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

IN RE: **REVIEW OF THE PUERTO RICO ELECTRIC POWER AUTHORITY INTEGRATED RESOURCE PLAN**	CASE NO.: CEPR-AP-2018-0001 SUBJECT: Final Substantive Legal Brief

THE PUERTO RICO ELECTRIC POWER AUTHORITY REPLY BRIEF IN SUPPORT OF THE PROPOSED INTEGRATED RESOURCE PLAN

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TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

In compliance with the Energy Bureau's[1] *Resolution and Order* dated July 3, 2019,[2] as amended from time to time, and the Energy Bureau's *Resolution and Order* dated March 3, 2020,[3] PREPA submits this reply brief in support of its *Final Brief in Support of the Proposed Integrated Resource Plan*.

I. INTRODUCTION AND SUMMARY OF ARGUMENT.

PREPA's Proposed IRP offers a solid foundation on which PREPA, prospective generation and storage resource developers, electricity consumers, other stakeholders and the Energy Bureau can collaborate to plan, develop and build a cleaner, more efficient and more resilient electric power system. The Proposed IRP comprehensively defines the challenges PREPA must confront as it manages the transition of its system into one dominated by renewable energy sources and energy storage. It offers a practical and flexible roadmap for overcoming these challenges, and defines a set of resource development plans and options that, if pursued as proposed, will enable PREPA over time to minimize electricity supply costs, improve system reliability and enhance grid resiliency. The Proposed IRP and, in particular, the Preferred Resource Plan, will preserve the flexibility PREPA will need to respond to delays in the pace of resource development, varying rates of energy efficiency improvements and unanticipated changes in electricity demand.

As the PREPA Brief shows, the Proposed IRP fully complies with the applicable laws, Energy Bureau regulations and orders.[4] The IRP Main Report and its attachments, PREPA's responses to requirements of information and testimony provided by PREPA witnesses, taken

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[1] Capitalized terms used herein and not otherwise defined shall have the meanings ascribed to them in PREPA's *Final Brief in Support of the Proposed Integrated Resource Plan* filed on March 6, 2020 (the "PREPA Brief").
[2] *Resolution and Order* entered on July 3, 2019 (the "July 3 Order") at Sec. II (G-F).
[3] On March 3, 2020, the Energy Bureau entered a *Resolution and Order* directing the parties to address the following topics as part of the replies to legal briefs: rooftop solar, hydroelectric generation and virtual power plants.
[4] PREPA Brief, Parts III and IV at pags. 11-25.

together, provide more than adequate information supporting PREPA's request for acceptance of the Proposed IRP, and on which the Energy Bureau may approve it as well as PREPA's Preferred Resource Plan and Action Plan. The Energy Bureau now has before it a fully developed record on which it can, and should, authorize PREPA to begin to implement the Preferred Resource Plan and the Action Plan.

In their final briefs, the Opposing Intervenors[5] have launched a barrage of criticism at the Proposed IRP and PREPA's identification of its Preferred Resource Plan and Action Plan. They suggest that the Energy Bureau should reject the exhaustive analyses and well sustained recommendations reflected in the Proposed IRP in favor of creative, ill-defined and unsupported alternatives that, for the most part, disregard the real world constraints PREPA faces and in multiple ways distort or ignore the evidence and analyses PREPA has presented in this proceeding. PREPA submits this reply brief in response to the major challenges to the Proposed IRP, the Preferred Resource Plan and the Action Plan which the Opposing Intervenors have raised in their final briefs.[6]

At the threshold, the Energy Bureau should dismiss requests for rejection of the Proposed IRP. PREPA has established that the Proposed IRP complies with all applicable legal and

[5] Arctas Capital Group, LP ("Arctas"), the Environmental Defense Fund ("EDF"), Empire Gas Company, Inc. ("Empire Gas"), the Independent Consumer Protection Office ("OIPC" for its Spanish acronym), the Local Environmental Organizations ("LEO"), the Not-for-Profit Opposing Intervenors ("NFP"), Sunrun, Wärtsilä North America, Inc. ("Wärtsilä") (all hereinafter referred to as the "Opposing Intervenors"; the Opposing Intervenors together with AES Puerto Rico L.P. ("AES-PR") are hereinafter referred to as the "Intervenors").

[6] *Arctas Final Substantive Legal Brief* (the "Arctas Brief"), *Brief of Environmental Defense Fund* (the "EDF Brief"), *Empire Gas Company, Inc. Final Brief* (the "Empire Brief"), *Alegato de la OIPC Como Parte Interventora* (the "OIPC Brief"), the *Local Environmental Organizations Legal Brief* (the "LEO Brief"), *ICSE and the Other Not for Profit Opposing Intervenors (Together the Not Profit Entities) Closing Argument and Brief* (the "NFP Brief"), the *Final Substantive Brief by Sunrun* (the "Sunrun Brief"), and the *Final Substantive and Legal Brief of Wärtsilä North America, Inc.* (the "Wärtsilä Brief"), all filed on March 6, 2020 (all the aforementioned briefs hereinafter referred together as the "Opposing Intervenors' Briefs") and AES Puerto Rico's Post-hearing Brief filed on March 6, 2020 (the "AES-PR Brief").

regulatory requirements; Opposing Intervenors' arguments to the contrary reflect their preferences for resource plans that differ from those which PREPA's modeling has generated, not legal deficiencies in the Proposed IRP itself. Rejecting the Proposed IRP because it does not embrace approaches Opposing Intervenors favor, and includes elements (such as near-term development of new gas-fired generation) they oppose, would be contrary to the public interest in that it would delay – for months, perhaps years – the day on which PREPA can begin the time consuming work of soliciting, evaluating and selecting proposals for the most rapid practicable development of the renewable generation, energy storage and conventional generation resources Puerto Rico urgently needs and the law mandates.[7]

The Proposed IRP and PREPA's Preferred Resource Plan provide for a balanced and pragmatic approach to the addition of supply-side resources and the retirement of existing inefficient and costly generating resources as quickly as possible. The Proposed IRP and Preferred Resource Plan are not, as some Opposing Intervenors claim, biased against renewable resources, energy storage, enhanced energy efficiency, and distributed and customer-owned generation. The plans PREPA prefers would result in the addition of *significantly more* solar photovoltaic ("solar PV") generation and battery energy storage capacity than fossil-fueled generating capacity over the first five (5) years, and in each of those years the plans would add as much solar PV capacity as can practically be integrated into the existing transmission and distribution system. These amounts of renewable capacity would be more than adequate to comply with Act 17-2019's ambitious renewable portfolio standards and to ensure compliance with those standards over the

[7] *See, e.g.,* Act No. 17-2019, Sec. 1.6 (articulating public policy goal of promoting "the fastest and most efficient reconstruction, modernization, and revamping of the transmission and distribution system for the purpose of developing a robust and flexible system that can integrate new technologies, distributed generation, renewable energy sources, and energy efficiency mechanisms as well as provide consumers with alternatives in the energy sector").

20-year term of the Proposed IRP. Indeed, the Proposed IRP contemplates one of the most rapid rates of solar PV and battery energy storage development and capacity integration ever achieved anywhere in the world. In the Proposed IRP and Action Plan, PREPA has put renewable resources and storage first, filling in with gas-fired capacity as needed to satisfy demand and meet local generation and reliability requirements.

Thus the Energy Bureau should give no weight to criticisms that the Proposed IRP and Action Plan do not adequately prioritize the integration of renewable resources, and that the pace of renewable generation resource additions is too slow. The Energy Bureau should also dismiss arguments that in formulating the Proposed IRP and Action Plan, PREPA and Siemens failed to take into account all available supply resources, including energy efficiency, demand response, rooftop solar systems, virtual power plants ("VPPs") and batteries combined with solar PV systems. The Proposed IRP, the Preferred Resource Plan and the Action Plan assume continued growth in distributed generation (including rooftop solar, and aggregations of rooftop solar and other customer-owned resources under VPP arrangements), energy conservation and demand response. They assume that new resources will be integrated in a manner that reflects the practical constraints PREPA faces. Those plans also recognize that there are fundamental limits to the pace at which new resources can be solicited; proposals can be formulated, evaluated, accepted and contracted; interconnection impacts can be studied, and necessary upgrades installed; land and rights-of-way acquired; facilities engineered and constructed; and new resources actually interconnected. These limits constrain *any* utility seeking to procure and integrate new generation and storage resources and the number of projects that can be carried out in parallel without creating interference and unsecure conditions, let alone an island utility as financially and operationally challenged as PREPA currently is.

Nor are the Proposed IRP, the Preferred Resource Plan and the Action Plan overly reliant on natural gas-fired generation. The retention of existing gas-fired generating capacity and the addition of some amounts of new gas-fired generating capacity are necessary, as LTCE model runs show, to bridge the gap between anticipated demand and the quantity of renewable resources, energy storage and customer-owned generation that modeling indicates will be available to satisfy this demand. New thermal generation is also likely to be needed to support MiniGrids and to ensure that that critical loads can be served even during disruptive events. Analyses of the S4S2 Strategy/Scenario combination and the ESM Plan confirm that retention of the existing EcoEléctrica natural gas-fired generating facility, the conversion of gas-fired generating facilities at Mayagüez and the possible addition of CCGTs at Yabucoa and Palo Seco will yield the least cost solution over most cases. The Energy Bureau should reject the proposition that no gas-fired generating capacity should be added under the approved IRP.

Perhaps as important, the option of adding new gas-fired generating capacity as described in the Preferred Resource Plan and the Action Plan would afford PREPA a valuable "hedge" against the possibilities that renewable resources and storage may be added more slowly or in smaller quantities than anticipated, or that demand does not decline as quickly as projected (perhaps because economic activity accelerates or energy efficiency and demand response measures are not as effective as assumed). Having the option, if circumstances require, to call for the development of one or more new gas-fired generating facilities will give PREPA a measure of control over its ability to assure that supply will be adequate to meet demand with an adequate reserve margin that it would otherwise lack. Resource plans that give PREPA this risk mitigation tool are clearly superior to those that would entirely preclude the development of new gas-fired generation. This is the major reason why PREPA has identified the ESM – which incorporates

most elements of the S4S2 portfolio, with the preservation of specified options to develop gas-fired generation – as its Preferred Resource Plan. This is also the major reason why alternative resource portfolios advocated by certain Opposing Intervenors (the S3S2S8B or S4S2S9 portfolios, with certain modifications) are not in fact superior to PREPA's Preferred Resource Plan and Action Plan.

The MiniGrid concept described in the Proposed IRP is an essential element of any plan to improve the resiliency and reliability of Puerto Rico's electric grid. Investments in MiniGrids will yield resilient interconnections between substations serving critical and priority loads and local resources, permitting service to critical loads to be maintained or quickly restored in the wake of disruptive events. Including local thermal generation in each MiniGrid is consistent with the goal of providing generation that can be counted upon to be available when needed, which is why the Preferred Resource Plan contemplates this approach. It is, however, possible that renewable generation plus storage could also satisfy the "available when needed" criterion in some circumstances; this possibility is not precluded under the Preferred Resource Plan or Action Plan. Accordingly, opposition to the MiniGrid concept that is based on opposition to the addition of thermal resources anchoring the MiniGrids should be discounted.

The Proposed IRP incorporates reasonable and adequately supported estimates of renewable and conventional resource costs, derived from sources widely accepted in the electric utility industry and adjusted appropriately for Puerto Rico conditions. Suggestions that PREPA should have used different estimates, or the results of requests for proposals ("RFPs"), to establish resource costs are not well founded. Assertions that the costs of residential rooftop solar PV installations, rather than the costs of utility-scale solar PV installations, ought to be the basis for renewable resource cost projections must be rejected. These assertions ignore the reality that

PREPA cannot prudently make resource planning decisions on nothing more than the hope that thousands of rooftop solar plus storage installations will be procured, financed, installed and maintained as and when needed over the next few years so that they can provide the large amounts of capacity and energy Puerto Rico will require from solar PV resources. This does not mean that there is no place for VPPs in the Proposed IRP, the Preferred Resource Plan or the Action Plan; if appropriately documented VPP arrangements are offered in resource solicitations contemplated by the Proposed IRP, and can be shown to be dependable and competitive with utility-scale resources, there is no reason why PREPA wouldn't select them.

Equally unfounded are criticisms of the manner in which the Proposed IRP handles projections of future demand for electricity. While acknowledging the many uncertainties that projections of future electricity demand must accommodate, the Proposed IRP adequately takes into account the potential impacts on future demand of energy efficiency, growth in customer-owned distributed generation (including rooftop solar) and demand response.

The Proposed IRP's analysis of PRM and their role in driving resource additions in LTCE model runs is reasonable and adequately supported. Sensitivity analyses documented in the Proposed IRP Main Report show that the 30% PRM employed in the development of the Proposed IRP did not drive it toward a costlier solution than would have been reached with a lower PRM. Consequently, arguments proposing a reduction in the PRM should be rejected.

Some Opposing Intervenors assert that the Proposed IRP does not adequately address potential environmental impacts associated with the implementation of various resource options. This is not correct, Such impacts are prominently identified and considered throughout the Proposed IRP analysis. The Proposed IRP Main Report summarizes the environmental standards and regulations applicable to PREPA's existing facilities and to new generating resource

alternatives, reviews relevant environmental considerations, including key existing and potential environmental regulations, identifies the need to comply with environmental regulations as one of the fundamental factors driving the resource needs assessment, and specifically analyzes environmental impacts, focusing on projected emissions reductions and water use impacts for the various scenarios and as compared with impacts projected for Scenario 4 and the ESM Plan. All scenarios examined would yield very substantial reductions in CO_2 emissions as the Puerto Rico generation fleet moves away from heavy oil-fired generation to renewable resources and efficient natural gas-fired generation. The Proposed IRP gives appropriate consideration to environmental impacts, and in this regard is fully compliant with the requirements of Act No. 17-2019 and Energy Bureau Regulation 9021.

Other Opposing Intervenor challenges to the Proposed IRP and the Preferred Resource Plan may readily be dismissed. Complaints that PREPA should have assumed greater reliance on hydroelectric resources and offshore wind lack merit. PREPA did in fact consider both categories of potential resources, and concluded that they would either not contribute meaningfully to supply even under the most favorable assumptions or would not be economic (a conclusion with which, as to offshore wind, the Energy Bureau's staff and advisors concurred). Complaints that PREPA did not give adequate attention to the impact on demand of electric vehicle adoption are shown below to be unfounded.

Arguments that the Proposed IRP should have assumed the use of liquified petroleum gas ("LPG") or synthetic natural gas ("SNG") in place of natural gas in new thermal generating facilities are similarly meritless. As documented in the IRP Main Report, natural gas is superior to other liquid fuels, including LPG, because natural gas is lower cost, can be combusted more cleanly, and offers greater operating flexibility and efficiency. Moreover, although the LTCE

model was given the option of fueling one new combustion turbine with LPG, the model did not select this option.

As noted in the final two parts of this reply brief, a number of other arguments pressed by Opposing Intervenors relate to matters not relevant to this proceeding. The Energy Bureau therefore need not to consider or address them.

The modeling tools employed in the development of the Proposed IRP were adequate to the task. Opposing Intervenor arguments to the contrary do not establish that the AURORA model yielded incorrect results and that their preferred alternatives would yield more accurate results. The consultants and advisors who assisted PREPA in the development and defense of the Proposed IRP did not and do not have conflicts of interest that would influence their ability to assist and advise PREPA free of any bias or improper influence.

For the reasons given in the PREPA Brief and in the following pages, the Energy Bureau should dismiss the various challenges to the adequacy and legal sufficiency of the Proposed IRP, and should approve it, endorse PREPA's identification of the S4S2 portfolio, as modified by the ESM Plan, as the Preferred Resource Plan, and authorize PREPA to implement the Action Plan.

II. THE ENERGY BUREAU SHOULD DISMISS OPPOSING INTERVENORS' THRESHOLD REQUESTS FOR THE REJECTION OF THE PROPOSED IRP.

The Energy Bureau should dismiss the demands of certain Opposing Intervenors to reject the Proposed IRP.[8] These demands are predicated on a number of demonstrably false premises, and they urge a result that, by casting aside two years' of intensive effort on the part of PREPA, the Energy Bureau and their advisors, would delay necessary generating resource project

[8] *See, e.g.*, EDF Brief at pags. 1, 41-42, 61; LEO Brief at pags. 3, 5, 74; NFP Brief at pags. 18, 21.

development activities. If it were to do as Opposing Intervenors demand, the Energy Bureau would condemn Puerto Rico's energy sector to additional years of uncertainty, insecurity and resource inadequacy. It is no exaggeration to state that outright rejection of the Proposed IRP would set Puerto Rico back years in its efforts to renew its electrical grid and move toward a future dominated by renewable energy sources and energy efficiency. This would not be in the public interest.

Opposing Intervenors moving the Energy Bureau to reject the Proposed IRP are wrong in claiming that the Proposed IRP is not compliant with the directives of Act 17-2019, Regulation 9021 and other Energy Bureau directives.[9] As PREPA demonstrated in its Final Brief and throughout these proceedings, through the written testimony of several PREPA officers and expert advisors, as well as workpapers, responses to requirements of information (including numerous model runs) and live testimony presented during technical and evidentiary hearings, the Proposed IRP is fully compliant with the requirements of Act 17-2019, applicable regulations and the Energy Bureau's directives.[10] Significantly, the Energy Bureau has specifically found that the Proposed IRP complies with the requirements established in Regulation 9021.[11] It is not alone in reaching this conclusion; AES-PR concurs that "the proposed IRP satisfies each of the statutory requirements and is in the public interest."[12]

Opposing Intervenors claiming that the Proposed IRP fails to satisfy Act 17-2019's requirements have failed to show that it lacks measures calculated to achieve specific and quantifiable Act 17-2019 targets or requirements. *All* generation portfolios designed in the

[9] *See, e.g.*, EDF Brief at pags. 7, 16; LEO Brief at pags. 2-3, 24; OIPC Brief at pag. 5.
[10] *See* PREPA Brief at pags. 14-25.
[11] July 3 Order ("Upon reviewing the documents related to the Revised IRP Filing, the Energy Bureau **DETERMINES** that the Revised IRP Filing **complies with the requirements established in Regulation 9021**.") (original emphasis); *see generally* Regulation 9021.
[12] AES-PR Brief at pag. 6.

Proposed IRP comply with Act 17-2019 targets (40% by 2025, 60% by 2040 and 100% by 2050);[13] the various portfolios use varying amounts of gas fired generation as a component of the least cost plan generated on the basis of specified assumptions underlying the scenario or sensitivity under consideration.[14] Opposing Intervenors criticize the Proposed IRP because it doesn't include preferences for particular approaches to the pursuit of renewable resources and their resistance to central station and natural gas-fired generating resources.[15] But the inclusion of gas-fired generation is clearly not inconsistent with Act 17-2019; that law in fact assumes that gas-fired generation will be an important part of Puerto Rico's near-term energy mix, by requiring that "at least sixty percent (60%) of the electric power generated in Puerto Rico based on fossil fuels (gas, oil byproducts, oil, and others) is high efficiency, as such term is defined by the Energy Bureau,"[16] and by its establishment of incremental targets for the integration of renewable resources, leading to 100% renewable resources by 2050.[17]

[13] *See, e.g.,* Prop. IRP Ex. 8-20 (S4S2), 8-55 (ESM), 8-72 (S1S2), 8-81 (S3S2) and 8-91 (S5S2) (showing the target and actual renewable portfolio standard ("RPS") compliance and demonstrating compliance after an initial buildout period and that the levels achieved are consistent with 60% RPS by 2040). Attachments 2 to 11 of PREPA's Response to PREB Ninth Set of ROIs, Case No. CEPR-AP-2018-0001 (summarized in Page 9 Results) also show compliance with the RPS under the Metrics Tab, line 46 & 47.

