commission and utility consumer counselor regarding stakeholder access to data and opportunities for stakeholder comments and feedback.[100]

Lastly, in Minnesota, the public utilities commission requires that utilities provide a way for interested stakeholder to review their IRPs and offer input. This stakeholder engagement process allows stakeholders four months to submit comments on a utility's draft IRP and mandates that the utility reply to such comments within two months of receipt. Once all replies have been filed, the commission produces a summary of the comments and responses and schedules a meeting to address the issues raised.[101]

C. Technology Neutral RFP Prior to Modeling

In order to ensure the most up-to-date cost estimations are included in the modeling for future IRP's EDF recommends that technology neutral RFP should be issued prior to model input assignments. The RFP should be facilitated by an independent third party with proposals accessible to stakeholders to provide added transparency. As was stated earlier, the RFP issued must be inclusive of all solutions and technologies and be open to both supply- and demand-side

[100] Ind. Admin. Code, *Rule 7: Guidelines for Integrated Resource Planning by an Electric Utility*, http://www.indianadg.net/wp-content/uploads/2015/11/170-IAC-4-Electric-Utilities.pdf (last visited March 5, 2020).

[101] Minn. Admin. Rules, *Title 7843, Utility Resource Planning Process*, https://www.revisor.mn.gov/rules/7843/ (last visited March 5, 2020).

measures such as demand response programs, virtual power plants, solar and storage, to ensure PREPA is procuring the least- cost solution for each service.

D. Pre-Approval of Modeling Tool, Inputs, and Assumptions

PREPA should be required to obtain the Energy Bureau's pre-approval for the modeling tool, inputs and assumptions for future IRPs. This will help ensure that the process results in useful information. This will also provide full transparency, as required in Act 17, for the Energy Bureau and all stakeholders. The result of this requirement would be to give stakeholders and customers more confidence that the ultimate plan is a least-cost plan that serves Puerto Rico's energy policy objectives and customers' best interests.

In addition, PREPA and its consultants should be required to obtain a modeling license that extends to intervenors and their experts, a practice employed in various states. To achieve the full transparency necessary to a public process, and the best possible ratepayer outcomes, third-party experts must have access not only to a complete set of model inputs and outputs, but to the model itself - at PREPA's expense. In this way, intervenors' experts can: (1) directly examine model settings, assumptions and data; (2) examine the model's sensitivity to PREPA's modeling choices; and (3) test out additional scenarios, portfolios, assumptions, data and settings to achieve a more thorough analysis of all possible options and future circumstances. Compliance with Act 17 should not be treated as an output of modeling; all of Siemens's modeling runs must comply with Puerto Rico's RPS requirement.

The modeling tool selected by PREPA, and approved by the Energy Bureau, should permit the exploration of different levels of energy efficiency, demand response, and other demand-side resources. Multiple levels of investment in each type of demand-side resource should be explored

in modeling, from no investment up to the maximum technical potential for each resource. In this way, final portfolio modeling results--with the utility cost of all demand-side measures included--can be compared on an even playing field.

The modeling tool selected by PREPA, and approved by the Energy Bureau, should also permit the exploration of risk and uncertainty, using either stochastic analysis or deterministic modeling that explores an appropriate range of possible values for each uncertain modeling input both singly and in combination. Uncertain parameters should include: fuel and technology prices; load growth; impacts from climate, weather and other natural disasters; and the potential for federal or local policy that places a price on carbon (see more detail on including carbon prices in modeling above).

E. Include Advanced Grid Methods in the IRP Process

One of the first objectives of Act 17 is to promote the most efficient grid modernization.[102] A common contention amongst many intervening stakeholders was the exclusion of the grid modernization plan, produced by COR3, from a stakeholder driven IRP. Large investments which potentially can limit options for capacity procurement should be integrated in the IRP process that is open to all stakeholders. Moreover, a criticism of the Not-for-Profit Intervenors expert witness Eric Ackerman,[103] was the exclusion of a "bottoms up" analysis to evaluate loads at the

[102] Act 17 states that its purposes include "[t]o design an electric power grid that takes into account the development and integration of community solar, wheeling, the creation of microgrids, and electric cooperatives or energy cooperatives as alternatives and tools to improve the access to renewable energy and the electric power grid's resilience to natural disasters." Puerto Rico Energy Public Policy Act, Act-17, sec 1.5 (2)(f) (2019).

[103] *Motion Submitting Expert Witness Statements,* Not for Profit Intervenors, CEPR-AP-2018-0001 (Oct. 22, 2019).

distribution circuit level. This type of analysis will provide guidance to prosumers[104] and third-party investors to make the most economically efficient investments and identify locations for DERs which will provide the most grid value. Further, this approach to grid planning allows PREPA to deploy new grid components where and when they are needed and avoids unnecessary upward pressure of rates by preemptively investing in modern grid components before the market is ready. Integrated distribution planning using a bottoms up approach as described by Ackerman should be included in all future IRP processes.

F. Detailed Risk Assessments Should be Included in Future IRPs

The Energy Bureau should require PREPA to include a detailed risk assessment when filing future IRPs. The risk assessment would review various factors that could materially impact the IRP's conclusions, such as commodity price, climate, regulatory, reliability, and operational risks. The scenario analysis that PREPA performed is one way of assessing risk but it did not help that some of the scenarios failed to comply with Act 17, resulting in a less robust risk assessment. PREPA could have used additional modeling methods such as optimization modeling or Monte Carlo analysis. The goal should be a robust analysis that includes the below discussed topics to reduce the risk of selecting a sub-optimal plan.