[14] *See id.*

[15] *See, e.g.,* EDF Brief at pag.16; LEO Brief at pag. 9 (characterizing the Proposed IRP's inclusion of gas-fired generating resources as being inconsistent with Act 17-2019).

[16] Act 17-2019 at Sec. 5.23 (amending Sec. 6.29 of Act No. 57-2014 to require that fossil generation be "high efficiency").

[17] Act 17-2019 at Sec. 4.2 (amending Sec. 2.3 of Act 82-2010 to establish a revised RPS). Moreover, all thermal generation was priced assuming that it must be fully depreciated by 2050. *See* Prop. IRP Part 6.2.2 at pag. 6-3 ("[G]iven the mandates of Act 17-2019 that defines 2050 as a target year for 100% renewable generation, the Capital Recovery Period of thermal generation is reduced as the development date is closer to 2050, so that the asset would be totally paid for at that time and could be retired."). This is shown by workpapers supporting cases that have the same types of thermal units built in different years and that show higher capital cost recovery components for later builds; for example, the workpaper associated with Strategy/Scenario S5S1B (S5S1B_Metrics_Base_Case_SII.xlsx) that has two Combined Cycle units (369 MW) added in Costa Sur one in 2025 and one in 2028, shows that the unit built in 2025 (New Resource 5487 from RMT4_1 Generic CC_F.05_gas) has a capital cost component (Fixed_Cost_Aux) of $37.03 million/year while the unit built in 2028 (New Resource 5499 from RMT4_1 Generic CC_F.05_gas) has a value of $40.2 million/year.(See Resource Year Spreadsheet, Column Z and, for example, rows 2033 and 2034, that show the 2028 values.)

Rejecting the Proposed IRP would have the perverse result of impeding, rather than advancing, achievement of the goals PREPA, the Energy Bureau, the Puerto Rico Legislature and most Opposing Intervenors share of advancing the most rapid possible development of renewable and energy storage resources. Having an approved IRP and Action Plan in place is absolutely essential to this end. PREPA would have no basis on which it could even begin the process of contracting for the resources that Puerto Rico requires without these working tools and roadmaps. Directing PREPA to go back to the drawing board, or requiring it to accept and implement an alternative plan that PREPA has not been able to assess for itself, would only further postpone the beginning of the important transformation of Puerto Rico's electric grid, perhaps by years. The Energy Bureau should reject all requests to reject the Proposed IRP and Action Plan and should instead find, as AES-PR Rico has stated, "that it is in the best interest of ratepayers and Puerto Rico to move forward with the [Proposed] IRP and the Action Plan."[18]

III. THE PROPOSED IRP AND ACTION PLAN PROVIDE FOR THE MOST RAPID INTEGRATION OF RENEWABLE RESOURCES THAT CAN REALISTICALLY BE ACHIEVED.

Opposing Intervenors are incorrect in alleging that the Proposed IRP and PREPA's Action Plan are improperly "biased" in favor of,[19] or overly reliant on,[20] natural gas-fired generating resource additions. In fact, in all scenarios examined in which fossil fueled generation additions were permitted,[21] the LTCE planning optimization process – which is driven by the AURORA modeling logic, not by any PREPA or its experts' "thumb on the scale" – selected the thermal generation to be included in the resource mix required to satisfy load.[22] At the same time, the

[18] AES-PR Brief at pag. 17.
[19] *E.g.*, LEO Brief at 6.
[20] *E.g.*, EDF Brief at pag. 1; LEO at pags. 1, 6; NFP Brief at pag. 16.
[21] That is, in all Scenarios other than Scenario 1; *see* Prop. IRP at pags. 1-3.
[22] *See* Prop. IRP, Part 8.1, Ex. 8-1 and PREPA Resp. PREB ROI 9 PREB-PREPA-09-01 at pag. 12, Table 3 (filed Dec. 6, 2019).

LTCE plans reflected in the Proposed IRP and, in particular, the Action Plan, add *significantly more* solar PV generation and battery energy storage capacity than new fossil generation capacity over the Action Plan implementation period year planning period, that is the initial five (5) years.[23] Indeed, the Action Plan, both under the "Low EE" or "No EE" assumptions, contemplates the addition of a quantity of solar PV capacity (2,760 MW by 2024) that coincides with the maximum annual amounts of such capacity that can practically be added (600 MW/year).[24]

The addition of new gas-fired generating capacity is required to bridge the gap between anticipated load and the quantity of renewable resources, energy storage and customer-owned generation that will be available to satisfy this load. The Proposed IRP modeling process identified the addition of gas-fired CCGTs and peaking resources as being necessary to satisfy the criteria that the plans minimize costs while achieving other objectives, including satisfying Act 17-2019's renewable portfolio standard requirements, meeting local resource requirements in support of the MiniGrid concept, and maintaining required levels of reliability and resiliency.[25] The Opposing Intervenors, therefore, have it exactly backwards. The Proposed IRP, Preferred Resource Plan and Action Plan in fact put renewable resources and storage first, filling in with gas-fired capacity as needed to satisfy demand and meet local generation and reliability requirements. These plans simply are not biased in favor of gas-fired generation resources and against renewables.

The Proposed IRP assumes an accelerated timeline for solar project development and construction of a total of twenty-four (24) months, twelve (12) months for RFP, bid evaluation, permitting and financing, and twelve (12) months for construction.[26] At the same time, the

[23] *See* PREPA Resp. PREB ROI 09-01 at pags. 15-17; *see also* Prop. IRP at pags. 10-1 – 10-9.
[24] *See* PREPA Resp. PREB ROI 09-01 at pag. 16.
[25] *See generally* Prop. IRP Part 10; *see also* PREPA Resp. PREB ROI 09-01 at pags. 7-9.
[26] *Id.*

Proposed IRP acknowledges, as is only prudent, that PREPA will be physically able to interconnect only so much new generation and storage capacity in any given year.[27] The Proposed IRP and Action Plan therefore limit new solar PV installations to 360 MW in 2020 and 600 MW per year thereafter; battery energy storage system installations are limited to 40 MW in 2019, 200 MW in 2020 and 600 MW annually thereafter.[28] Critics of these practical limitations have offered no evidence establishing that the assumed renewable and storage resource uptake rates are unreasonable, nor have they shown that PREPA is not ultimately constrained as to the rate at which renewable and storage resources can actually be added.

The Proposed IRP and Action Plan consider all practically available, cost-effective resource options, and propose the incorporation of these resources at a pace that will meet, if not exceed, all applicable legal requirements, including the renewable portfolio standards of Act 17-2019. The priorities that guided the Proposed IRP's development and that drove the selection of the Action Plan are summarized in the Introduction and Summary of Conclusions in Part 1 of the IRP Main Report:

> The foundational recommendations of this IRP are: a) *integrating the maximum amount of renewable generation that is practical to interconnect in the first four years* of the planning period, b) *adding distributed resources* and hardening the transmission and distribution grid so that it can be segregated into eight largely self-sufficient electric islands (MiniGrids) c) *increasing energy efficiency and demand response* and d) *retiring obsolete oil fired units and modernizing the generation fleet* with dual fuel (LNG) gas turbines. These changes are essential to mitigate, manage and enable timely recovery from future major storms, while shifting the existing generation fleet from largely heavy fuel oil and distillate fuels to renewables and cleaner natural gas.[29]

[27] *Id.; see also* Prop. IRP Ex. 6-28, 6-29 and 6-30; PREPA Resp. PREB ROI 09-01 at pag. 9.
[28] PREPA Resp. PREB ROI 09-01 at pag. 9.
[29] Prop. IRP Part 1.2 at pag. 1-5 (emphasis added); *see also id*. at Part 10 at pag. 9-2 (repeating the "foundational recommendations" of the Proposed IRP and relating them to the Action Plan).

To these ends, the Proposed IRP identifies two resource plans that were found to be low cost and practicable (the ESM and the Scenario 4 Strategy 2 ("S4S2") Plan), and describes how these plans – which are the foundation of the Action Plan – assume the most aggressive possible addition of solar PV systems, battery energy storage, customer-provided distributed generation and energy efficiency gains, to be supplemented by efficient natural gas generation to ensure resource adequacy.[30] The Proposed IRP provides for PREPA to:

- Maximize the rate of installation of solar photovoltaic (PV) generation for the first four years of the plan (2019 to 2022) with the goal of adding 1,380 MW of solar PV capacity in the first four years of the plan (i.e., by 2023);[31] following additional model runs requested by the Energy Bureau to test the impacts of low energy efficiency and no energy efficiency gains, this amount was increased to 2,760 of PV by 2024)[32];

- Install 920 MW of Battery Energy Storage in the first four years of the plan (i.e., by 2023), an amount correlated with the large amount of solar PV to be added;[33] in responses to the Energy Bureau's Ninth Requirements of Information, this amount of BESS was increased to 1,440 MW by 2024;[34]

- Partner with customers by accelerating energy efficiency and enabling demand response and increases in the penetration of distributed energy resources (by, among other measures, reinforcing the distribution system to enable two-way energy flows to facilitate increased penetration of distributed energy), with the objective of reducing demand by approximately 2% per year, yielding in the case of energy efficiency over 1,900 GWh of demand reductions and the addition of over 60 MW of flexibility to the system by 2025;[35] and

- Retain the EcoEléctrica L.P. gas-fired combined cycle combustion turbine generating facility in service under renegotiated, more favorable pricing and dispatch terms; develop a new combined cycle gas turbine (CCGT) at Palo Seco; proceed with design and permitting and (depending on load) develop a new CCGT at Yabucoa and convert existing combustion turbines to gas firing

[30] Prop. IRP Part 1.2 at pags. 1-6 – 1-7.
[31] *Id.* at pags. 1-8 – 1-9.
[32] PREPA Resp. PREB ROI 09-01 at pag. 15.
[33] Prop. IRP Part 1.2 at pag. 1-9.
[34] PREPA Resp. PREB ROI 09-01 at Sec. 4 pag. 10.
[35] Prop. IRP Part 1.2 at pags. 1-9 – 1-10.

> at Mayagüez; and install 18 gas turbines, 23 MW each, at five locations to replace existing Frame 5 units.[36]

The Action Plan adopts each of the above-listed elements.[37] These are hardly modest targets, particularly insofar as the addition of solar PV and battery energy storage systems are concerned. As the IRP Main Report notes, under Scenario 4 (and the Action Plan):

> the system transitions from one based on coal and oil to a system dominated by natural gas, renewables and energy storage. By 2038, 79% of the installed capacity in the system consists of renewable generation or facilities in place for its integration, including solar, battery storage and CHP distributed generation. Total renewable generation accounts for 63% of the total by 2038 with gas generation accounting for 30% of the total (Exhibit 8-13). [38]

In reality, the ESM Plan, S4S2 portfolio and the Action Plan reflect the most rapid deployment of renewables, battery energy storage and distributed generation judged to be feasible in Puerto Rico,[39] taking into account practical constraints relating to procurement processes, development and permitting timelines, coordination of works for the physical interconnection of projects and the evaluation and satisfaction of customer interconnection requests and related feeder upgrades.[40] Given the constraints which PREPA, a potential T&D concessionaire and developers of solar PV and battery energy storage systems will inevitably face, as documented in the Proposed

[36] Prop. IRP, Parts 1.2.2 and 1.2.3 at pags. 1-11 – 1-13; PREPA Resp. PREB ROI 09-01 Sec. 4.2-4.5 at pags. 116-17.
[37] Prop. IRP, Part 10.3 (describing upgrades in the distribution system required to support acceleration of energy efficiency and enabling demand response as well as measures intended to promote energy efficiency yielding 2% per year in demand reductions and 60 MW of demand response programs).
[38] Prop. IRP Part 8.2.4 at pag. 8-25.
[39] The IRP "assumes an accelerated timeline for solar projects, assuming 12 months for the development period (request for proposal, bid evaluation, permitting, and financing) and 12 months for construction. *** This time line assumes fast track permitting, proper submittal of project design for evaluation by PREPA (particularly for mathematical model evaluation, and control, protection and telecommunications design), as well as securing the land for the interconnection line and any additional land acquisition required for interconnection at PREPA's facilities that will be secured by project company. Those projects that require new-build PREPA interconnection facilities (sectionalizer or transmission centers) could require longer development and construction times."). Prop. IRP Part. 6.4.6, pags. 5-22 – 5-22.
[40] Prop. IRP Part 1.2.1 at pags. 1-9 – 1-10; *see also id.* Part 10.1.1 at pags. 9-2 – 9-3.

IRP Main Report at Part 6.4.6,[41] it is simply not realistic, nor would it be responsible, for the Proposed IRP to assume that Puerto Rico could achieve a more rapid uptake of solar PV and battery energy storage systems ("BESS") than is reflected in the Action Plan.

The evidence presented throughout these proceedings establish that the Action Plan, which reaches 40% renewable penetration almost immediately, contemplates one of the most rapid rates of solar PV and battery energy storage development and capacity integration ever achieved anywhere in the world.[42] This 40% solar PV penetration rate is hardly insignificant: in 2018, utility-scale solar PV and distributed solar PV combined represented just 4.6% of the U.S.'s net summer capacity and 2.3% of annual generation; that year, California, the U.S. state with the highest percentage of solar penetration, obtained only 19% of its generation from solar sources.[43] The Opposing Intervenors that take issue with the Proposed IRP's commitment to renewable resources and energy storage may prefer that the rate of renewable penetration in Puerto Rico be even quicker. But they present no evidentiary basis on which the Energy Bureau could rely to conclude that integration rates even more rapid than those assumed in the Proposed IRP and Action Plan could in fact be achieved in the real world. The Energy Bureau should accept the assumptions regarding new resource integration presented in the Proposed IRP and the Action Plan.

EDF asserts that the Proposed IRP analysis inappropriately limited the rate at which renewable and energy storage resources could be deployed and should not have imposed annual capacity expansion constraints on additions of these resources.[44] EDF is incorrect.

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[41] Prop. IRP Part 6.4.6 at pags. 5-22 – 5-23.
[42] *See* Panel I IRP Evidentiary Hearing Feb. 7, 2020 *https://www.youtube.com/watch?v=vIXWJt52Hfk* (Examination of Dr. Bacalao by Commissioner Rivera "To operate a 3,000 MW system with only solar and storage is something that has never been done.").
[43] National Renewable Energy Laboratory, *Q4 2018 / Q1 2019 Solar Industry Update*, David Feldman and Robert Margolis, May 2019 (available at https://www.nrel.gov/docs/fy19osti/73992.pdf).
[44] EDF Brief at pag. 20.

As noted in the Proposed IRP Main Report, there are limits on the number of solar PV and battery energy storage systems that can be effectively carried out in parallel and completed in any year.[45] For planning purposes, the Proposed IRP modeling assumes that the annual limit on solar PV and BESS installations 2020 onwards will range between 300 MW and 1200 MW, with 600 MW as the limit 2022 onwards on most scenarios, with the exception of the low cost of renewable case.[46] All Scenarios assume that solar projects will be developed, permitted and constructed on an accelerated timeline (*i.e.*, twelve (12) months for the development period (from request for proposal, to bid evaluation, then permitting, and financing) and twelve (12) months for construction).[47] Notably, installations of renewable resources in accordance with the specified annual limitations will yield aggregate quantities of renewable resources under all Scenarios and in particular, the ESM Plan and the Action Plan, that are compliant with the renewable portfolio standards imposed by Act 17-2019.[48]

That there will be limits to how much solar PV and BESS capacity can be added to the PREPA system each year is a matter of common sense. There are only so many interconnection projects PREPA can oversee and physically handle in a given period, and there are additional practical, safety and reliability concerns that constrain how much capacity can be added more or less concurrently to an operating transmission system.[49] Indeed, the annual limits on renewable

[45] Prop. IRP Part 6.4.6 at pag. 5-22 and Ex. 6-28, 6-29 and 6-30 (summarizing annual installation constraints for Core Scenarios, Sensitivity 1 and the ESM Scenario).
[46] *See id.* at Ex. 6-28, 6-29 and 6-30.
[47] *Id.*, Part 6.4.6, pag. 5-22 ("Those projects that require new-build PREPA interconnection facilities (sectionalizer or transmission centers) could require longer development and construction times."): *see also id.* at Part 10.1.1 at pag. 9-3 (annual solar PV additions from the ESM Plan shown in Ex. 10-1 "should be considered an objective that could be achieved with streamlined procurement processes and enhanced capabilities either from additional PREPA resources or the new concessionaire. Expedited permitting and financial backing of the PPOA[]s will play a critical role."); *see also id.*, Part 9, pag. 8-4, ¶ 15.
[48] Prop. IRP Part 8.3.8.1 at pag. 8-56 and Part 10.1.1 at pags. 9-2 – 9-3.
[49] Prop. IRP Part 9 at pag. 8-3, ¶ 14 ("The IRP assumes an accelerated timeline for solar and storage projects, assuming fast track of permitting, proper submittal of project design for evaluation by PREPA, and securing the land for the interconnection line and facilities. In addition to unforeseen events that could delay these tasks, this timeline could be

and BESS additions assumed in the Proposed IRP are ambitious, in the sense that PREPA's internal capabilities to support and manage interconnection projects are currently limited and PREPA's current (legally mandated) procurement and approval processes,[50] unless overcome, could limit annual installations to amounts significantly lower than those assumed.[51] They are also ambitious in their sheer scope and novelty: the amount of utility-scale battery energy storage recommended in the Proposed IRP "is much higher than the total capacity currently installed in the whole United States."[52]

Nevertheless, the Action Plan acknowledges, and is designed to respond to, the urgency of adding as much solar PV capacity (backed by BESS) as practical. It recognizes "the need to provide distributed power to critical and priority loads in the MiniGrids as soon as possible, the compelling economics of PV *vs.* existing fossil generation, the pending expiration of the federal Investment tax credits and the requirement to comply with Act 17-2019."[53] The annual limits assumed for planning purposes are reasonable, and observing them will not inhibit PREPA from achieving the a rate of integration of renewable and battery energy storage systems that has never been achieved before.[54] EDF's criticism of the Proposed IRP's recognition of real world practical limitations should be disregarded.

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delayed by limitations on the amount of annual installations that can effectively be carried out in parallel maintaining the continuous operation of the power system.").

[50] *See* Prop. IRP Part 10.1.1 at pags. 9-2 – 9-3.

[51] *See id.*

[52] Prop. IRP Part 9 at pag. 8-4, ¶ 15. The aggregate targeted amount of BESS "represents an installation never done before in a power grid, especially no[t] in an isolated system like the one in Puerto Rico. Hence, it is foreseen that the first storage projects will take more time to be developed and integrated with the power system, as they will be the pilot projects of very large bulk storage in Puerto Rico and the main land. … [Such projects will] have to be developed maintaining the reliability and continuity of the service in Puerto Rico.").

[53] *Id.*

[54] *See* Panel I IRP Evidentiary Hearing Feb. 7, 2020 *https://www.youtube.com/watch?v=vIXWJt52Hfk*

> *Dr. Bacalao*: If we go to the meet level that produces part of the least cost solution, includes the combined cycles just because the storage would be too expensive to just rely on it. Second it puts the pressure to get the cost down to scenario 3. Those are starting from the load, moving to the cost, moving to the other one that is less quantifiable, we have never operated a system of this size with

The Energy Bureau should also disregard criticisms that the Proposed IRP and Action Plan do not place enough reliance upon distributed generation, VPPs and demand response, and that energy efficiency gains, energy efficiency targets, costs of distributed generation and impacts on load are improperly handled in the IRP analysis.[55] The Action Plan is designed to take advantage of the benefits of distributed generation,[56] energy efficiency and demand response,[57] and assumes that the PREPA fleet is restored to and maintained in good operating condition.[58] That is, the Proposed IRP assumes the availability of substantial amounts of distributed generation and demand response (load projections reflect the impact of such resources on the amount of demand to be served),[59] and in all cases the Proposed IRP assumes that energy efficiency programs will

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> only renewables, with only storage. That's the third aspect, if we find that if we integrated renewables for the next four years, five years, maybe six years and we have issues and there are things that the technology doesn't quite address…
>
> *Commissioner Rivera*: I understand. We have never done it. Before Columbus sailed from Spain they never went west. I understand we have never done it. I understand we have to be cautious and what is the concern? that we have never done it? that the we don't know how the system is going to react? that we don't have that technology? that we don't know what technology is going to be needed to implement it? what is what is the concern besides we have never done it?
>
> *Dr. Bacalao*: The concern is our experience in having seen how the technology takes time to mature, how when you start pushing boundaries it takes time to mature that we may not have.
>
> *Commissioner Rivera*: You're saying that solar plus storage is not mature enough at this point to start relying more and more on that technology the next five six seven years?
>
> *Dr. Bacalao*: To operate at 3,000 MW system with only solar and storage is something that has never been done.

[55] *E.g.*, LEO Brief at pag. 24; EDF Brief at pag. 16; NFP Brief at pag. 15.

[56] *See* Prop. IRP, Appendix 4 – Demand Side Resources (showing the basis for the distributed generation forecast (Section 3.1)); *see also* PREPA Resp. PREB ROI 01-18-c PREB-PREPA-01-18-c (expanding on explanation of basis of distributed generation forecast). Note that these resources were explicitly modeled in the IRP (*see, e.g.*, Parts 8.2.4, and 8.3.3) and their impact on reduced supply from utility resources accounted for. Part 3.16, at pag. 3-14, explains that the impact of DG on technical losses was also properly accounted for.

[57] *See* Prop. IRP, Appendix 4, pag. 2-1 and PREPA Resp. PREB ROI 09-01 (showing that Energy Efficiency was modeled in accordance with Regulation 9021 and/or following instructions from the Energy Bureau and show plausible programs as well as an estimate the costs of the EE); *see also* PREPA Resp. PREB ROI 09-01 Sec. 2.2 at pags. 8-9 (summarizing assumptions considered in the modeling of the Low EE and No EE scenarios) and PREB_ROI_9-1_Attach_1-EE-DSM Cost Calculation-v5.xlsx.

[58] *See* Prop. IRP Part 1.2.3 at pag. 1-13 ("PREPA will need to preserve operations and maintenance (O&M) programs to ensure the[] availability [of existing fossil generation resources] until these recommendations [to retire existing fossil units] are in place. It is important that PREPA refrain from pulling back on O&M expenditures until new resource come on line to replace these important assets.").

[59] *See* PREPA Resp. PREB ROI 09-18 PREB-PREPA-01-18 (describing manner in which new customer owned distributed generation, new combined heat and power and energy efficiency would impact system peak demand).

meet the requirements of Act 17-2019 (*i.e.*, 2% per year of incremental savings attributable to new energy efficiency programs through 2037, resulting in 36% cumulative energy savings by 2038).[60] The Proposed IRP analysis shows that incentives for customers to develop customer-owned generation will continue through the planning period, and therefore projections of demand assumed that there would continue to be high levels of penetration of customer-owned generation, such as rooftop solar PV installations, and resources that could be aggregated through VPPs.[61]

Even so, the Proposed IRP's LTCE runs clearly shows that the substantial amounts of distributed generation (including rooftop solar and other forms of customer-owned generation), energy efficiency and demand response anticipated over the planning horizon would not be sufficient to meet projected demand, and would need to be complemented by large amounts of utility scale renewable generation, as well as smaller but still substantial amounts of gas-fired generating capacity.[62] The Proposed IRP and Action Plan therefore contemplate very substantial commitments to the various resources Opposing Intervenors claim they shortchange. Moreover, as Dr. Bacalao testified during the evidentiary hearings, some of the assumed renewable generation and storage resources could be provided through VPP arrangements involving customer-owned resources (so long as such arrangements require the resources to be available, adequately responsive and centrally dispatchable in accordance with a schedule).[63] Thus the Proposed IRP

[60] *See, e.g.*, Prop. IRP Part 8.2 at pags. 8-16 – 8-19 (summarizing assumptions relating to resource availability, RPS requirements and effects on demand of customer-owned generation).

[61] *See* Prop. IRP Parts 8.2.13 and 8.3.10 (showing that when the costs of distributed generation are compared with the possible rates that the customer could face there is a gap that confirms that the incentives for the projected high penetration of customer owned generation would be present); *see also* Corrected Rebuttal Testimony of Nelson Bacalao, Ph.D. ("Reb. Test. Bacalao"), Ex. 8:59, 6:101-103 ("during the analysis we confirmed that the economies driving the development of customer owned generation were likely to stay; this was included in the Rate Impact parts of the IRP report.").

[62] *See generally* Prop. IRP Part 8.2 (discussing assumptions relating to availability of savings attributable to new energy efficiency programs, effects of customer-owned generation and compliance with Act 17-2019 RPS requirements).

[63] *See* Sunrun Brief at pags. 2, 4 (citing evidentiary hearing transcript excerpts in which Dr. Bacalao identifies characteristics that would make VPPs the functional equivalent of utility-scale solar resources plus batteries).

and Action Plan do not preclude or even discourage efforts to aggregate solar and battery resources, potentially including customer-owned resources, into VPPs, or to develop other customer-centric supply resource solutions that are competitive with the costs of utility-scale solar PV.

Several other criticisms focused on the Proposed IRP's reliance on gas-fired generation require only brief comment. For example, the argument that the "gas heavy" plans do not outperform a "renewables heavy" portfolio on cost[64] is only valid in limited circumstances in which the cost of renewables is consistently and significantly lower than expected in the reference case. In such circumstances, Scenario S3S2S8B may appear to be lower cost than other Scenarios;[65] however, there can be no assurance that the real world cost of developing, financing and constructing renewables over the planning period will in fact be consistently lower than reference case projections. The ESM Plan, identified as PREPA's Preferred Resource Plan, is actually the least cost resource portfolio under other realistic circumstances.[66] Said plan has the additional virtue of including resource development "hedges," as discussed in more detail below, that mitigate the risk that load may be greater than projected or renewable resource development may proceed more slowly than the plans assume.

The claim that the Proposed IRP underestimates the capital costs of gas-fired plants (and of related gas delivery infrastructure)[67] is predicated on a misunderstanding of the manner in which capital costs were estimated generally through the development of the Proposed IRP. As explained in detail in Part 6.3 of the Proposed IRP Main Report, capital costs of future generation resources were estimated for purposes of Proposed IRP development through use of the PEACE capital cost

[64] LEO Brief at pag. 7.
[65] *See* PREPA Resp. PREB ROI 09-01 at pag. 10 (showing that under Low EE, S3S4 has a 2.4% lower NPV of revenue requirements than the ESM and 5.0 % lower under No EE); *see also* Prop. IRP Ex. 1-9, pag. 1-20.
[66] *See* PREPA Resp. PREB PREB-PREPA-09-01 at pag. 10.
[67] *E.g.*, LEO Brief at pag. 43.

estimating module associated with the GT Pro software package.[68] This module uses equipment selection and sizing as determined in GT Pro to estimate equipment and installation costs, to which are added other components, including contractor engineering, commissioning, overhead, escalation, contingency and fees, to determine an engineering, procurement and construction price. Owner's costs for development, permitting and legal/contracting activities, and cost escalation were included, as were total development and financing costs, such as interest during construction, financing fees, project management, mobilization operation and finance, startup fuels and consumables. Adjustments to labor productivity and labor and materials costs specific to Puerto Rico were made based on the U.S. Department of Defense Area Cost Factor for Puerto Rico of 16% percent. Therefore, cost estimates developed through PEACE module runs provide a consistent approach to the development of cost estimates for all generation resource options, including gas-fired generation, as well as solar photovoltaic generation resources. Such estimates are suitable for planning purposes and are broadly accepted as such in the electric utility industry.[69]

Assertions that the Proposed IRP underestimates the costs of natural gas[70] are neither well founded nor justified. The Proposed IRP Main Report explains at some length the manner in which PREPA developed delivered natural gas price forecasts for the various existing and proposed generating facilities that could receive and consume natural gas.[71] Those forecasts reflect Siemens' outlook for Henry Hub natural gas prices,[72] the benchmark against which LNG delivered to Puerto Rico is and will be priced. PREPA developed base case delivered natural gas prices, as well as two sensitivities (High and Low cases, reflecting plus or minus one standard deviation

[68] Prop. IRP Part 6.3.2.2 at pags. 5-11 – 5-13.
[69] *See id.*
[70] *E.g.*, LEO Brief at pag. 41.
[71] *See generally* Prop. IRP Part 7.2.
[72] The development of this outlook is described in general terms at Prop. IRP Part 7.2.5 at pags. 7-25 – 7-26 and in Prop. IRP Attachment A.

around the expected base commodity Henry Hub price).[73] Siemens specifically considered in its estimates the LNG pricing formulae found in PREPA's existing natural gas supply agreements and, in response to Energy Bureau requirements of information 9 and 10, incorporated into revised model runs the delivered natural gas price formula adopted in the recently negotiated and approved Naturgy Aprovisionamientos S.A. Gas Sale and Purchase Agreement.[74] In this way, the most recent Proposed IRP model runs performed incorporate the natural gas pricing provisions actually applicable to the delivery of natural gas to Puerto Rico. Thus, PREPA has in fact based its analyses on precisely the sort of "real world data on gas prices" which the Local Environmental Organizations criticizes it for not having considered.[75]

Opposing Intervenors are plainly wrong in arguing that the Action Plan does not address the potential for "stranded costs" associated with gas-fired generation and gas delivery infrastructure, and that investments in gas will not be fully amortized by the time gas plants must be shut down to meet renewables goals.[76] The Proposed IRP Main Report makes it clear that the Proposed IRP explicitly incorporates in its capital cost recovery analyses the requirement that all fossil generation be retired per Act 17-2019 by 2050.[77] This is confirmed in the Proposed IRP workpapers. The capital cost component ("Fixed O&M Aux 1") reflected in those workpapers is

[73] Prop. IRP Part 7.2.5 at pags. 6-28 – 6-30.
[74] *See Resolution and Order* in Case No. NEPR-AP-2019-0001 (issued March 11, 2020) (granting Energy Bureau approval of the Amended and Restated Power Purchase and Operating Agreement between EcoEléctrica, L.P. and PREPA (the "ECO PPOA") and the Amended and Restated Natural Gas Sale and Purchase Agreement between Naturgy Aprovisionamientos, S.A. and PREPA (the "Naturgy GSPA")).
[75] *See* LEO Brief at pag. 41.
[76] *E.g.*, EDF Brief at pag. 38; NFP Brief at pag. 12; OIPC Brief at pag. 5.
[77] Prop. IRP Part 6.2.2 at pag. 5-3 ("[G]iven the mandates of Act-17-2019 that defines 2050 as a target for 100% renewable generation, the Capital Recovery Period of thermal generation is reduced as the development date is closer to 2050, so that the asset would be totally paid for at that time and could be retired.").

higher for resources that are built closer to 2050 (that is, if a resource were built in 2025 it would have a 25-year life, whereas one built in 2030 is assumed to have a 20 year life).[78]

Opposing Intervenors are also incorrect in asserting that the Proposed IRP does not address the environmental impacts associated with the operation of gas-fired plants and natural gas production, delivery and use.[79] As discussed in greater detail in Part XIII below, all of the Proposed IRP's scenarios include a discussion of the manner in which environmental and renewable portfolio compliance will be achieved given the resource mix assumed, and they describe in detail how emissions will be reduced over time.[80]

IV. CERTAIN MODEL RUNS INPUT OF SOME FIXED DECISIONS IS APPROPRIATE.

PREPA's witnesses have previously responded to arguments to the effect that certain "fixed decisions" pertaining to resource selection were improper.[81] As the Proposed IRP Main Report states[82] and Dr. Bacalao has testified,[83] most of the resources identified in the individual model runs performed in support of the Proposed IRP were selected on the basis of the least cost strategy;[84] in only a few cases were fixed decisions added (as, for example, in the case of the ESM Plan's inclusion of two gas-fired CCGTs at Palo Seco and Yabucoa and the planned replacement

[78] *See, e.g.*, Workpaper supporting S5S1B S5S1B_Metrics_Base_Case_SII.xlsx. This case has two Combined Cycle units (369 MW) being added in Costa Sur, one in 2025 and one in 2028. The unit built in 2025 (New Resource 5487 from RMT4_1 Generic CC_F.05_gas) has a capital cost component (Fixed_Cost_Aux) of $37.03 million/year, while the unit built in 2028 (New Resource 5499 from RMT4_1 Generic CC_F.05_gas) has a value of $40.2 million/year. *See also* Resource Year Spreadsheet, Column Z and, for example rows, 2033 and 2034 that show the 2028 values.
[79] *E.g.*, LEO Brief at pags. 54-56; EDF Brief at pags. 35-36.
[80] *See* Prop. IRP Parts 8.2.5 (Scenario 4 RPS and environmental compliance), 8.3.8 (ESM RPS and environmental compliance), 8.4.5 (Scenario 1 RPS and environmental compliance), 8.5.3 (Scenario 3 RPS and environmental compliance), and 8.6.3 (Scenario 5 RPS and environmental compliance). The workpapers for each of the scenarios contain the details on other effluents (CO, SOx, NOx and FPM). *See, e.g.*, PREB_ROI_9-1_Attach_7_ESM_Low EE.xlsx Emissions Spreadsheet and use the dropdown menu on the first table to see other effluents (currently in CO_2). For the ESM Low EE case we see that CO_2 drops by 89% by 2038, SOx is practically eliminated (99.9% reduction), FPM drops by 95%, and NOx drops by 98%.
[81] *See, e.g.*, Rebuttal Test. Bacalao, 12:204-13:223.
[82] Prop. IRP Part 5.4 at pag. 4-4 and Part 8.3, at pags. 8-46 – 8-49.
[83] Rebuttal Test. Bacalao, 12:208-13:223.
[84] *See* Prop. IRP Part 8 at pags. 8-11 – 8-12.

of all existing Frame 5 gas turbine peaking units with new 23 MW units to come on line by 2021).[85] In each case involving a fixed decision, the inclusion of this decision in the model run was clearly disclosed.

Opposing Intervenors' challenges to the Proposed IRP's "fixed decisions" to include fossil generation resources in specific applications[86] are unfounded. The only fixed decisions that were modeled across all scenarios were those related to the need to support service to critical loads with thermal generation. This approach was based on the reasonable assessment that thermal generation resources (gas turbines or RICE) best meet the need to have dependable generation that can be available during and immediately following a major weather or other event that affects electric service.[87] As expert witness Dr. Bacalao noted, the essential requirement is to have available dependable generation resources that the critical loads can count on during and immediately following a major event.[88] While historically thermal generation (gas turbines or RICE) have been considered necessary to meet this requirement, it is possible that other energy sources (*e.g.*, hardened solar PV plus battery energy storage) could also meet it. Dr. Bacalao frankly acknowledged that, where renewable resources plus storage can meet the essential requirement that they be available as and to the extent needed in emergency circumstances, they should be

[85] *Id.*, Part 1.2 at pags. 1-7 -1-8 and Ex. 1-6; Part 5.4 at pags 4-5 ("The ESM plan has some decisions that are fixed and not subject to the LTCE selection. This includes a land based LNG terminal at San Juan and a new 302 MW Combined Cycle Gas Turbine (CCGT) to be developed at Palo Seco by 2025 (or as early as possible); these investments will follow the conversion of San Juan 5&6 to gas (in 2019), which will be supported initially by a ship-based LNG that will be replaced by the land-based when commissioned. At Yabucoa a Ship-Based LNG terminal is to be developed and 302 MW CCGT is installed by 2025 (or as early as possible). At Mayagüez, a Ship-Based LNG terminal is developed, but the only fix decision is to convert the existing 4x50 MW aeroderivative units to be able to burn natural gas."); *see also* Part 8.3 at pag. 8-46.
[86] *E.g.*, LEO Brief at pag. 17.
[87] PREPA Ex. 1.01 2018 Integrated Resource Plan Appendix 1: Transmission and Distribution, § 2.3.1 at pags. 2-6 and PREPA Resp. PREB ROI 07-06. PREB-PREPA-07-06.
[88] *See* Panel I IRP Evidentiary Hearings: https://www.youtube.com/watch?v=zkGmgsj6OTs&t=9s Feb. 7 2020.

considered.[89] But it was entirely reasonable for the Proposed IRP to proceed from the going-in assumption that some amount of thermal generation will be required at various locations around the island to ensure that critical loads can be served during and after disruptive events.

Some additional fixed decisions were incorporated into the ESM Plan, and therefore into the Action Plan. These include the retention of the existing EcoEléctrica natural gas-fired generating facility in the south of the Island and the conversion of gas-fired generating facilities at Mayagüez and the addition of CCGTs at Yabucoa and Palo Seco[90] The inclusion of these additional fixed decisions did not, however, improperly steer the Proposed IRP's analysis away from renewables and impede compliance with the requirements of Act 17-2019, nor did this prevent a plan incorporating these fixed decisions from qualifying as a least cost alternative under certain circumstances. Even with the additional fixed decisions to install gas-fired generation at three locations, the ESM proved to have lower costs, on a NPV of Revenue Requirements basis in both the "Low-EE" and "No-EE" cases, than Scenario 4, which did not include these fixed decisions.[91] Moreover, the fixed decisions to include certain gas-fired generating facilities do not prevent the ESM Plan from achieving full compliance with the Act 17-2019 renewable resource integration targets of 20% by 2022, 40% by 2025 and 60% by 2040, which are modeled as constraints to be met by all plans (as shown in the IRP Main Report and "metrics" workpapers).[92] The fixed decisions included in the Proposed IRP and Action Plan are legitimate, adequately

[89] *See* Panel I IRP Evidentiary Hearings: https://www.youtube.com/watch?v=zkGmgsj6OTs&t=9s Feb. 7 2020 (*Dr. Bacalao*: "No regrets renewables and storage, no regrets integration of DGs, no regrets maximize the amount of energy efficiency, no regrets hardening of the distribution and transmission system at the mini-grid level. Least regret, doing our planning engineering studies for the deployment of combined cycles or let's not use the term combined cycle. Deployment of baseload generation fast responding in the north of the first one particularly, Palo Seco and then Yabucoa and Mayagüez, those are cases that minimize regret.").

[90] Prop. IRP Part 1 at pags. 1-5 – 1-8; *see id.* at Part 10.1.3 – 10.1.8 at pags. 9-4 – 9-9; *see also* PREPA Resp. PREB ROI 09-01 at pags. 11-12.

[91] PREPA Resp. PREB ROI 09-01 at pag. 10.

[92] *See* Prop. IRP Ex. 8-55 (ESM) and PREB-PREPA-09-01 Attach 4.xlsx and PREB-PREPA-09-01 Attach 7.xlsx, Metrics tab line 46 & 47.

supported on resiliency and risk mitigation grounds,[93] and consistent with the goal of achieving least cost resource additions over a range of possible cases. These decisions are a feature of the Proposed IRP and Action Plan, not a flaw.