[104] Act 17 defines prosumers as "any users or customers of the Electrical System who have the capacity to generate electric power for self-consumption that, in turn, have the capacity to supply any energy surplus through the electric power grid." Puerto Rico Energy Public Policy Act, sec 1.2 (r), Act 17 (2019).

i. Account for Environmental Impact Assessments Related to Water Consumption, Solid Waste, and other factors such as Climate Change

As required by Energy Bureau's IRP Regulations, the Action Plan shall account for environmental impacts and discuss the plans to meet environmental regulatory requirements at existing resources beyond air regulatory matters, such as solid waste, water resources and climate change.

ii. Stranded Assets

Future IRPs need to explicitly assess the risks of stranded costs and rate impacts. In particular those of imported LNG fuels, terminals, docking facilities, pipelines and all other facilities related to new fossil generation which, due to Act 17, must be completely phased out by 2050. PREPA claimed to do so in this case but its analysis was opaque and it did not appear to include the cost of all the infrastructure related to the new gas plants. Further, EDF recommends that the Energy Bureau put PREPA on notice that it will protect ratepayers against stranded costs relating to any newly built fossil fuel generation and infrastructure by disallowing PREPA to recover these costs after 2050. As a result, the Energy Bureau should expressly notify PREPA through its order in this case that, in circumstances where costs of new fossil based assets cannot be fully recovered before 2050, PREPA will not be allowed to recover these remaining costs through rates.

iii. Resilience

PREPA should delineate a transparent planning process for resilience. More specifically, PREPA should work together with stakeholders to define resilience and resilience related goals in

the context of Puerto Rico's power system. Furthermore that discussion should investigate how decentralized, customer-sited systems can be leveraged for improved resilience. EDF also recommends further work with stakeholders to develop transparent metrics to measure the progress and performance of resilience related investments.

iv. Climate Change Vulnerability Study Should be Completed Prior to IRP Modeling

PREPA, in collaboration with the Energy Bureau, stakeholders and climate experts, should undertake a thorough study before the next IRP to evaluate both historical and projected climate-driven impacts on the utility's energy system. This study will help guide investments in resilient solutions and adaptation strategies and will also help assess the risks involved with different types of supply plans. The climate study should be updated before each new IRP.

VI. Conclusion

EDF thanks the Energy Bureau and its consultants for its thorough review and investigation of PREPA's IRP. Based on the foregoing, EDF respectfully requests that the Energy Bureau reject the IRP and approve a modified IRP as discussed herein.

RESPECTFULLY SUBMITTED,

IN SAN JUAN, PUERTO RICO, THIS 6th DAY OF MARCH, 2020.

ENVIRONMENTAL DEFENSE FUND

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IT IS HEREBY CERTIFIED that the foregoing was sent to the Puerto Rico Energy Bureau through its electronic filing tool at https://radicacion.energia.pr.gov and to the Puerto Rico Electric Power Authority to the following: Nitza D. Vázquez Rodríguez (n-vazquez@aeepr.com); Astrid I. Rodríguez Cruz (astrid.rodriguez@prepa.com); Jorge R. Ruíz Pabón (jorge.ruiz@prepa.com), Katiuska Bolaños (kbolanos@diazvaz.law), and Maralíz Vázquez (mvazquez@diazvaz.law).

IN SAN JUAN, PUERTO RICO, THIS 6th DAY OF MARCH, 2020.

ENVIRONMENTAL DEFENSE FUND

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CERTIFICATION OF FILING AND SERVICE

I hereby certify that on March 6, 2020, I have sent the above Brief of Environmental Defense Fund to the following intervenors: Javier Rúa-Jovet, Sunrun (javier.ruajovet@sunrun.com); Pedro Saadé-Lloréns, Ruth Santiago and Raghu Murthy, Local Environmental Organizations (pedrosaade5@gmail.com, rstgo2@gmail.com and rmurthy@earthjustice.org); Carlos A. Reyes and Carlos E. Colón-Franceschi, EcoEléctrica (carlos.reyes@ecoelectrica.com and ccf@tcmrslaw.com); Roy Torbert, Rocky Mountain Institute (rtorbert@rmi.org); Víctor L. González and Marc G. Roumain-Prieto, Grupo Windmar (victorluisgonzalez@yahoo.com, mgrpcorp@gmail.com); Hannia B. Rivera-Díaz and Jessica Rivera-Pacheco, Oficina Independiente de Protección al Consumidor (hrivera@oipc.pr.gov, jrivera@cnslpr.com); Manuel Fernández-Mejías, Empire Gas Company (manuelgabrielfernandez@gmail.com); Axel E. Colón-Pérez, AES Puerto Rico (axel.colon@aes.com, sboxerman@sidley.com and bmundel@sidley.com); Alexandra Casellas-Cabrera and Corey Brady, National Public Finance Guarantee (acasellas@amgprlaw.com and corey.brady@weil.com); Mariana Ortíz-Colon and Raúl Negrón-Casanovas, Progression Energy (maortiz@lvprlaw.com and rnegron@dnlawpr.com); Paul De Moudt, Shell (paul.demoudt@shell.com); Eugene Scott-Amy, Wartsila North America (escott@ferraiuoli.com and sproctor@huntonak.com); Jéramfel Lozada-Ramírez, ACONER (aconer.pr@gmail.com); Fernando E. Agrait, Non Profit Intervenors (agraitfe@agraitlawpr.com); Pablo Vázquez-Ruíz, CIAPR (presidente@ciapr.org); Arctas Capital Group (sierra@arctas.com, tonytorres2366@gmail.com); SESA-PR & Caribe GE (cfl@mcvpr.com); League of Cooperatives of Puerto Rico and AMANESER 2025 (info@liga.coop, amaneser2020@gmail.com).

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