Thus the inclusion of fixed decisions in the ESM Plan is amply justified on the record. As the IRP Main Report provides, the ESM Plan is a variation of Scenario 4 that includes a set of pre-defined investment decisions that considers procurement options presented by the Public Private Partnership Authority, pricing structures necessary to retain existing natural-gas fired generation in the south, and locational alternatives for new large scale CCGTs.[94] Its purpose is to expedite the implementation of a preferred plan utilizing procurement options that have the highest probability of achieving the goals of improving reliability and reducing costs for ratepayers.[95] The ESM also preserves optionality, through recommended early development and permitting efforts, for alternative resource locations. It contains implementation options consistent with the broad framework of the IRP scenarios designed to support generation diversity, grid resiliency, and cost efficiency and that are judged to have the best chance of success.[96] The ESM was benchmarked against the formulated least cost plans,[97] and was found to be comparable in terms of NPV to the S4S2 Plan, and indeed lower cost in terms of a number of metrics, including the average cost of energy for the period 2019-2028, than Scenario 4 in the "No EE" and "Low EE" cases.[98] Thus, the inclusion of the fixed decisions in the ESM Plan do not ultimately prevent that plan from being a least cost solution, notwithstanding Opposing Intervenor claims to the contrary.

[93] PREPA Ex. 1.01 Appendix 1, § 2.3.1, Prop. IRP Part 1.2.3 at pags. 1-12, 1-13 and Part 10.1.7 at pags. 9-7 and 9-8.
[94] IRP Prop. Part 5.4 at pags. 4-4 – 4-5; Part 8.3 at pags. 8-46 – 8-48.
[95] *See* Prop. IRP at Ex. 2.0, Considerations on the ESM Plan.docx.
[96] *Id.*, Part 8.3 at pag. 8-46.
[97] *Id.*
[98] *See* PREPA Resp. PREB ROI 09-01 Sec. 3 at pags. 10-14.

The requirement to meet the critical load with dependable generation was also forced.[99] But, as shown in PREPA's responses to the Energy Bureau's Seventh Set of Requirements of Information, question 6, even in cases in which these decisions are not forced, similar levels of peakers are installed (448 MW versus 421 MW), but later in the planning horizon (most in 2023).[100] In other words, even when the AURORA model is permitted to determine whether and when to add peaker resources on an economic basis, those resources are selected (and even more such resources are selected).[101] Thus, the incorporation of the fixed decision to replace existing costly and poorly performing peakers with new dependable sources of generation does not prevent the plans incorporating this decision from being least cost (and, significantly, offers the additional benefit of enabling the various MiniGrids to maintain supply to critical and priority loads).

Consequently, the imposition of fixed decisions into some IRP model runs and, in particular, into the ESM Plan, was not the error Opposing Intervenors claim it was. Rather, the inclusion of these fixed decisions yields a plan – the ESM Plan, PREPA's choice as its Action Plan – that "represents a low cost, practical option that provides the high level of renewable energy contribution and significantly improves the resiliency of the system" while including flexibility, allowing PREPA to "alter its implementation to follow the S4S2 or S4S2S9 plans should the Puerto Rico load and progress of the new unit additions warrant such an adjustment."[102] PREPA submits that these are critically important attributes, and their achievement through the Action Plan is ample justification for its incorporation of certain fixed decisions.

[99] Reb. Test. Bacalao, 12:208-13:223.
[100] PREPA Resp. PREB ROI 07-06 at pags. 4-8.; *see also* Reb. Test. Bacalao, 12:208-13:223.
[101] Reb. Test. Bacalao, 12:208-220.
[102] Prop. IRP Part 10.1 at pag. 9-2.

V. THE ENERGY BUREAU SHOULD ADOPT THE ACTION PLAN'S PROPOSED INCLUSION OF PROJECT DEVELOPMENT "HEDGES" AGAINST DEMAND AND RESOURCE ADDITION UNCERTAINTIES.

The Proposed IRP Main Report provides a summary of the reasons why it is critically important for PREPA to preserve optionality, including the ability to call for the development of gas-fired generating resources as "hedges" against greater-than-anticipated load or less-than-anticipated renewable and storage project completion:

> Should the declining load forecast not materialize, resources must be available to serve load in a resilient and reliable manner. This load growth uncertainty requires additional planning and optionality, which is manifest in the Action Plan and its associated recommendations. Load growth is a very real concern to PREPA, and growth at this moment is highly uncertain and could go from negative to positive should federal monies stimulate the economy, out-migration reverse, or industrial and tourism industries increase. Developing new generation resources take time, in the order of several years, and PREPA is designing a plan with the necessary flexibly to initiate development opportunities that can be implemented should the forecast prove to be incorrect[.][103]
>
> …
>
> [H]ow the PREPA customer load evolves presents one of the greatest uncertainties that could impact these plans. Economic stimuli associated with federal monies, improved electrical reliability, and overall infrastructure improvements could favor higher load growth that requires additional contingency planning. Likewise, if energy efficiency gains or customer provided distributed generation do not materialize at the levels modeled, future load could be higher than forecast.[104]

Some Opposing Intervenors challenge the Action Plan's inclusion of this "hedge" feature.[105] Their challenges reflect their general aversion to the development of new gas-fired generating resources, not any evidence-based refutation of the proposition that PREPA could find itself short of generation resources if demand were not to decline as projected or third-party resource developers do not succeed in bringing new capacity online at the ambitious pace the Proposed IRP assumes. The Energy Bureau should reject these challenges to the Action Plan's

[103] Prop. IRP at pag. 1-3.
[104] *Id.* at pag. 1-8.
[105] *E.g.*, LEO Brief at pag. 44; *see also, e.g.*, EDF Brief at pag. 20; OIPC Brief at pag. 6.

"hedge" elements, and should authorize PREPA to preserve the ability to accelerate or discontinue development of gas-fired generation at Yabucoa or Mayagüez should actual demand make this the prudent course in the interest of ensuring generation resource adequacy in the face of uncertainty.

PREPA's response to the Energy Bureau's Ninth Requirement of Information perfectly illustrates the value of the gas-fired generating facility "hedge" included in the Action Plan.[106] As PREPA's response shows, with the base cost of renewable resources, the ESM Plan (and, therefore, the Action Plan) is the least cost plan in circumstances in which aggregate demand does not decline as projected. Demand could fail to decline as projected because Puerto Rico economic activity increases relative to the levels assumed, or because energy efficiency gains or growth in customer-owned generation do not reduce demand as anticipated. Or supply resources may not be developed at the pace required to meet the demand, because renewable resource and energy storage developers do not succeed in constructing and commissioning the very large amounts of capacity the Proposed IRP expects them to bring online in record time. In any of these circumstances (and, it should be noted, these circumstances are not mutually exclusive), Puerto Rico will need the generating capacity that preserving the "hedges" will make available.

Going the route of not engaging in early pre-development and permitting efforts for the Yabucoa and Mayagüez gas-fired facilities would leave PREPA exposed to the responsibility of dealing with higher load by running inefficient and costly generation, or by contracting for the installation of more renewable generating capacity than would be economic. Neither of these alternatives is desirable; both can be avoided if PREPA is allowed to move ahead with preliminary

[106] *See generally* PREPA Resp. PREB ROI 09-01.

work that, if necessary, can support the later development and construction of capacity needed to serve demand as it evolves.

VI. ALTERNATIVE PLANS SOME OPPOSING INTERVENORS ADVOCATE ARE NOT SUPERIOR TO THE PREFERRED RESOURCE PLAN AND ACTION PLAN.

Two Opposing Intervenors recommend that the Energy Bureau reject PREPA's Preferred Resource Plan and the Action Plan and instead approve alternative plans. EDF urges the Energy Bureau to approve a "modified IRP" based on the S3S2S8B Scenario/Strategy/Sensitivity case;[107] while OIPC recommends as an alternative to the ESM Plan the S4S2S9 Scenario/Strategy/Sensitivity case, modified in a number of respects.[108]

PREPA submits that these Opposing Intervenors have failed to show that their recommended alternatives are superior to PREPA's Preferred Resource Plan and to the Action Plan. Neither S3S2S8B nor S4S2S9, with the modifications EDF and OIPC propose, would include "hedges" in the form of options to develop gas-fired generating capacity at Yabucoa and Mayagüez which PREPA believes must be preserved in order to address the possibility that electricity demand could outstrip available supply. Nor would they include the development of a gas-fired CCGT at Palo Seco.[109] The alternative plans promoted by EDF and OIPC therefore would limit PREPA's ability to respond to circumstances in which renewables cost more than envisioned in the low renewables cost case, developers do not succeed in constructing adequate amounts of renewable and battery energy storage capacity to meet demand as legacy fossil resources are retired, or demand does not decline as projected. Both alternatives would also

[107] EDF Brief at pags. 1, 40-42; *see also Amicus Brief Filing of Rocky Mountain Institute*, Case No. CEPR-AP-2018-0001 (filed Dec. 20, 2019) ("RMI Amicus Brief") at pags. 4-6, 16-17 and 24.
[108] OIPC Brief at pags. 9-11.
[109] EDF Brief at pag. 44; OIPC Brief at pags. 10-11; *see also* RMI Amicus Brief at pag. 17.

foreclose development of a large generating resource in the north, at Palo Seco, near the San Juan load center, which PREPA and the U.S. Department of Energy believe would be critically important to the maintenance of service in the north during and following weather events that impact long-distance transmission lines.[110] PREPA firmly believes that it would be irresponsible to declare "off limits" the addition of new, highly efficient, clean gas-fired generating capacity at the same time that renewable resources plus storage are to be added at an unprecedented pace, given the risks that these resources may cost more than projected or may come on more slowly than required, or both.

PREPA acknowledges that the S3S2S8B portfolio has some attractive attributes. As noted in the IRP Main Report, Scenario 3 Strategy 2 offers the lowest NPV under the base load forecast by a narrow margin, but, it must be noted, subject to the critical assumption that solar PV and energy storage costs will consistently come in at the low end of the range of projected capital costs.[111] The comparative NPV advantage of S3S2 over S4S2 and the ESM would disappear if load turns out to be at the high end of the forecast range, and S4S2 would have a lower NPV than S3S2 if load turns out to be at the low end.[112] The S3S2 portfolio also has significant disadvantages, including high capital costs, high technology risk and high sensitivity to the cost of renewable resources.[113] Implementation of this portfolio, moreover, would present practical system management issues, because the large amount of solar PV it assumes would be almost

[110] *See* U.S. Department of Energy, *Energy Resilience Solutions for the Puerto Rico Grid* (June 2018) (available at https://www.energy.gov/sites/prod/files/2018/06/f53/DOE%20Report_Energy%20Resilience%20Solutions%20for%20the%20PR%20Grid%20Final%20June%202018.pdf), at pags. 24 and 55 (recommending analysis on re-powering Palo Seco with alternative fossil fuels to reduce the criticality of the transmission system when recovering from anticipated extreme events in the future).
[111] *See* Prop. IRP Part 8 at pag. 8-11.
[112] *Id.*
[113] *Id.* at pag. 8-14.

double the forecasted peak load as it would decline over the planning horizon, increasing the risks of curtailment and potentially straining energy storage capacity.[114]

To PREPA, which will continue to have the responsibility of procuring resources required to satisfy electric demand on a reliable and resilient basis, the disadvantages of the S3S2S8B portfolio and of the modified S4S2S9 plan are significant. Both plans would limit PREPA's ability to secure capacity from gas-fired facilities if it turns out that renewable resources are not deployed in amounts adequate to meet demand. PREPA sees substantial risk that, despite its, Siemens' and the Energy Bureau's best efforts, any IRP selected could be wrong about the future cost of renewables, about the future trajectory of demand, about the ability of the market to bring renewables and storage online at a pace never before achieved, or about all of these things at the same time. In PREPA's view, its Preferred Plan and the Action Plan would equip it best to react to the consequences of being wrong; the S3S2S8B portfolio and the modified S4S2S9 plan which EDF and OIPC advocate would leave PREPA much more exposed to the consequences of being wrong, and with many fewer options to mitigate these consequences.

The Energy Bureau should grant PREPA leave to proceed, as the Action Plan proposes, with the pre-development activities required to maintain the "hedges" represented by the Yabucoa and Mayagüez gas-fired generating projects. It should reject Opposing Intervenor recommendations that PREPA be directed to adopt alternative plans.

[114] *Id.* at pags. 8-11 and 8-77 – 8-78; *see also* PREPA Resp. PREB ROI-01-54 c.

VII. THE MINIGRID ARCHITECTURE ADVANCED IN THE PROPOSED IRP AND ACTION PLAN WOULD ESTABLISH A SOUND FOUNDATION FOR THE FUTURE OF PUERTO RICO'S ELECTRIC GRID.

Some Opposing Intervenors question aspects of the MiniGrid construct incorporated into the Proposed IRP and Action Plan.[115] They claim that the proposed MiniGrids are too reliant on thermal resources and instead should rely on distributed renewables plus storage.[116] They also question whether implementation of the proposed MiniGrids will actually result in a more resilient grid.[117] One Opposing Intervenor states that the Energy Bureau should not approve the Action Plan proposal "to spend $3.8 billion in the next three years" on transmission-level investments related to the MiniGrid concept;[118] another suggests that the Energy Bureau should grant conditional approval for the development of only one MiniGrid.[119]

These arguments misapprehend the MiniGrid concept as it is presented and developed in the Proposed IRP, the Preferred Resource Plan and Action Plan. The MiniGrid concept must be understood as one designed to create local resilient transmission systems that will provide a minimum level of interconnection between local resources (including local renewable generation resources and storage, as well as conventional thermal resources) and local loads, with emphasis on critical and priority loads, ensuring that service to these loads can be timely restored following a major event.[120] There is nothing in the MiniGrid concept that is opposed to the use of distributed generation (including VPPs); quite the opposite: as the grid is recovered and operates within the

[115] *E.g.*, EDF Brief at pags. 26-27; LEO Brief at pag. 36; NFP Brief at pags. 13-15.
[116] *E.g.*, EDF Brief at pag. 27; NFP Brief at pag. 15.
[117] EDF Brief at pag. 26.
[118] LEO Brief at pag. 36.
[119] EDF Brief at pag. 50.
[120] *See generally* Prop. IRP, Appendix 1 (Transmission & Distribution Design). Prop. IRP Part 8 discusses MiniGrid implementation and resiliency-related consequences for Scenario 4 (at Part 8.2.8, pags. 8-29 – 8-31), the ESM Plan (at Part 8.3.6, at pags. 8-54 – 8-55), Scenario 1 (at Part 8.4.4, pags. 8-69 – 8-70), Scenario 3 (at Part 8.5.5, pags. 8-78 – 8-79) and Scenario 5 (at Part 8.6.5, pags. 8-86 – 8-87).

minimum requirements of voltage regulation and frequency, distributed generation will be able to interconnect to the grid, benefiting both the local prosumer and the system at large.

The Proposed IRP offers a useful summary of the concept:

> A critical component of the formulation of the 2018 Integrated Resource Plan (IRP) is the identification of electrical islands or "MiniGrid[s]" into which the system may be segregated after a major atmospheric event (e.g. hurricane). In other words, the MiniGrids are regions of the system that are interconnected with the rest of the electric power system via lines that may take over a month to recover after a major event, and should be able to operate largely independently, with minimum disruption for the extended period of time that would take to recover full interconnection. In addition to the MiniGrids, there are also microgrids located within some of the MiniGrids that will be isolated from the MiniGrid after a major event.[121]

As shown in Appendix 1 to the IRP Main Report,[122] the investments in MiniGrid transmission system upgrades, controllers and communications infrastructure will yield resilient interconnections between substations serving critical and priority loads and local resources.[123] These local resources would include not only local distributed generation (typically, solar PV plus battery installations) for which no transmission would be required but also, and critically, the local utility scale generation resources identified in the Proposed IRP[124] that play a fundamental role in reliably supplying load within each MiniGrid within acceptable levels of quality of service (voltage and frequency). Without such local utility scale resources, the level of load shed in a major event

[121] Prop. IRP Part 8.2.8 at pags. 8-31 – 8-33.
[122] *See* Appendix 1 Sec. 2.3.2 (MiniGrid Transmission / Distribution Design), pp. 2-7 for an overall description of the design and Sec. 2.13 (Summary of Transmission Investments) for the investments by driving factor (technical justification) and pags. 2-98 – 2-103 (showing that at the 115 kV level the bulk of the investments are for creation of a backbone reliably interconnecting substations with loads and resources and at the 38 kV level for interconnecting substations supplying critical loads).
[123] *Id.* at Appendix 1 Sec. 2.5.4 at pags. 2-22 – 2-26 , 2.6.4 at pags. 2-36 – 2-40 , 2.7.4 at pags. 2-47 – 2.51- 2.8.4 at pags. 2-54 – 2-58, 2.9.4 at pags. 2-65 – 2-71, 2.10.4 at pags. 2-76 – 2-80 and 2.11.4 at pags. 2-89– 2-96; *see also* Prop. IRP Parts 10.2.1 and 10.2.2, at pags. 9-11 – 9-15.
[124] *See* Prop. IRP Part 8.2.1, pags. 8-19 – 8-20 (discussing capacity additions contemplated by S4S2); Part 8.3.1, pags. 8-46 – 8-48 (discussing capacity additions contemplated by the ESM Plan); Part 8.4.1, pags. 8-63 – 8-66 (discussing capacity additions contemplated by Scenario 1); Part 8.5.1, pags. 8-72 – 8.74 (discussing capacity additions contemplated by Scenario 3); and Part 8.6.1, pags. 8-81 – 8-83 (discussing capacity additions contemplated by Scenario 5).

would be substantial and the distributed generation would be confined to serving the local loads, if storage is present.[125] So, for example, the generation portfolio identified as S4S2 would eventually serve at least 80% of peak demand needs from local generation resources (solar and battery storage plus local thermal generation within the individual MiniGrids), and with the MiniGrid transmission infrastructure this generation can be timely and reliably delivered to the load.[126] Similar observations can be made with respect to all Scenarios, including the ESM and the Action Plan, which propose the incorporation of resources to fully meet critical load requirements with local generation by 2021. It is important to note that without the addition of the resilient MiniGrid transmission facilities, this local generation would be ineffective.[127]

Local thermal generation has generally been viewed as necessary to supply critical loads because thermal generation has historically been uniquely capable of providing "full coverage right after the event and before the renewable generation (generally, solar PV) and battery storage systems are back online."[128] In those cases in which renewable generation plus storage can satisfy this same "full coverage" criterion, local solar PV plus battery storage could be considered as part of the solution for individual MiniGrid generating resource needs.[129] But where renewable

[125] *See* Appendix 1 (analysis of lost load) at Sec. 2.15 at pags. 2-104 – 2.106.
[126] Prop. IRP Part 8.2 and Appendix 1, Sec. 2.5.2 at pag. 2-18, 2.6.2 at pag. 2-28, 2.7.2 at pag. 2-42, 2.8.2 at pag. 2-51, 2.9.2 at pag. 2-61, 2.10.2 at pag. 2-73 and 2.11.2 at pag. 2-80.
[127] *Id.*, Part 8.2.8 at pag. 8-31 and Part 8.3.6 at pags. 8-56 – 8-57.
[128] *See* Appendix 1, Sec. 2.3.1 at pag. 2-6.
[129] *See* Panel F Part I Feb 5 2020 https://www.youtube.com/watch?v=8nIYVqDaEb8&t=2s at 3:16:03:

> *Commissioner Rivera*: On the rebuttal testimony that you presented on December 20th of 2019, but I refer you to page 7 …The page essentially covers a portion of your testimony. It's an answer to a question regarding, I want to read the question in whole, it says witness for Not-for-Profit Intervenors: PREPA should be directed to revise its approach to the design of mini-grids to minimize their reliance on thermal resources, and should make only minimal investments in natural gas-fired generation facilities and infrastructure. Do you agree? Your response was, "no I do not," then you elaborate into the system which is: you present this question very similar to the one that we are having here saying the primary benefit of having thermal is a service you have like what you call "black start", essentially I go there, I push a button and my generator starts. Well, it's a little more complicated than that, but it's assumed that is some more relatively faster, much much faster, than any other resource. However, on the last sentence of that answer which covers line 120 - 122 it says: "Thus, in as much as other resources are certified and guaranteed to match the expectation of availability they could be considered to supply in the critical load." I would like to concentrate on that answer

resources plus battery energy storage systems cannot be shown to be capable of providing the required "full coverage," thermal resources can readily be sited within the MiniGrids in order to yield the more resilient grid which the Proposed IRP targets.

Implementation of the MiniGrid concept is essential if Puerto Rico's electric grid is to become capable of supporting electric service to critical and priority loads during and following major disruptive events that impact transmission systems.[130] It seems self-evident that the institution of MiniGrids centered on local supply resources and capable of operating independently would indeed enhance resiliency, particularly when one considers the difficulties PREPA encountered in restoring service to many areas following Hurricane Maria. But the Proposed IRP actually quantifies the resiliency-related benefits which MiniGrid capability would yield, by estimating the economic impact of disruptions of power service to customers and adding the result – the "value of lost load," or "VoLL" – to the NPV of revenue requirements over the IRP planning horizon in order to capture the value of the resiliency MiniGrids will promote.[131] In this way,

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and what does that entail? Does that mean that if it can be guaranteed that the resource is going to be available right after the event under similar conditions of availability, will the results be different?

Dr. Bacalao: It's interesting that you pointed that because that's exactly what the point I was trying to make at the moment you directed to my testimony. I would say that right now the IRP and the plan was presented in something that we do know can be achieved. As you said, you press a button and almost it's there, we recovered the system in that way, the system is recovered in that way continuously. In as much as somebody can guarantee and demonstrate…Yes, I can certify the way we've designed this system would be equivalent to a black start unit and inverters have to be able to provide Black start. Then its equivalents megawatts available, the only thing that we're saying here from a technical point of view ourselves is that we need these many megawatts reliably.

See also Panel F Part II Feb 5 2020 https://www.youtube.com/watch?v=vIXWJt52Hfk&t=9059s at 2:25:44:

LEO's Raghu Murphy: Ok, and we discussed how when the mini-grids concept was designed, that distributed generation especially for critical loads was only thermal and now we're talking about that distributed generation being technology-neutral possibility.

Dr. Bacalao: Well, I just wanted to make sure that everything was properly understood, and by that, you have to go back to what triggered the need and what triggered the need is to be available to get to your loads as soon as possible. So, then when I was asked can only GTs do that? Well no, I'm only saying that there is need. Something that meets that need, perfect.

[130] *See generally* Prop. IRP Part 10.2 at pags. 9-11 – 9-14 (describing a comprehensive list of transmission system-related projects required to bring existing PREPA transmission facilities up to current or new standards and new construction of infrastructure, including hardening of transmission lines and substations, required to support MiniGrid operations as part of the Action Plan).

[131] *See* Prop. IRP Part 7.3 at pags. 6-36 – 6-38.

PREPA has used VoLL calculations to estimate the economic impact of *not* implementing the transmission investments contemplated by the MiniGrid proposal.[132] On the basis of this MiniGrid VoLL analysis, PREPA has concluded that the total VoLL for any severe event that caused transmission lines to be out of service for even a few weeks would be more than enough to justify the total cost of the proposed MiniGrid transmission investments.[133] Opposing Intervenors have presented no evidence that addresses, let alone rebuts, this conclusion.

VIII. THE PROPOSED IRP AND ACTION PLAN ARE PREDICATED ON REASONABLE ASSUMPTIONS REGARDING RESOURCE COSTS.

Opposing Intervenor criticisms regarding the capital costs assumed in the Proposed IRP and Action Plan are readily countered. The capital costs of utility-scale renewables are not, as some Opposing Intervenors allege, overstated by 30% in the IRP analysis.[134] Part 6.4 of the IRP Main Report describes how the cost estimates for utility-scale solar PV projects were developed on the basis of overnight capital costs and operating costs for utility-scale PV systems consistent with the 2018 Annual Technology Baseline ("ATB") prepared by National Renewable Energy Laboratory ("NREL"), as shown in IRP Main Report Exhibit 6-23.[135] These costs were estimated with PREPA-specific interconnection costs in lieu of the corresponding NREL cost element,[136] as well as Puerto Rico-specific land costs,[137] a weighted average cost of capital of 8.5%,[138] and an

[132] *See* Prop. IRP, Appendix 1, Sec. 2.15 at pags. 2-104 - 2-106.
[133] *Id.*
[134] *E.g.*, LEO Brief at pag. 12.
[135] Prop. IRP Part 6.4.1 at pag. 5-19.
[136] *Id.*, Part 6.4.2 at pag. 5-20.
[137] *Id.*, Part 6.4.3 at pag. 5-21.
[138] *Id.*, Part 6.4.4 at pag. 5-21.

adjustment where appropriate for the Investment Tax Credit.[139] This is an industry-standard approach to the estimation of solar PV capital costs.

As Dr. Bacalao noted in his rebuttal testimony, one criticism the LEO leveled at this approach may be dismissed because LEO's witness, Dr. Irizarry-Rivera, incorrectly compared estimated costs of residential rooftop solar PV installations with estimated costs of the utility-scale solar generation on which the Proposed IRP analysis is based.[140] Another LEO criticism, as set forth by LEO witness Mrs. Sommer, is that the method Siemens employed included a critical error in applying the Inverter Load Ratio of 1.3.[141] Mrs. Sommer's confusion is perhaps understandable, as indeed in the ATB the capacity factor is expressed in units of $kWh_{AC}/(8760\ kW_{DC})$, so the DC to AC correction is embedded. However, in Siemens' calculations the capacity factor (22%) is according to the standard definition $kWh_{AC/}\ (8760^*\ kW_{AC})$,[142] so the inverter loading ratio must be used explicitly.

In any event, the possibility that solar PV capital costs may be lower than Siemens has assumed is in fact taken into consideration in the Proposed IRP. Scenario 3 shows the impacts of lower-than-projected renewable resource capital costs on the addition of new solar PV capacity.[143] As indicated in the IRP Main Report, Part 8.5, the low capital costs of renewables assumed in Scenario 3 would drive towards a resource expansion plan that possibly would have lower production costs than the ESM and the S4S2 Plans. However, for this to happen, the costs of renewables would have to drop to a greater extent than forecasted, which is still to be seen, and if

[139] *Id.*, Part 6.4.5 at pag. 5-21.
[140] Reb. Test. Bacalao 6:31-34, 16:289-305.
[141] LEO Brief at pags. 13-14, citing Dir. Test Sommer pags. 20-21.
[142] *See* Workpaper PREPA IRP Solar Wind Storage Costs-Updated CF-Wind.xlsx that shows the CF of 22% - line 17 of Solar LCOE Mid spreadsheet - and how it was used to determine the LCOE that then was used to price the PV (energy produced = MW_{AC} x CF x 8760), line 18 to line 34.
[143] *See, e.g.*, Prop. IRP Main Report, Part 5.4 at pag. 4-4 (Scenario 3 "assumes the deeper drop (NREL Low Case) of solar and storage costs coupled with high availability of renewables (early ramp up)").

it were to implement this Scenario, PREPA would have to assume the risks associated with potentially significant practical and operational challenges that could result in the curtailment of the resource.[144] Given this risk, and the conclusion that the ESM would be the preferred plan if demand is greater than projected, there is a rational basis on which to conclude that the best approach overall would be to adopt either the ESM or S4S2 plans as the Action Plan and modify their implementation if the renewable costs do in fact drop as hoped to permit larger amounts of renewables to be integrated in the grid sooner. Opposing Intervenors' challenges to the solar PV capital cost assumptions incorporated in the Proposed IRP do not ultimately invalidate the analysis or undercut the conclusion that the Action Plan is the best course for Puerto Rico to adopt.

Nor is it correct to state, as LEO does, that the Proposed IRP is flawed by having overestimated the cost of distributed generation by "at least 50%."[145] First, as noted above, the comparison on which LEO's witness, Dr. Irizarry-Rivera, bases this assertion is not valid, in that it suggests that the costs of residential rooftop solar PV installations, rather than the costs of utility-scale solar PV installations, ought to be the basis on which the Proposed IRP analysis proceeds. This is an apples-to-oranges comparison. As Dr. Bacalao has testified,[146] the argument is further flawed because it disregards the reality that PREPA cannot prudently make resource planning decisions on the hope that thousands and thousands of rooftop solar plus storage installations will be procured, financed, installed and maintained over the next few years so that they can provide the large amounts of capacity and energy Puerto Rico will require from solar PV resources.[147]

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[144] *Id.,* Part 8.5.1 at pag. 8-77; *see also* PREPA Resp. PREB ROI 09-01, Part 3 at pag. 10 (as in the original IRP analysis, Scenario 3 "reaches the highest level of solar development with over 5,600 MW of photovoltaic generation by 2038 (see Table 3), which might be difficult to integrate in the system, equivalent to more than twice the peak demand.").
[145] LEO Brief at pag. 10.
[146] Reb. Test. Bacalao Ex. 6:31-34, 16:289-305.
[147] *See id.* at 16:299 – 17:326.

Second, in the Proposed IRP analyses the projected costs of distributed generation do not directly affect the determination of the quantity of generation resources that will be required; rather, the Proposed IRP analyses reflect the assumption that the availability of distributed generation (and of energy efficiency gains) reduces the energy demand to be met by generation.[148] The Proposed IRP assumes that there will continue to be strong incentives for customers to develop their own generation resources, and that the aggregate amount of demand that will have to be met by utility-side resources will be substantially lower than it would be otherwise (on the order of 49% lower when the effects of both distributed generation and energy efficiency gains on aggregate load are considered).[149] Consequently, even if LEO's witnesses are correct that distributed resources will actually cost less than the Proposed IRP assumes, given that the Proposed IRP assumes high levels of penetration of distributed generation, the conclusions reflected in the Proposed IRP would not be affected.

Energy efficiency gains, impacts on aggregate demand and legally mandated targets for energy efficiency improvements are properly taken into account in the load projections considered in the Proposed IRP.[150] The Proposed IRP's net long term energy forecast explicitly assumes that energy efficiency gains required by Act 17-2019 will actually be achieved, resulting in substantially lower energy demand – some 35% lower[151] – than would exist absent these improvements.[152] In response to the Energy Bureau's Ninth Set of Requirements of Information, PREPA and Siemens also evaluated scenarios in which only low levels of energy efficiency improvements ("Low EE") and no energy efficiency improvements ("No EE") would be

[148] *See* Prop. IRP Part 3.1.6 at pags. 3-12 – 3-16; *see also* PREPA Resp. PREB ROI 01-18 c.
[149] *See* Prop. IRP Part 3.1.6 at pag. 3-15 and Ex. 3-19.
[150] Opposing Intervenors (LEO Brief at pag. 24, OIPC Brief at pags. 11-12 and EDF Brief at pag. 21) challenge the manner in which the Proposed IRP addresses energy efficiency targets.
[151] Prop. IRP Part 3.1.6 at pag. 2-15 and Ex. 3-17.
[152] *See* Prop. IRP Part 3.1.6 at pags. 2-12 – 2-16 and Appendix 4.

achieved.[153] In the original IRP analyses and in the later low/no energy efficiency analysis prepared at the Energy Bureau's request, PREPA and Siemens considered actual demand side management programs as well as energy efficiency gains resulting from initiatives such as energy efficient construction standards.[154] Thus the Proposed IRP and the required follow-on analysis identified the energy efficiency programs that could be implemented to achieve the targeted levels of energy efficiency gains. This is all that is required to form a view as to likely future energy demand; the precise details of energy efficiency programs are and will be the subject of other proceedings before the Energy Bureau where program details can be formulated and evaluated. So, far from ignoring energy efficiency and the impacts it can have on aggregate energy demand and the need for supply-side resources, the Proposed IRP and Action Plan assume that in fact energy efficiency gains will be a major factor in the levels of energy demand to be met over the planning horizon.

The Proposed IRP and the Action Plan have adequately considered the role of customer-owned generation resources, the impacts of energy efficiency and demand response, and the possibility that customer-owned and other resources could be aggregated in the form of VPPs. In any event, since PREPA's plan is to go to the market to seek third party commitments to develop, construct and own the resources the Proposed IRP envisions,[155] the market ultimately will have the opportunity to respond with proposals that incorporate elements – such as VPPs and demand response offerings – which Opposing Intervenors advocate. The Energy Bureau should find and

[153] *See* Reb. Testimony of Efran Paredes Maisonet in Support of PREPA's Draft Integrated Resource Plan ("Reb. Test. Paredes"); *see also* Ex. PREB ROI Set 9 12-06-2019 2nd Supp. rev JMC, 3:43 – 4:68 and 4:80 - 5:89; PREPA Resp. PREB ROI 09-01.

[154] *See generally* Prop. IRP Appendix 4 Sec. 2.1.6 at pag. 2-10; *see also* PREPA Resp. PREB ROI 09-01 Sec. 2.1.2 at pags. 4-5.

[155] *See* Prop. IRP Part 10 at pag. 9-1 (discussing PREPA's "plans to solicit bids from vendors for PPOAs, facilities lease agreements, or similar commercial structures where the bidders would Design, Build and Finance, or Design, Build, Finance, Operate and Maintain the projects and sell power or use of the project to PREPA.").

conclude that the Proposed IRP and the Action Plan have reasonably estimated generation resource costs and have properly considered the various factors that can influence net energy demand.

Some Opposing Intervenors fault the Proposed IRP for relying on projected resource costs as inputs to the IRP modelling, claiming that these projected costs are "outdated" or otherwise unrepresentative.[156] These criticisms misapprehend the purpose of the Proposed IRP as a planning tool, not a procurement tool, and suggest putting the cart before the horse by having PREPA run multiple RFPs for generation resources before it has the benefit of the IRP analysis to shape these RFPs.

The costs PREPA used in developing the Proposed IRP are planning level cost estimates[157] based on industry standard sources of information such as NREL on representative costs of specific categories of resources.[158] PREPA has adjusted these broadly representative costs to reflect costs specific to procurement and construction in Puerto Rico.[159] This is standard operating procedure in the development of integrated resource plans[160] which, after all, are intended to identify, broadly, specific resource needs over a defined planning horizon in order to inform detailed planning and procurement activities to be undertaken once a plan is approved. The Proposed IRP identifies resource needs and contemplates that, following Energy Bureau approval of the Proposed IRP and an Action Plan, PREPA will proceed with RFPs addressing the identified resource needs.[161]

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[156] EDF Brief at pags. 18-19; LEO Brief at pags 10-14; Wärtsilä Brief at pags. 4-6.
[157] *See* Prop. IRP Part 6.3.2.3 at pag. 5-13 (discussion of capital cost estimation methodology).
[158] *See, e.g.*, Prop. IRP Part 6.4 at pags. 5-19 – 5-21 (discussion of methodology for developing cost estimates for utility scale solar PV projects).
[159] *See id.*, Parts 6.4.2 and 6.4.3 at pags. 5-20 - 5-21 (discussing adjustments for PREPA-specific interconnection costs and Puerto Rico land costs).
[160] Regulation 9021 recognizes that there are uncertainties in capital cost forecasts, when it defines capital cost as a component of the Reference Case (1.08 – 35 at. pag. 8) and Scenarios (1.08 – 38 at pag. 8) and requires PREPA to provide forecasts (2-a-vii at pag. 24).
[161] *E.g.*, Prop. IRP Part 10 at pag. 9-1 ("PREPA currently plans to solicit bids from vendors for PPOAs, facilities lease agreements, or similar commercial structures where the bidders would Design, Build and Finance, or Design, Build, Finance, Operate and Maintain the projects and sell power or use of the project to PREPA. The estimated overnight

The alternative approach several Opposing Intervenors advocate – in effect, run "all resource" RFPs first, and then develop an IRP that would deploy them – would simply not be practical for PREPA, and in any event cannot be expected to provide results that would be more reliable, up to date, and useful for planning purposes than those incorporated in the Proposed IRP. The approach envisioned in the Proposed IRP and Action Plan would rely upon targeted RFPs seeking binding proposals from qualified market participants to develop, finance, construct and operate actual projects to be delivered within specified time frames in a setting that would generate real competition. Moreover, this approach, which would start with solicitations for renewable and storage resources (to be installed as soon as practicable under the Action Plan),[162] would benefit PREPA and the Puerto Rico energy sector generally by affording all concerned real-world experience with large-scale generation resource procurement and integration that can be applied to later solicitations for conventional combined cycle generation and additional renewable resources.

PREPA employed an industry-standard methodology for developing resource costs estimates for use in the formulation of the Proposed IRP. This same methodology has been applied in the development of a number of other integrated resources plans throughout the United States. All arguments suggesting other approaches are unrealistic and impractical and should be disregarded.

capital expenditures are provided for most of the projects listed. These estimated capital expenditures provide an indication of the magnitude of the investments that would be financed by potential vendors. The vendor financing costs would then be paid through the proceeds from a PPOA or other commercial agreement and ultimately become part of PREPA's operating expenses, as opposed to PREPA capital expenditures.").

[162] *See* Prop. IRP Part 10.11 and 10.1.2 at pags. 9-2 – 9-3 (showing solar PV and BESS additions beginning in 2020 and 2019, respectively) and Part 10.1.5 at pags. 9-6 – 9-10 (showing large new natural gas fueled CCGTs being installed only in 2025 and thereafter).

IX. THE PROPOSED IRP ADEQUATELY DEALS WITH THE CHALLENGE OF PROJECTING ELECTRICITY DEMAND.

One of the most significant challenges the Proposed IRP confronts is the pervasive uncertainty regarding the trajectory of demand for electric energy in Puerto Rico over the planning horizon. The IRP Main Report addresses the topic exhaustively;[163] it was extensively canvassed in Energy Bureau's Requirements of Information[164] and PREPA's responses to them.[165] The Energy Bureau's Ninth Set of Requirements of Information asked PREPA and Siemens to examine "Low EE" and "No EE" cases and their impact on the demand the PREPA system will face. Demand forecasts and the uncertainties affecting them were subjected to numerous sensitivities and multiple rounds of analysis by PREPA, Siemens and the Energy Bureau. Thus, the impact that changes in utility-served load have on the decisions across scenarios has been thoroughly evaluated and documented.[166]

Opposing intervenors EDF and LEO nevertheless challenge the manner in which PREPA has projected energy demand.[167] EDF and LEO challenge PREPA's assumptions regarding the demand impacts of energy efficiency improvements, calling them "implausibly high,"[168] and they assert that Siemens did not test its modeling results for sensitivity to changes in forecasted energy efficiency.[169] EDF and LEO also criticize PREPA and Siemens for assuming that energy demand could fall to half its current levels, and question whether it was appropriate to assume that customer-sited distributed generation will increase to as much as 30% of PREPA's total renewable

[163] *See generally* Prop. IRP Part 3.
[164] *See, e.g.,* PREPA Resp. PREB ROI 01-18 at Ex.AP-2018_0001 PREB ROI Set 1 08-02-2019.pdf.
[165] *See generally* PREPA Resp. PREB ROI 09-01.
[166] *See generally* Prop. IRP Part 1.2 at pags. 1-5 – 1-9, Part 8.1 at pags. 8-1 – 8-16; *see also* PREPA Resp. PREB ROI 09-01.
[167] EDF Brief at pags. 21-22; LEO Brief at pags. 24-27.
[168] EDF Brief at pag. 21.
[169] EDF Brief at pags. 21-22; LEO Brief at pags. 25-26.

energy requirement by 2038, while at the same time accusing PREPA of having underestimated the potential for grid defection resulting from customer adoption of distributed energy solutions.[170]

Opposing Intervenors' internally inconsistent challenges underscore the fundamental reality that load forecasts attempting to chart the future of Puerto Rico electricity demand are inherently uncertain. Such forecasts must account for and attempt to reconcile numerous variables that cannot be controlled. For this reason, PREPA has presented to the Energy Bureau a variety of analyses and sensitivities that take into account the multitude of variables that could affect electricity demand (including in particular the impacts of energy efficiency improvements and customer-driven generation resource uptake). As the Energy Bureau must appreciate, it is not possible to conclude with confidence today whether energy efficiency improvements will in fact yield absolute reductions in electric energy demand, or whether economic growth or adoption of electric vehicles might be substantial enough to overcome the demand reduction that energy efficiency might otherwise cause. It is, however, possible and indeed prudent for PREPA and the Energy Bureau to chart a course that will enable PREPA to meet future demand and to adjust its resource procurement efforts as necessary to meet demand as it changes.

Some Opposing Intervenor attacks on the Proposed IRP's load forecasts actually support the approach taken in the Action Plan. The Action Plan is designed specifically to put PREPA in a position to anticipate and respond to electricity demand as it changes over time by either pressing forward with, or deferring or even cancelling, generation capacity resource additions that can be brought on, or not brought on, as demand dictates. Thus, Opposing Intervenors' criticisms of the demand forecasts undergirding the Proposed IRP make the point PREPA has repeatedly pressed in this proceeding: the plan the Energy Bureau authorizes PREPA to implement (which PREPA

[170] EDF Brief at pags. 21-22; LEO Brief at pags. 24-27.

firmly believes should be the Action Plan) must incorporate "hedges" that will permit PREPA to add (or not add) resources that can be permitted, developed, constructed and conditioned in a predictable time frame to meet demand as it may appear.

The Action Plan envisions an approach through which PREPA may implement or elect not to implement action items in future years "should new units not become operational in time to support the planned retirements, or if customer energy consumption, or vendor responses to solicitations[,] substantially differ from those anticipated and described in this IRP."[171] Moreover, it should also be stressed that the approval of the Action Plan, as submitted to the Energy Bureau, would not give PREPA authorization to enter unilaterally into individual generation resource procurement contracts, should the right conditions arise; as per applicable regulations and law, the Energy Bureau is the entity that must review and authorize each PREPA decision to solicit and contract for particular generation resources.

X. THE IRP MODELING PROPERLY ADDRESSES ENERGY EFFICIENCY AND DISTRIBUTED GENERATION.

EDF argues that the Proposed IRP improperly treated resources such as energy efficiency and distributed generation as fixed inputs into the model, rather than treating them on an equal footing with fossil fuel resources and allowing the model to optimize among the available resources.[172] This argument misses the mark. The Proposed IRP analysis treated energy efficiency in accordance with the targets established by Act 17-2019 and in accordance with Energy Bureau orders.[173] Distributed generation was in effect treated in the IRP analysis as a given (through load

[171] Prop. IRP Part 10 at pags. 9-1 – 9-2.
[172] EDF Brief at pag. 23.
[173] *See, e.g.,* Prop. IRP Appendix 4, Sec. 2 at pag. 2-1; *see also* Resolution and Order, Case No. CEPR-AP-2018-0001 (April 26, 2019) at pag. 4 (ordering PREPA to model EE with gains of two percent (2%) each year, based on the energy sales of that year (or the previous year), for 18 years).

projections that assumed its continued growth), since incentives favoring customer development of distributed resources are assumed to persist throughout the planning period. As Dr. Bacalao testified, specific amounts of distributed generation simply cannot be mandated to appear in the amounts required at or before the time they are needed, and therefore cannot be treated as a generation resource on which PREPA may depend in the same way as it can depend on utility-scale solar, battery energy storage systems and thermal generation.[174] Nevertheless, the Proposed IRP assumes that distributed generation will continue to be developed and will continue to act as an offset against demand, reducing load that would need to be met by supply-side resources. This is entirely appropriate.

XI. OPPOSING INTERVENORS' COMPLAINTS REGARDING THE TREATMENT OF HYDROELECTRIC, OFFSHORE WIND, DEMAND-SIDE RESOURCES AND ELECTRIC VEHICLES ARE UNFOUNDED.

Several Opposing Intervenors assert that the Proposed IRP is flawed because it does not include and properly prioritize hydroelectric resources,[175] offshore wind resources[176] and demand-side resources.[177] Some Opposing Intervenors challenge the Proposed IRP because it does not pay what they believe is adequate attention to electric vehicles.[178] These challenges are not well founded.

The Proposed IRP Main Report evaluates the hydro resources available in Puerto Rico and considers the potential refurbishment of some existing hydro capacity.[179] Operational units currently available to PREPA total 34 MW and had a capacity factor of less than 20 percent as of

[174] Reb. Test. Bacalao, 16:305-17:314.
[175] EDF Brief at pag. 27; NFP Brief at pags. 19-20.
[176] EDF Brief at pags. 27-28.
[177] *Id.* at pag. 23.
[178] *E.g.*, *id.* at pag. 22; LEO Brief at pags. 19-22, 30.
[179] *See* Prop. IRP Part 4.2.1.4 pags. 4-8 – 4-9.

the first quarter of 2018.[180] Even if all hydro resources available in Puerto Rico were to be returned to a state of good repair, the total amount of capacity gained would be 105 MW.[181] It might be possible to more or less double this capacity, to 70 MW, with an expenditure of about $100 million, though even with this investment the capacity factor of hydro resources taken together is not expected to exceed 28%.[182] This amount of capacity, which would be available just over a quarter of the hours in a year, is simply not substantial enough (at under 2% of the energy mix)[183] to make a material difference in the Puerto Rico generation resource mix (it would not exceed the capacity and availability one might expect from one or two large utility-scale PV generating facilities). PREPA appropriately took this limited resource into account.

In its Proposed IRP analysis, PREPA did consider the potential for offshore wind resources to contribute to Puerto Rico's energy needs. Because available studies indicated that offshore wind was unlikely to be economic, PREPA, after consultation with the Energy Bureau, decided not to include offshore wind in the Proposed IRP's LTCE model runs.[184] Further analysis confirmed that offshore wind would not be competitive in price terms with solar PV, and stood only a moderate chance of being competitive with onshore wind in Puerto Rico.[185] Given this, it was reasonable for PREPA to focus its attention on generation resources likely to be added to the resource mix.

Demand-side resources were in fact considered in the Proposed IRP analysis. An entire Appendix to the Proposed IRP Main Report – Appendix 4: Demand-Side Resources – is devoted

[180] *Id.* at pag. 4-8.
[181] Reb. Test. Bacalao 8:127-134.
[182] Prop. IRP Part 4.2.1.4 at pags. 4-8 – 4-9.
[183] Reb. Test. Bacalao 8:133-134.
[184] Reb. Test. Bacalao 2:31-37.
[185] *Id.* at 2:37 – 3:49.

to the subject. Regulation 9021 requires this analysis, and as the Proposed IRP Main Report notes, the Proposed IRP complies with the requirement that it addresses such resources.[186]

One of the fundamental elements of the Proposed IRP and the Action Plan is the transformation of the PREPA system into eight MiniGrids to improve the system's resiliency.[187] A key recommendation to this end is to "[r]einforce the distribution system and enable two-way flow of energy, provide voltage regulation and flicker control to facilitate the high penetration of distributed energy," as discussed in Appendix 4 – Demand-Side Resources.[188] To this end, the Action Plan includes specific elements supporting customer-supply and demand response programs.[189]

PREPA also considered the future adoption of electric vehicles and their potential impact on electricity demand. As Dr. Bacalao testified, Siemens developed a high-level estimate to assess the potential impact of electric vehicles on peak demand, estimating potential levels of electric vehicles adoption. As a result of this analysis, it was concluded that the impact of electric vehicles adoption on electricity demand in Puerto Rico would be "in the order of 20 to 57 MW by 2038" and therefore did not warrant inclusion in the IRP load forecast. But in responding to the Energy Bureau's Ninth Set of Requirements of Information, PREPA offered "Low EE" and "No EE" cases that could be viewed as a proxy for circumstances in which transportation electrification could impact electric demand. In any event, the amount by which electric vehicles adoption could drive

[186] Prop. IRP Part 2.2 at pags. 1-3 – 1-4 (citing Regulation 9021); *see also id.,* Part 6.3.2 at pag. 5-4 (noting that combined heat and power was considered as an option, and is discussed in Appendix 4: Demand-Side Resources).
[187] *See* Prop. IRP Part 1.2.1 at pag. 1-9; *see also id.,* Part 10.3.6 at pag. 9-23 ("Demand response programs become increasingly important as renewable penetration rises;" accordingly, the Action Plan "calls for establishing Demand Response (DR) programs with a goal of over 60 MW of flexibility to the system by 2025 [and for reinforcing] the distribution system and enable two-way flow of energy and providing voltage regulation and flicker control to facilitate the high penetration of distributed energy," citing Appendix 4 – Demand -Side Resources).
[188] *Id.,* Part 1.2.2 at pag. 1-11.
[189] *Id.,* Part 10.3.6 at pag. 9-23.

an increase in electricity demand is small enough so that not breaking it out for separate treatment does not affect the Proposed IRP or the Action Plan.

XII. THE SELECTION OF LIQUIFIED NATURAL GAS AND NATURAL GAS OVER LIQUIFIED PETROLEUM GAS OR SYNTHETIC GAS IS AMPLY SUPPORTED.

Intervenor Empire Gas argues that the Proposed IRP should be revised to conclude that liquified petroleum gas and synthetic gas derived from LPG are viable and practical primary fuels that should be used in converted peaking generation facilities and in new mobile gas turbine generating units.[190] Empire Gas further argues that the marine LNG receiving terminals proposed for Yabucoa and Mayagüez should be devoted to LPG, rather than LNG.[191]

Empire Gas' arguments lack merit. The Proposed IRP Main Report examines at length the possibility of using propane (*i.e.*, LPG) as a fuel in some generation applications. As the IRP Main Report notes, natural gas is superior to other liquid fuels, including petroleum products such as diesel and residual fuel oil, as well as natural gas liquids such as ethane and propane, because it is lower cost, can be combusted more cleanly, and offers greater operating flexibility and efficiency.[192] In theory, there could be a place for propane (LPG), ethane and biofuels in Puerto Rico's generation fuel mix; however, LPG suffers from the very significant disadvantages of being more costly and of emitting more carbon dioxide than natural gas when consumed as a generation fuel.[193] Although the cost and environmental attributes of LPG/SNG in peaking applications

[190] Empire Gas Brief at pags. 6-7.
[191] *Id.* at pags. 7-8.
[192] Prop. IRP Part 7.1.1 at pag. 6-1; *see also id.* at Part 7.1.2.14 at pag. 6-16 – 6-17.
[193] *Id.*, Part 7.1.2.14 at pag. 7-15 ("Over the past two years, propane has been about 2.5 times as costly as natural gas on an equivalent MMBtu basis. Propane when burned for power generation emits about 16% more carbon dioxide than natural gas but is cleaner than residual fuel oil."); *see also* Reb. Test. Bacalao 20:385-397.

would be attractive relative to diesel, they would not be relative to natural gas derived from LNG.[194] This is likely to remain true over the long term.[195]

Empire Gas is incorrect in asserting that "[t]here is no base or factual evidence supporting the IRP's LPG future cost projection."[196] Part 7.2.5 of the IRP Main Report describes the manner in which Siemens developed its outlook for delivered fuel prices to Puerto Rico, including diesel, residual fuel oil, natural gas and LPG.[197] These delivered price forecasts were built from Siemens' independent projection of regional fuel prices of natural gas, crude oil and petroleum products, including diesel, fuel oil and LPG, as described in Part 7.2.1 of the IRP Main Report.[198] Empire Gas takes issue with the use of 2018 prices for LPG, observing that August 2019 LPG spot prices at Mont Belvieu were some $0.31/gallon lower than 2018 prices, and that the average Mont Belvieu price of LPG as of February 28, 2020, which it claims was $0.409/gallon, was lower still. This, of course, proves nothing other than that LPG prices, like the prices of other fuel commodities, are volatile. A comparison of the average 2018 Henry Hub natural gas price (which Siemens presents in IRP Main Report Exhibit 7-7 as $2.91 per MMBtu) with the February 28, 2020 Henry Hub price of $1.725/MMBtu, shows a reduction in the price of natural gas which, at 41%, is comparable to the LPG price reduction over the same period (~ 53%) which Empire Gas

[194] Reb. Test. Bacalao 20:389-397.
[195] Prop. IRP Part 7.1.2.14 at pag. 6-17 ("While increases in propane and ethane production associated with U.S. shale gas production have led to recent market imbalances that have depressed the prices of these products, prices have begun to rise again as the market recovers. Siemens believes that in the long-term, propane and ethane prices will maintain higher levels relative to diesel and certainly with respect to natural gas. So, while there may be some Interim opportunities to take advantage of such fuels, propane, ethane, and biofuels are not expected to be long-term cost-effective solutions.").
[196] Empire Gas Brief at pag. 4.
[197] Prop. IRP Part 7.2.5 at pags. 6-28 – 6-30.
[198] *Id.*, Part 7.2.1 at pag. 6-21.

touts. And notably, Empire Gas offers no evidence for its claim that the price of LPG will remain low "for year[s] to come."[199]

PREPA incorporated into some LTCE model runs the possibility of fueling a new combustion turbine with LPG, with projections of LPG prices reflecting costs of LPG delivered to Bayamón.[200] Specifically, the option of a new combustion turbine at Palo Seco fueled by LPG was considered in Scenario 4 and the ESM Plan. This option was not selected in any model runs. The Proposed IRP's analysis of the economics of LPG/SNG relative to those of natural gas as a fuel for power generation concludes quite clearly that LPG/SNG would not be competitive. Empire Gas fails to offer any legitimate basis on which the Energy Bureau should second-guess or revisit this analysis.

The Proposed IRP makes it clear that PREPA intends to solicit bids from vendors for power purchase and operating agreements ("PPOAs"), facilities lease agreements or similar commercial structures that would support development of new generation resources.[201] Empire Gas and other advocates of LPG/SNG as potential generating fuels will be free to offer proposals for LPG/SNG-fueled facilities in response to such solicitations. If the economics of those projects can be shown to be competitive on a full life-cycle basis with natural gas-fueled and other generation alternatives on price and non-price terms, they may be selected. The Energy Bureau should not in effect pre-judge the outcome of this process, as Empire Gas urges, by requiring PREPA to eliminate the option of developing natural gas-fueled facilities in favor of facilities that would be fueled by what the record shows would be costlier, and less environmentally attractive, LPG/SNG.

[199] Empire Gas Brief at pag. 4.
[200] *See* Prop. IRP Part 7.2.5 at pags. 6-28 – 6-30 and Ex. 7-13, Part 8.2 at pags. 8-16 – 8-19 and Part 8.3 at pags. 8-46 – 8-48.
[201] Prop. IRP Part 10 at pags. 9-1 – 9-2.

XIII. THE PROPOSED IRP ADEQUATELY IDENTIFIES AND CONSIDERS ENVIRONMENTAL IMPACTS.

As Act 17-2019 and Energy Bureau Regulation 9021 require,[202] environmental impacts associated with various resource options are prominently identified and considered throughout the IRP analysis. The Proposed IRP Main Report identifies the environmental standards and regulations applicable to PREPA's existing generating facilities and to new generating facility alternatives,[203] reviews relevant environmental considerations, including key existing and potential environmental regulations that will or could impact portfolio costs and resource decisions,[204] points to the need to comply with environmental regulations as one of the fundamental factors driving the resource needs assessment,[205] and specifically analyzes environmental impacts, focusing on emissions reductions,[206] predicted for the various scenarios both independently and as compared with Scenario 4 and the ESM Plan.[207]

Nevertheless, Opposing Intervenors LEO and EDF contend that the Proposed IRP fails to satisfy the requirements of Act 17-2019 and Regulation 9021 mandating consideration of environmental impacts.[208] They assert that the Proposed IRP is flawed because it (i) does not assess environmental impacts associated with various resource options[209] and (ii) by failing to evaluate upstream emissions associated with natural gas production, transportation and delivery,

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[202] Act 17-2019, Sec. 1.9(3)(H); Regulation 9021, Sec. 2.03(B)(1) and Sec. 2.03(K)(2).
[203] Prop. IRP Part 2.1 at pags. 1-1 – 1-3 and Ex. 2-1.
[204] *Id.*, Part 4.3 at pags. 4-18 – 4-31 and Ex. 4-20 – 4-27.
[205] *Id.*, Part 5.1 at pag. 4-1.
[206] *Id.*, Part 8.1 at pag. 7-2.
[207] *See id.*, Part 8-1 at pags. 8-8 – 8-9, Ex. 8-3 (Summary of Results by Scenario, Strategy and Load Growth) (identifying "Emissions Reductions" as one of the "Central Metrics" compared across Scenarios and Strategies) and pags. 8-15 – 8-16, Ex. 8-7, 8-8 and 8-9 (Scorecards for Scenario 1, ESM and Scenario 4 and Scenario 5 for the Base Load Growth, High Load Growth and Low Load Growth Cases) (comparing emissions reductions across Scenarios). *See also id.*, Part 8.2.6 at pags. 8-29 – 8-30 and Ex. 8-21 and 8-22 (showing CO_2 emissions declines under Scenario 4 over the planning period); Part 8.3.8.2 at pags. 8-60 – 8-61 and Ex. 8-56 and 8-57 (showing CO_2 emissions declines under the ESM Plan over the planning period); Part 8.4 at p. 8-65 and Ex. 8-63 (Scenario 1); Part 8.5 at pags. 8-82–8-85 (Scenario 3); Part 8.6 at pag. 8-85 (describing CO_2 emissions reductions under Scenario 5).
[208] LEO Brief at pags. 2-3, 55-56; EDF Brief at pags. 35-38.
[209] EDF Brief at pag. 36.

does not consider the degree to which the Preferred Plan would contribute to or could be affected by climate change.[210] Opposing Intervenors are incorrect regarding the first of these assertions, and have not identified any legitimate basis for faulting PREPA and the Proposed IRP as to the second one.

The Proposed IRP analyses did indeed consider environmental impacts of the various alternative resource plans. While permitting for new facilities is outside the scope of the IRP,[211] a fundamental assumption underlying the Proposed IRP analyses is that new resources will be compliant with all applicable environmental regulatory requirements. Those analyses assume that new generation options will be designed to comply with federal Clean Water Act requirements[212] and Puerto Rico water quality standards applicable to new sources in Puerto Rico.[213] Moreover, cognizant of the potential for additional water use restrictions in Puerto Rico, all combined cycle options were assumed to have dry cooling with the use of air cooled condensers.[214]

The Proposed IRP analyses incorporate similar assumptions regarding compliance with regulations governing generating facility air emissions.[215] In fact all scenarios examined in the Proposed IRP project very substantial reductions in CO_2 emissions as the Puerto Rico generation fleet moves from its current reliance on heavy fuel oil and diesel to renewable resources and efficient natural gas-fired generation.[216] As the Proposed IRP Main Report notes, individual

[210] LEO Brief at pags. 55-56; EDF Brief at pag. 36.
[211] *Id.*, Part 4.3.10.1 at pag. 4-31.
[212] Prop. IRP Part 4.3.9 at pag. 4-30.
[213] *Id.*, Part 4.3.10 at pag. 4-31.
[214] Prop. IRP at Part 6.3.1 at pag. 5-3 - 5-4.
[215] *Id.*, Part 4.3 at pag. 4-18; *see also id.*, Part 1.2.2 (compliance with CAA Mercury and Air Toxics Standards) and Ex. 2-1.
[216] *See, e.g., id.*, Part 8.2.6 at pag. 8-29 ("CO2 emissions for PREPA's fleet [under Scenario 4] fall in the first ten years of the forecast driven by the retirement of the older fuel oil, diesel and gas units along with increased penetration of solar generation. Emissions fall 42% by 2027 and 61% by 2028 with AES coal retirement. Emissions continue falling after 2028 reaching an 86% reduction by 2038. The emission rate for the fleet falls from 1,336 lbs./MWh in 2019 to 368 lbs./MWh in 2038.") and Part 8.3.8.2 at pag. 8-60 ("CO2 emissions for PREPA's fleet [under the ESM Plan] fall in the first ten years of the forecast driven by the retirement of the older fuel oil, diesel and gas units along with

generating facilities will need to obtain a variety of federal and state permits, which will generally be the responsibility of these projects' developers;[217] in seeking these permits, project proponents will have to demonstrate compliance with then-applicable air emissions regulations, water withdrawal and discharge limitations and all other applicable environmental permitting requirements. A planning document such as an integrated resource plan can do no more than this, and the Proposed IRP complies with the applicable requirements of Act 17-2019 and Regulation 9021 in the way it has identified environmental permitting requirements and assumed future compliance with them.

The needs to reduce the use of fossil fuels, minimize greenhouse gas emissions and address climate change are acknowledged and addressed throughout the Proposed IRP Main Report and are major drivers behind all of the evaluated resource plans, including the Preferred Resource Plan. All of these plans project very significant reductions in the use of fossil fuels[218] and in resulting air emissions[219] over the study period. The Preferred Resource Plan would add large (but not too large)[220] amounts of new solar generation and energy storage, as well as new natural gas generation and fuel supply infrastructure, and would retire or convert all existing heavy oil and coal-fired

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increased penetration of solar generation. Emissions fall 52% by 2027 and further by 75% a year later with AES coal retirement in 2028. Emissions continue falling but more gradually after 2028 reaching an 87% reduction by 2038. The emission rate for the fleet falls from 1,351 lbs./MWh in 2019 to 365 lbs./MWh in 2038.").

[217] *Id.,* Part 10.1.10 and Part 10.2.4.

[218] *See, e.g., id.,* Part 8.2.5 at pags. 8-27 – 8-28 (under Scenario 4, "the system moves away from heavy fuel oil and coal to natural gas along with a sharp drop in overall fuel consumption and associated costs with the implementation of the plan. Fuel consumption declines with the retirement of EcoEléctrica in 2024, old gas and heavy fuel oil units and the peakers. Overall fuel consumption continues to fall through 2038 despite the new CCGTs in Palo Seco and Costa Sur coming online in 2025. Total fuel consumption drops 82% by 2038 with natural gas dominating this remaining fuel consumption.") and Part 8.3.4 (under the ESM Plan, "the system moves away from heavy fuel oil and coal to natural gas. There is a significant decline in the overall fuel consumption and associated costs with the implementation of the plan. Fuel consumption declines 82% by 2038 with the retirements of old Steam gas, heavy fuel oil and coal units.").

[219] *See, e.g., id.,* Part 8.2.6 at pags. 8-29 – 8.30 (documenting emissions reductions that would be achieved under Scenario 4) and Part 8.3.8.2 (documenting emissions reductions that would be achieved under the ESM Plan).

[220] *See id.,* Part 8.1 at pag. 8-11 (noting "practical implementation issues" presented by the addition of solar PV capacity representing "almost double the forecasted peak load" which "would strain the remaining resources on the system including the storage and could lead to unexpected curtailment").

generation.[221] The result would be a far "greener" system,[222] yet one that one would satisfy the criteria of being both practical and low cost while being significantly more resilient.[223] Thus the Preferred Resource Plan in fact deals in a responsible, pragmatic way with the objectives of reducing emissions and other environmental impacts associated with the generation of electric energy in Puerto Rico.

It is, of course, true that neither the Preferred Resource Plan nor any of the other resource plans considered in the Proposed IRP would eliminate all fossil fuel use immediately. They would instead move as quickly as possible from petroleum-based fuels to far cleaner natural gas as the predominant generation fuel for Puerto Rico and set the path toward 100% renewable generation in the mid- to long-term. But this reflects the reality that in the near term (over the period covered by the Action Plan and for some time thereafter), natural gas-fired generation will be required to replace existing, less efficient and more environmentally damaging oil-fired generation in order to meet Puerto Rico's forecasted electricity requirements in a way that promotes both system reliability and resiliency [224] as the island makes the legally-mandated transition to a system that is entirely supported by renewable energy sources.[225] That Opposing Intervenors wish that gas-fired generation were not necessary does not make the Proposed IRP, the Preferred Resource Plan or the Action Plan deficient under the governing law and regulations.

[221] *Id.,* Part 10 at pag. 9-1.
[222] *Id.,* Part 10.1 at pags. 9-1 – 9-11.
[223] *Id.,* Part 8.1 at pag. 8-12; *see also* Part 10.1 at pag. 9-2.
[224] Act 17-2019 specifically requires IRPs to evaluate combinations of resources that will "improve the reliability and stability of the electric power grid." Act 17-2019, Sec. 1.9(3)(F). Similarly, Regulation 9021 requires IRPs to consider the impact of the location of new supply-side resource options on "reliability and system resilience." Regulation 9021, Sec. 203(F)(1)(b)(vi).
[225] Notably, while Act 17-2019 establishes a specific date (January 1, 2028) by which the use of coal as an energy source is to be eliminated (Act 17-2019, Sec. 1.6 (3)), it does not impose a similar requirement to eliminate electric power generation from fossil fuels apart from the requirement that one hundred percent of power generation be obtained from renewable energy resources by on or before 2050 (Act 17-2019, Sec.1.6 (7)).

In describing and analyzing natural gas-fired generating resource additions and incremental LNG and natural gas infrastructure, the Proposed IRP does not explicitly address upstream greenhouse gas emissions. This is not a fatal flaw, since neither Act 17-2019 nor Regulation 9021 specifically mandates that an IRP attempt to quantify and evaluate such upstream emissions.[226] Act 17-2019 and Regulation 9021 are not unique in this regard: given the many uncertainties and speculative assumptions they would inevitably involve, such upstream emissions quantification exercises are generally not required in environmental assessments and environmental impact statements addressing natural gas projects under U.S. federal laws and court decisions.[227]

PREPA and Siemens quite simply have no basis on which to determine – or even develop an educated guess regarding – where, among numerous potential sources, natural gas to be consumed in Puerto Rico will originate, how much may come from those sources over time, and what environmental impacts might be ascribed to the development and operation of those sources and transportation from those sources to Puerto Rico. Such an exercise in guesswork would be ultimately futile, and for this reason, in evaluating environmental impacts under the expansive National Environmental Policy Act of 1969,[228] federal agencies are *not* required "to engage in

[226] Act 17-2019 requires simply that an IRP include "environmental impact assessments related to air emissions and water consumption, and other factors such as climate change." Act 17-2019, Sec. 1.9(3)(H). It does not call specifically for quantification of upstream greenhouse gas emissions and their contribution to climate change. Regulation 9021 is even less prescriptive: it stipulates only that the IRP include in its uncertainty analysis "environmental regulations," and that, in selecting the Preferred Resource Plan, PREPA consider, in addition to the "primary selection criterion" of "the minimization of the present value of revenue requirements," the plan's "environmental impacts." Regulation 9021, Sec. 2.03(H)(2)(d).

[227] *See, e.g., Sierra Club v. U.S. Dep't of Energy,* 867 F.3d 189, 199 (D.C. Cir. 2017) (accepting the U.S. Department of Energy's explanation that "it would be impossible to identify with any confidence the marginal production at the wellhead or local level" that would be induced by a specific U.S. natural gas export project, given that every natural-gas-producing region across the lower 48 states is part of the interconnected pipeline system and may respond in unpredictable ways to prices that rise or fall with export demand).

[228] 42 U.S.C. §§ 4321, *et seq.*

speculative analysis" or "to do the impractical, if not enough information is available to permit meaningful consideration."[229]

The same practicality concerns have led federal agencies and federal courts to conclude that a project proponent or reviewing agency is not generally required to quantify emissions of greenhouse gas emissions and climate change impacts that may be associated with natural gas transportation, processing and combustion. Puerto Rico's potential development of additional gas-fired generating facilities offers a case in point. At this time, it cannot be known to any degree of certainty which of the natural gas-fired generating facility options identified in the Proposed IRP may eventually be developed, when it will come on line, how it will receive natural gas, where that gas will come from over time, and how much the facility will operate over its life.[230] Given this, the degrees to which any gas-fired generation or transportation facility, let alone all the facilities evaluated in the Proposed IRP, will actually produce greenhouse gas emissions, and what the impacts of those emissions may be on climate change, are not reasonably foreseeable. As the Federal Energy Regulatory Commission ("FERC") has held in a number of natural gas facility authorization proceedings, the environmental effects associated with natural gas production are generally neither caused by a specific proposed natural gas pipeline or natural gas export projects, nor are they reasonably foreseeable consequences of the approval of such projects.[231]

[229] *N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1078 (9th Cir. 2011).
[230] *But cf. Sierra Club v. FERC*, 867 F.3d 1357, 1374 (D.C. Cir. 2017) (FERC must consider a pipeline's direct and indirect GHG emissions where those emissions can readily be quantified and directly attributed to specific power generation facilities to be served by the pipeline).
[231] *See, e.g., Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP*, 170 FERC ¶ 61,202 at P 174 (2020), citing *Cent. N.Y. Oil & Gas Co., LLC*, 137 FERC ¶ 61,121, at PP 81-101 (2011), *order on reh'g*, 138 FERC ¶ 61,104, at PP 33-49 (2012), *petition for review dismissed sub nom. Coal. for Responsible Growth and Res. Conservation v. FERC*, 485 F.App'x. 472, 474-75 (2d Cir. 2012) (unpublished opinion).

Accordingly, there is no basis on which PREPA and Siemens may be taken to task for having not "counted" upstream greenhouse gas emissions[232] or acknowledged "any emissions at all from gas ports."[233] Neither Act 17-2019, Regulation 9021 nor federal environmental law generally require the sort of emissions analysis Opposing Intervenors advocate. Such an analysis would be no better than mere guesswork and, therefore, would be of no value to the Energy Bureau's evaluation of the Proposed IRP. The Energy Bureau should conclude that PREPA and Siemens were not required to include in the Proposed IRP assessments of upstream and downstream emissions associated with natural gas generating facilities and related infrastructure.

XIV. THE IRP ANALYSES PROPERLY APPLIED AND APPROPRIATELY TESTED PLANNING RESERVE MARGINS.

Several Opposing Intervenors assert that the Proposed IRP is flawed because it yields reserve margins which they consider excessive, suggesting that the Proposed IRP puts forward solutions that are costlier than they need to be.[234] These Intervenors misunderstand the role of the Planning Reserve Margin in the development of the Proposed IRP.

Opposing Intervenors complaining that the Proposed IRP contemplates excessive reserve margins appear to believe that the PREPA system is planned only to meet a given planning reserve margin over the expected peak load at least cost. This belief is not unreasonable when the system being planned has growing load and lower load factors and an LTCE model generally finds that "base load" capacity additions (*i.e.*, generation to supply energy at lower costs) are not enough to provide the needed reserves. In such cases, the PRM becomes binding and the expansion model adds peaking resources, typically lower capital cost (but lower efficiency) gas turbines (or

[232] LEO Brief at pag. 55.
[233] *Id.* at pag. 56.
[234] *E.g.*, EDF Brief at pag. 26; LEO Brief at pag. 19-22.

RICE),[235] and/or in certain markets in the U.S., the model calls for purchases of capacity on the market. [236] As noted in the Proposed IRP Main Report, this is not true of the PREPA system.[237]

In the case of the PREPA system, the PRM is only one of the constraints or factors that the optimization program needs to consider in finding the least cost solution. There are other important constraints and factors:

- PREPA's load is declining and PREPA has an existing fleet of fossil-fueled generating facilities. The optimization model will maintain the existing generation resources online as long as the value of the benefits that they bring in terms of capacity and energy are higher than their fixed costs. This results in the high initial reserve levels observed in the LTCE model runs. Moreover, towards the end of the planning period, the reserve margin increases as load declines but generating capacity does not to the same degree.

- Baseload generation needs to be added to the PREPA system to provide the energy required by the system at least cost as the existing baseload generation is retired; this happens in 2025 (by then the entirety of the HFO fired generation is retired) and 2028 (AES retirement). For the addition of the required new baseload generation the optimization model selects combined cycle gas turbine generation ("CCGT") or solar PV plus battery storage. The CCGT facilities and storage both contribute to reserves, but they were not added to that end.

- Act 17-2019 RPS compliance and, in particular, the target of 40% renewables by 2025, drives the addition of solar PV which, in time, requires the addition of storage. This contributes to reserves, but storage is not added for this purpose. Rather, storage is added for the effective integration and firming of the added renewable resources.

- The need to improve the resilience of the PREPA system also results in the incidental addition of reserves. Enhancing resilience requires a) the installation of dependable generation that will be available to supply critical loads right

[235] *See generally id.*, Part 8.7.2 at pags. 8-94 – 8-95 (describing cases in which binding PRM conditions led the LTCE model to call for new peaking generation).

[236] *See, e.g.,* http://www.mlgw.com/images/content/files/pdf/PSAT_Siemens%20Presentation_02-27-2020.pdf at pags. 13 – 15. In this case the PRM of 8.9% (on unforced capacity) was binding and the model added in addition to the CCGTs, combustion turbines for local reserves (due to transmission limitations), and purchased the balance of the reserves required from the MISO market.

[237] Prop. IRP Part 1.1 at pag. 1-1 ("The 2019 IRP is not a classical IRP designed to identify the least cost approach to address the expected gap between future load growth and resources while maintaining a desired Planning Reserve Margin (PRM). Rather, this plan must satisfy the five pillars stated above for a system with declining load. The load served by the PREPA is projected to significantly decline over the course of this IRP's planning horizon due to a combination of expected base load reduction (driven by negative population and economic forecasts), large energy efficiency gains, and demand side resources.").

after a major event and b) over time a move away from centralized generation so that there is a minimum amount of local generation to serve local load (*e.g.*, 80% under Strategy 2). Both requirements (*i.e.*, the need to supply critical loads and to maintain minimum local reserves) trigger generation additions and, while capacity is added, this is not done to meet the system-wide PRM requirement.

- The optimization process monitors the energy not served ("DSM" in AURORA output) and places a high price on it. There are instances in which the optimization process finds that smaller amounts of peaking generation are necessary to complement the storage that shifts energy to the night peak and minimize the DSM.[238]

The best way to illustrate how these constraints and factors play out in an optimized case that has significantly more reserves than the PRM target of 30% is to review the resource additions of Scenario 5, the scenario which provides maximum flexibility on how resources are added.[239] Here we see:

- 2021 – 371 MW of peaking generation GT is added for local reserves (to service the critical loads).[240]

- 2021 to 2024 – 2460 MW of renewable resources are added for energy and RPS compliance. In addition, 1,200 MW of BESS are added for renewable integration. Base load thermal generation retires.

- 2025 – the last of the thermal MATS noncompliant generation retires, EcoEléctrica L.P. retires[241], and a CCGT is added as a base load (energy) resource at Costa Sur. Reserves are not binding.[242]

- 2028 – AES coal fired generation retires, and another CCGT is added at Costa Sur for baseload needs. With these actions reserves reach a minimum (32%) but are not binding; energy supply at least cost is the driver.

[238] *See, e.g.*, Workpaper S1S2_Metrics_Base_SII.xlsx. (showing in the Additions & Retirements spreadsheet, line 68, that RICE generation is added in 2028 and 2029, after the retirement of AES (46 MW per year); *see also id.* at Metric_Detail line 334 (showing that there is a slight amount of Energy Not Served (DSM) in both years; these values would be much larger if it were not for the RICE additions) and line 197 (showing that the reserves are above 30% (34% and 41%)).
[239] *See id.* at Part 8.6 at pags. 8-86 – 8-88.
[240] *See* Prop. IRP at Ex. 8-86.
[241] *See* Prop. IRP at Ex. 8-87.
[242] *See* Prop. IRP at Ex. 8-88.

- 2029 to end of the period – the quantity of reserves as a percentage of the load increases as load declines. Storage is added to manage the renewable curtailment driven by this decline in load.

Similar analyses can be carried out for all generation additions for other scenarios/strategies, but the above is illustrative.

The Proposed IRP model runs identified only a few cases in which the 30% PRM requirement was a binding constraint driving peaking generation addition; in most portfolios examined, reserve levels fell to close to the 30% level, but did not reach it.[243] That is, for most years in most cases the PRM was not binding despite reserve levels that became relatively low.[244]

To assess the impact of the 30% PRM, Siemens carried out a sensitivity analysis in which it assessed the impact of reductions in the PRM below 30%, focused on the S4S3B portfolio in the year 2028.[245] In the first element of this analysis, Siemens adjusted the model to eliminate certain of the peaking units that model called for, and retired some units earlier than the model had indicated. Doing this yielded a number of hours in which some load would not be served, generating an unserved energy cost that was *more than double* the potential savings resulting from the decision not to build peaking units and to retire others early.[246] This analysis suggests that savings that might be achieved by reducing the PRM and constructing fewer peaking facilities would be substantially less than the unserved load costs that would result.[247] A second element of this sensitivity analysis showed that running the LTCE plan for the same portfolio with a PRM value of 20% had a minimal impact on the overall results, as AURORA also monitors the cost of

[243] *See* Prop. IRP Part 8.7.2 at 8-95.
[244] *Id.*, Part 8.7.3 at pag. 8-95 – 8-97.
[245] *Id.*
[246] *Id.*
[247] *Id.*

energy not served.[248] This led Siemens to conclude that PRM does not have a noticeable impact on the overall solution even when PRM target is reduced to relatively low values, *e.g.*, 20%.[249]

Thus, the PRM employed in the development of the Proposed IRP did not drive it toward a costlier solution than would have been reached with a lower PRM. Consequently, reducing the PRM, as some Opposing Intervenors advocate, cannot be expected to generate significant savings in terms of required resource investment.

XV. THE MODELING TOOLS USED TO DEVELOP THE PROPOSED IRP ARE WELL-SUITED FOR THE TASK.

The Energy Bureau should disregard Opposing Intervenors' challenges to the manner in which the model used to develop the Proposed IRP was selected and implemented.[250]

The model Siemens chose to develop the Proposed IRP (AURORA® (by EPIS, now Energy Exemplar)), is appropriate for the task of long-term capacity expansion plan development and analysis. AURORA is a tool that is broadly accepted and widely used in the utility industry for capacity expansion planning purposes.[251] Early in the process of developing the IRP, Siemens and PREPA discussed with the Energy Bureau and its advisors their planned use of the AURORA model, and no substantive objections to its use were raised (as would be expected given the wide use of this model and Siemens' extensive experience using it). Siemens has used AURORA for 17 years for pricing forecasts, scenario planning and integrated resource plans. The tools used

[248] *Id.*
[249] *Id.*
[250] Among the Opposing Intervenors whose briefs challenge Siemens' model selection and modelling approaches are EDF (*see* EDF Brief at pag. 16-30) and Wärtsilä (*see* Wärtsilä Brief at pag. 1-3).
[251] Rebuttal Test. Bacalao, 11:189-12:203 (disagreeing with assertions that AURORA leads to less accurate results than can be achieved with other software, *e.g.*, Plexos, and noting that AURORA is "widely used in the U.S[.] and other countries" and "has a larger market share than Plexos in the U.S.").

were made available to the Energy Bureau and its advisors, and Siemens offered to make the tools available to parties to the Proposed IRP proceeding in its offices if required.

Some Opposing Intervenors have asserted that another modelling tool – Plexos – ought to have been selected over AURORA.[252] Wärtsilä argues that Plexos is "a more robust tool in the context of modeling island grids" and is the "most accurate software to use."[253] Siemens' Dr. Bacalao has disputed this assertion, noting that both AURORA and Plexos "have advantages and disadvantages compared to each other but none of particular concern for the IRP analysis.[254] Both models are comparable in terms of their capabilities to perform hourly chronological dispatch studies and to develop long-term capacity expansion plans under specific constraints such as renewable or emissions reductions targets. Independent reviews and discussions Siemens has had with industry participants and Energy Exemplar, the developer of both models, indicate that Plexos has superior capabilities to simulate financial forward power markets (month ahead, day-ahead, intra-day and balancing market), which are not applicable to Puerto Rico's regulated market or the Proposed IRP. None of the independent reviews indicates that AURORA has inferior capabilities to develop long-term capacity studies to those offered by Plexos[255] In fact, some publicly available studies show AURORA having been used to develop a long-term capacity expansion plan and then Plexos having been used to develop a more granular sub-hourly analysis[256] (at least until a few years ago when AURORA added a sub-hourly capability). It is well known that AURORA offers

[252] Wärtsilä Brief at pags. 2-3.
[253] *Id.* at pag. 3.
[254] Reb. Test. Bacalao 11:198-12: 200.
[255] Ringkjøb, H.-K., Haugan, P. and Solbrekke, I., *A review of modelling tools for energy and electricity systems with large shares of variable renewables*, Renewable and Sustainable Energy Reviews, Volume 96 (Nov. 2018), pags. 440-459 (*available at* https://www.sciencedirect.com/science/article/pii/S1364032118305690?via%3Dihub).
[256] *Capacity Expansion and Dispatch Modeling: Model Documentation and Results for ERCOT Scenarios*, The University of Texas at Austin, Energy Institute, July 2017 (*available at* https://energy.utexas.edu/sites/default/files/UTAustin_FCe_ERCOT_2017.pdf.)

superior integration of its capacity expansion capabilities and chronological hourly dispatch compared to many other models employed in the industry, including Plexos.

As for complaints that AURORA yielded inaccurate results because it does not resolve down to a short enough interval to capture sub-hourly start capability, the answer is that for purposes of the Proposed IRP analysis AURORA's maximum resolution by hour is sufficient.[257] In the LTCE part of AURORA simulations all fossil generating units, even those that have short startup and shutdown times, were initially modeled with such times assumed to be two hours. Because the resolution of the LTCE model is two hours, not being able to capture startup times of as short as five minutes would not affect technology selection.[258] Thus the resolution limits of the AURORA software did not, contrary to Wärtsilä's suggestion,[259] drive any systematic selection against the reciprocating internal combustion engine technology Wärtsilä champions.[260]

Although it should be clear from discussions of the subject in the Proposed IRP,[261] PREPA reaffirms here that the RFP processes it undertakes in soliciting developer proposals to supply thermal generating facilities for peaking and baseload applications will be technology-agnostic. That is, developers or vendors wishing to propose RICE technologies will be as welcome to submit proposals, as will those wishing to propose combustion turbine technology. This should be a complete answer to the concerns Wärtsilä has advanced in this proceeding, as well as to concerns

[257] *Id.* at 10:163-167, 11:176-180.
[258] *Id.* at 11:176-180.
[259] Wärtsilä Brief at pags. 7-8.
[260] *See* Rebuttal Test. Bacalao, 11:182-188.
[261] *See, e.g.,* Prop. IRP Part 6.1 at pag. 5-1 (among the new fossil-fueled generation resources considered in the IRP were "CCGT, GT, reciprocating internal combustion engines (RICE) and CHP."); Part 6.3.1 at, pag. 5-4 (discussing "the RICE case" evaluated in IRP model runs, specifically referencing Wärtsilä technology); Ex. 6-15 (referencing Wärtsilä 18V50DF RICE unit).

regarding "unnecessary requirements for the replacement peakers that limit the available technical solutions" which ARCTAS Capital Group, LP has raised.[262]

XVI. PREPA'S EXPERTS AND ADVISORS DO NOT HAVE CONFLICTS OF INTEREST THAT PRECLUDE THEM FROM ADVISING AND REPRESENTING PREPA IN THE CAPTIONED PROCEEDING.

Opposing Intervenors EDF and LEO have challenged PREPA's selection and reliance upon Siemens Industry, Inc. – Siemens Power Technologies International ("Siemens PTI") as its consultant in the formulation and development of the Proposed IRP.[263] EDF and LEO assert that the Proposed IRP is tainted because a unit of Siemens, separate from the Siemens PTI unit engaged to consult PREPA on the Proposed IRP's development, is engaged in the manufacture of gas-fired generating facilities. They suggest that, given this relationship, the Proposed IRP's selection of gas-fired resources must be the product of Siemens' bias.[264] LEO makes an additional conflict of interest accusation in urging the Energy Bureau to "consider the potential for conflict in PREPA's retention of King & Spalding."[265]

EDF and LEO are rehashing arguments that they have previously brought before the Energy Bureau, and again are grasping at straws. Opposing Intervenors' allegations of bias on the part of PREPA's consultant and a legal advisor should be rejected as entirely unfounded. As PREPA stated in its response to the Environmental Defense Fund First Set of Interrogatories and Request for Production of Documents and Information ("EDF-PREPA-01"), Siemens has signed an Organization Conflict of Interest ("OCI") agreement with PREPA which commits the Siemens organization to the establishment and maintenance of separation ("isolation") between Siemens

[262] ARCTAS Brief at pags. 33-35.
[263] EDF Brief at pags. 14-15, 54; LEO Brief at pags. 66-69.
[264] EDF Brief at pag. 14; LEO Brief at pag. 67.
[265] LEO Brief at pags. 69-70.

PTI's personnel involved in the IRP and all other Siemens units and, in particular, Siemens Energy Inc., the unit engaged in the marketing of power generation and other electrical equipment.[266] All involved Siemens consulting personnel signed the appendix to that OCI agreement, evidencing their undertaking to observe the contractually required separation of consulting unit from equipment manufacturing and marketing units.[267] In addition, Siemens and PREPA have put into place individual non-disclosure agreements ("NDAs") that apply to the Siemens organization as a whole and, separately, the Siemens consulting unit (Siemens PTI) assigned to the PREPA IRP project.[268] This is well known to the Energy Bureau, since the OCI and its appendix, as well as the NDAs, are on file with the agency.[269] PREPA is aware of no expression of Energy Bureau concern regarding the adequacy of the OCI and NDAs as an appropriate and effective means of ensuring that the Siemens PTI consulting unit and Siemens units engaged in generating equipment manufacturing and marketing would be isolated from one another insofar as the PREPA IRP consulting engagement are concerned.

Opposing intervenors EDF and LEO have failed to offer evidence that Siemens PTI consulting personnel failed to abide by the OCI and their individual agreements throughout the course of the Proposed IRP's preparation. Nor have they presented any evidence (as opposed to unsupported innuendo) to the effect that any aspect of the analysis and recommendations included in the Proposed IRP – and, in particular, the inclusion of gas-fired generating capacity – was influenced in any manner by a bias in favor of Siemens as an equipment manufacturer or even by a preference for fossil generation generally over other energy production technologies. Instead, they point to the Energy Bureau's expression of concern in an earlier proceeding regarding the

[266] PREPA Resp. EDF-PREPA-01-01 at pag. 2. *See also* Reb. Test. Paredes, 4:71-79.
[267] PREPA Resp. EDF-PREPA-01-01 at pag. 2.
[268] *Id.*
[269] *Id.*

perception of bias that could result where "the consultant conducting resource planning has a business interest in resource selection" and "the modeling technique used by the consultant involves subjectivity."[270] That is not the situation presented here.

Siemens PTI, the consultant in this matter, has no interest in any resource selection that could result from the Proposed IRP. Not only is it legally and contractually isolated from any other Siemens units, including the units involved in the manufacturing and marketing of power generation equipment, but the manner in which resources have been modeled in this proceeding has not involved subjectivity that could favor Siemens the equipment manufacturer and marketer. In the LTCE modeling performed in the development of the Proposed IRP, fossil generating facilities were offered to the AURORA program as supply side options; the model chose them for addition to the resource mix only as and to the extent doing so generated the least cost solution.[271] The identity of the manufacturer of these generic categories of fossil generating facilities was not a factor (nor could it have been, given the parameters the model takes into account).

The only exceptions to the rule that the LTCE runs selected fossil generation where doing so contributed to a least cost solution were (i) the "fixed decisions" to add a minimum amount of thermal generation to the MiniGrids to supply critical loads, and (ii) in the Scenario known as the ESM the possible conversion of certain existing diesel-fueled peaking units to dual-fuel capability and the addition of a gas-fired CCGT at Palo Seco and a gas-fired CCGT at Yabucoa.[272] The

[270] EDF Brief at pag. 14 and LEO Brief at pag. 67 (quoting *Final Resolution and Order on the First Integrated Resource Plan of the Puerto Rico Electric Power Authority*, Case No. CEPR-AP-2015-0002 (Sept. 23, 2016) at pags. 37-38).
[271] *See, e.g.,* Prop. IRP Part 8.3.1 at pags. 8-49 – 8-51 (describing the development of the ESM Plan and the LTCE model's application of economic criteria in the selection of CCGT options).
[272] *See, e.g.,* Reb. Test. Bacalao, 12:204-13:223.

manufacturer of these units was not a factor the AURORA model was capable of considering, let alone favoring.

Moreover, as the Proposed IRP Main Report explains,[273]

> When Siemens selected new generation options for inclusion in portfolios, a particular unit design based on an actual product is chosen as representative of a class of similar units. In all cases, there is at least one additional unit available from a different manufacturer with sufficiently similar characteristics that competitive bidding would be possible at the time a project is implemented. The important point is that the generating units used for the IRP purposes do not lock PREPA into any particular manufacturer for project implementation and further optimization can be achieved at the time of implementation.

There is, therefore, no Siemens "thumb on the scale" in the selection of representative fossil unit manufacturer. In fact, *none* of the combustion turbine model characteristics used as representative in the IRP analyses reflect Siemens technology; the manufacturers identified in Part 6 (New Resource Options) of the Proposed IRP Main Report are General Electric and Mitsubishi Hitachi Power Systems.[274]

In any event, the ultimate decision as to which manufacturers' equipment will be bid into the RFPs which PREPA intends to conduct to secure resource development commitments.[275] It will be up to individual project proponents – not Siemens and not PREPA – which manufacturer's technology is to be employed in generating resource additions. Opposing Intervenors are, accordingly, simply not correct in alleging that Siemens' consulting unit has stacked the deck in its work on the Proposed IRP in favor of its affiliates' generating technology. The Energy Bureau should dismiss these allegations as entirely unsupported.

[273] Prop. IRP Part 6.3.1 at pag. 5-3.
[274] *Id.,* Part 6.3.2, Ex. 6-3 - 6-12.
[275] *Id.,* Part 10 preamble at pag. 910-1.

The Energy Bureau should likewise dismiss LEO's suggestion that it should "consider the potential for conflict" in PREPA's engagement of King & Spalding as one of its legal advisors. Even assuming that this inquiry is within the scope of this proceeding, which it almost certainly is not,[276] LEO has offered no tenable legal theory under which King & Spalding could be found to have a conflict of interest that could impair its ability to advise and represent PREPA zealously and impartially. LEO asserts that, because King & Spalding has represented Fortress Investment Group, there is a question as to whether the firm has a conflict in representing PREPA. But, as King & Spalding's representative explained,[277] his firm's representation of entities that are legally separate from NFE – a public company whose securities are widely owned[278] – in matters entirely unrelated to those as to which King & Spalding advises PREPA, presents no conflict under the applicable professional responsibility code.[279] There is, therefore, no basis for LEO's suggestion that there is "even a potential for bias" that would make it imprudent for PREPA to seek King & Spalding's counsel.[280]

[276] The Energy Bureau has concluded that questions relating to the conversion of San Juan Units 5 and 6 to dual fuel capability and the agreement to this end with NFEnergía LLC ("NFE") – the counterparty with which LEO alleges King & Spalding has some sort of improper relationship – are not relevant to this proceeding, because the NFE San Juan Units 5 and 6 conversion project and the related NFE fuel sale and purchase agreement have been approved by the Energy Bureau, and the Energy Bureau has directed that the Proposed IRP take as a given that the San Juan Units 5 and 6 conversion will be completed. *See also* Panel F IRP Evidentiary Hearing Feb. 5 2019, https://www.youtube.com/watch?v=vIXWJt52Hfk 4:52:54: *Commissioner Rivera:* "**The actual ruling of the Energy Bureau which is the one that by law I have to support now because it's the official decision of the Bureau is the San Juan 5&6 conversion could proceed for the planning purposes and the IRP San Juan 5&6 is a fixed decision**." (emphasis added).

[277] *Id.* at 3:39:40.

[278] *See* Panel B IRP Evidentiary Hearings (Feb. 3, 2020), https://youtu.be/weJfs72YtvE?t=11644 at 3:39:00.

[279] *Id.* at 3:39:40.

[280] Leo Brief at pag. 70. LEO's characterization of King & Spalding's consideration of this issue as having "acknowledged… the potential for a conflict of interest here" (*see id.* at 69-20) is entirely inconsistent with the testimony given at the Evidentiary Hearing: the witness stated clearly that King & Spalding had analyzed the question in light of concerns the firm had "heard expressed on that subject" and had concluded that "there is no conflict of interest." Panel B IRP Evidentiary Hearing Feb. 3, 2020, https://youtu.be/weJfs72YtvE?t=11644 at 3:39:40.

XVII. ARGUMENTS ADDRESSING MATTERS NOT RELEVANT TO THE PROPOSED IRP EVALUATION SHOULD BE DISMISSED OUTRIGHT.

Arguments pressing issues not relevant to the development, evaluation and approval of PREPA's integrated resource plan should be dismissed outright. As *déjà vu*, LEO has devoted a great deal of attention to several topics it has pursued elsewhere that are not directly relevant to the Proposed IRP that is the focus of this proceeding. These topics include the "safety risks involved with importing LNG into San Juan Harbor,"[281] "water impacts" associated with operation of the AES-PR Puerto Rico coal-fired power plant and PREPA's Aguirre Power Complex,[282] water discharges from the Aguirre Power Complex into Jobos Bay,[283] air emissions from the Aguirre Power Complex,[284] PREPA's asserted noncompliance with "Community Right to Know" obligations relating to the sharing of information with communities close to the Aguirre Power Complex and other PREPA facilities,[285] and noise impacts associated with current operations at the Aguirre Power Complex.[286]

The Energy Bureau has determined that issues relating to the San Juan Units 5 and 6 conversion project, the fuel sale and purchase agreement between PREPA and NFE for supply of natural gas to San Juan Units 5 and 6, and the supply of LNG to the NFE facility are not germane to this proceeding, since the Energy Bureau has approved the PREPA-NFE fuel sale and purchase agreement and has directed that the IRP analysis assume the completion of the San Juan 5 and 6 conversion and the operation of those units on natural gas in the IRP model runs.[287] The other topics cited above relate to conditions at or complaints relating to the operation of existing

[281] LEO Brief at pags. 57-58.
[282] *Id.* at pags. 58-60.
[283] *Id.* at pags. 60-61.
[284] *Id.* at pags. 62-64.
[285] *Id.* at pags. 64-66.
[286] *Id.* at pag. 66.
[287] *See* FN. 276, *supra*.

generating facilities, not plans for supply- and demand-side resource additions which are the focus of the Proposed IRP per Energy Bureau Regulation 9021.[288] They are, therefore, beyond the scope of this proceeding. If, *arguendo*, the Energy Bureau does have authority to act any of these issues, LEO must identify correct procedural vehicles to bring them to the attention of the Energy Bureau. As a result, all the topics set forth in pages 57 to 68 of LEO's Brief should be disregarded outright as being beyond the scope of this proceeding.

XVIII. ARCTAS CAPITAL'S CHALLENGES TO THE PROPOSED AMENDMENTS TO THE ECOELÉCTRICA PPOA AND NATURGY GSPA SHOULD BE DISMISSED.

ARCTAS Capital Group has submitted a Final Substantive and Legal Brief in this proceeding which focuses primarily on issues ARCTAS contends are presented by PREPA's amended and restated agreements with EcoEléctrica (the "ECO PPOA") and Naturgy (the "Naturgy GSPA"). PREPA intends for those amended and restated agreements to supplant its existing power purchase and operating agreement and natural gas sale and purchase agreement with EcoEléctrica and Naturgy, respectively. ARCTAS takes the position in its brief that "the approval of the ECO PPOA and Naturgy GSPA deserves further scrutiny," suggesting that the Proposed IRP may be approved "without first approving the ECO PPOA and Naturgy GSPA."[289]

By Resolution and Order in Case No. NEPR-AP-2019-0001 issued on March 11, 2020, the Energy Bureau approved PREPA's proposal to execute the ECO PPOA and the Naturgy GSPA.[290]

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[288] *See generally* Regulation 9021, Sec. 1.03 ("the IRP will consider all the reasonable resources to satisfy the demand for electricity services during a twenty (20)-year planning period, taking into account both supply- and demand-side electric power resources" and is to "serve as an adequate and useful tool to guarantee the orderly and integrated development of Puerto Rico's electric power system").

[289] ARCTAS Brief at pag. 40.

[290] *Resolution on the Puerto Rico Electric Power Authority's Request for Reconsideration of Resolution and Order on Denial without Prejudice of Approval of Amended and Restated Power Purchase and Operating Agreement with EcoEléctrica and Natural Gas Sale and Purchase Agreement with Naturgy,* Case No. NEPR-AP-2019-0001 (issued March 11, 2020) at pag. 14.

This action renders moot the arguments to which the bulk of the ARCTAS Brief is devoted, and the Energy Bureau therefore need not address them in this proceeding.[291]

ARCTAS' arguments concerning the manner in which a solicitation for a new gas-fired CCGT should be structured and should address the question of access to existing terminal and dock facilities in San Juan Harbor[292] are more appropriately advanced and addressed at the time PREPA actually presents such an RFP for Energy Bureau review, not in this IRP proceeding. [293] The Energy Bureau should decline to engage in the speculative exercise ARCTAS proposes.

XIX. CONCLUSION

WHEREFORE, the Puerto Rico Electric Power Authority requests the Energy Bureau to deny all of the Opposing Intervenors' requests, accept the Proposed IRP and approve the Preferred Resource Plan and authorize PREPA to pursue the Action Plan.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 20th day of April 2020.

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[291] ARCTAS Brief at pags. 1-33.
[292] ARCTAS Brief at pags. 35-39.
[293] ARCTAS' argument that "PREPA should avoid creating unnecessary arguments for the replacement peakers that limit the available technical solutions" is addressed in this brief in the text accompanying FN 262.

CERTIFICATE OF SERVICE

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

In San Juan, Puerto Rico, this 20th day of April 2020.

s/ Katiuska Bolaños
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