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

IN RE: PUERTO RICO ELECTRIC POWER AUTHORITY INTEGRATED RESOURCE PLAN	**CASE NO. CEPR-AP-2018-0001** **SUBJECT:** LEGAL BRIEF

LOCAL ENVIRONMENTAL ORGANIZATIONS' LEGAL BRIEF

COME NOW, Comité Diálogo Ambiental, Inc., El Puente de Williamsburg, Inc. - Enlace Latino de Acción Climática, Comité Yabucoeño Pro-Calidad de Vida, Inc., Alianza Comunitaria Ambientalista del Sureste, Inc., Sierra Club and its Puerto Rico chapter, Mayagüezanos por la Salud y el Ambiente, Inc., Coalición de Organizaciones Anti-Incineración, Inc., Amigos del Río Guaynabo, Inc., Campamento Contra las Cenizas en Peñuelas, Inc., and CAMBIO Puerto Rico (collectively, known as "Local Environmental Organizations"), by and through their legal counsel, to respectfully set forth and pray:

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Introduction

The goal of the Integrated Resource Plan should be the transformation of the Puerto Rico electric system to better serve the people of Puerto Rico. Every large power outage risks the loss of or detriment to human life, as experienced in the aftermath of Hurricane Maria. In addition to the immediate human toll, each big power failure also represents a blow to Puerto Rico's viability. After each major event, many Puerto Ricans, especially working-aged people and their children, leave the archipelago and do not return, leaving behind an increasingly aging and vulnerable population. The evidence on this record demonstrates that renewables and storage, especially distributed renewables and distributed storage, plus energy efficiency, are by far the least-cost and most resilient options to transform Puerto Rico's electric grid.

However, instead of embracing a clean, cost-effective, equitable, and resilient system, the Puerto Rico Electric Power Authority (PREPA) has asked the Energy Bureau to approve deeply flawed plans that will not solve Puerto Rico's energy problems. PREPA's Preferred Plans are over-reliant on imported methane gas, rather than prioritizing the maximum integration of renewable energy and distributed generation into the grid. PREPA fails to meaningfully consider and prioritize renewable and battery storage resources, particularly customer-cited rooftop solar and battery systems. It perpetuates an energy grid beholden to long-distance transmission lines that routinely fail, to fossil fuel imports that direct

money away from the Puerto Rican economy, and to emissions of pollution and greenhouse gases that threaten the lives of the public.

The people of Puerto Rico reject PREPA's Preferred Plans, and during a month of public hearings across Puerto Rico on the IRP, the public filled hearing rooms to urge the Bureau to do the same. Here, Local Environmental Organizations provide a summary of some of those comments, representative of the group of commenters.

Public commenters point out that the IRP does not integrate an evaluation of the seismic vulnerability of the existing and proposed infrastructure. The earthquake of January 7, 2020, not only intensified the need to decentralize the network, but also demonstrated the resilience of photovoltaic systems to seismic events.

Public commenters, especially those living in environmental justice communities, urge the Energy Bureau to consider the continuing harm caused by Puerto Rico's fossil fuel plants, especially the AES coal-fired plant.[1] PREPA's IRP violates Law 17 by failing to evaluate the air pollution, water pollution, water

[1] *See, e.g., Comments on PREB Dkt. No. CEPR-AP-2018-0001* of: Frente Unido Pro-Defensa del Valle de Lajas (Mar. 2, 2020); Leonor Vázquez (Mar. 2, 2020); Ametza Delgado Cardona (Mar. 1, 2020); Reverend Eunice Santana Melecio (Feb. 27, 2020); José Rodríguez Maldonado (Feb. 26, 2020); Amnistía Internacional Sección de Puerto Rico (Feb. 25, 2020); Víctor Alvarado (Feb. 25, 2020); Braulio Quintero (Feb. 22, 2020); Luz Vega Orozco (Feb. 19, 2020); Yabucoa Mayor's Office (Feb. 19, 2020); Manuel José Martínez (Feb. 19, 2020); Daniel Cruz Donato (Feb. 19, 2020); Mayra Vicil Bernier (Feb. 19, 2020); Rafael Alberto Malavé (Feb. 19, 2020); Miguel Sarriera (Feb. 18, 2020); Martha Quiñones (Feb. 16, 2020); Ciudadanos en Defensa del Ambiente, Iván Elías (Feb. 13, 2020); Hispanic Federation, Maritere Padilla (Feb. 13, 2020); Luis Pedraza (Feb. 13, 2020); Sergio Knaebel (Feb. 13, 2020); Reverend Sary Rosario Ferreira (Feb. 12, 2020); Lissette Avilez Rios (Feb. 12, 2020); Damaris Pérez Pagán (Feb. 12, 2020); Rafael Díaz Santiago (Feb. 12, 2020); ReImagina Puerto Rico (Feb. 11, 2020); Renewable Energy Coalition, Ron Leonard, (Feb. 11, 2020); Georgina Pietri (Feb. 11, 2020); Adriana Rivera (Feb. 10, 2020); and Marie Pérez (Feb. 4, 2020).

capacity, safety risks, and contribution to climate change of its gas-heavy Preferred Plans. The United Nations Special Rapporteur on Human Rights and the Environment has underscored that "clean air is a central component of the right to a healthy environment, together with clean water … and a safe climate." The Inter-American Court for Human Rights also recognized that the State must guarantee the provision of electrical energy without impacting especially vulnerable populations.[2]

Finally, public commenters point out the many ways they have been shut out of this process.[3] First, all written pleadings, as well as the majority of the evidentiary hearing, was conducted in highly technical English. This is a striking disparity against the public hearings and public comments, where Puerto Ricans spoke to the Energy Bureau in their native Spanish. In addition, PREPA has demonstrated a naked disregard for the concept of energy democracy, by continuing to implement portions of its Preferred Plans through secret and illegal RFPs, and plans made outside of this docket without public participation.

The Local Environmental Organizations share the public's sentiment on all of the failings of the IRP described above, and agree that the IRP must be rejected. PREPA acknowledges that it must install as much PV and storage as practical right away, but does not present specific locations, investments, budget allocations, or

[2] *Río Negro Massacres v. Guatemala*, Preliminary Objection, Merits, Reparations, and Costs, Judgment, Inter-Am. Ct. H.R., para. 284 (Sept. 4, 2012).
[3] *See, e.g., Comments on PREB Dkt. No. CEPR-AP-2018-0001* of: Frente Unido Pro-Defensa del Valle de Lajas (Mar. 2, 2020); Reverend Eunice Santana Melecio (Feb. 27, 2020); Amnistía Internacional Sección de Puerto Rico (Feb. 25, 2020); and Martha Quiñones (Feb. 16, 2020).

identify PREPA employees or consultants who will actually achieve these deployments. On distributed generation and storage, PREPA is even worse, refusing to offer any encouragement, customer engagement, incentives or service payments at all for the significant distributed solar and storage that Puerto Ricans are installing on their own. And finally on energy efficiency and demand response, PREPA freely admits it has no real plan whatsoever to incorporate these critical resources.

PREPA's indifferent approach to renewables, storage and energy efficiency is a striking contrast to the meticulous planning PREPA includes in the IRP for gas-fired resources, as well as the planning and actual procurement PREPA has already carried out for gas-fired resources. Notably, PREPA has aggressively pursued these new gas resources without an approved IRP, through secret, illegal RFPs conducted without Energy Bureau approval or public input.

Without more specific plans on renewables and storage, PREPA cannot claim to have a real plan to meet the RPS targets, or to eliminate our dependence on imported fuels. PREPA has therefore failed to meet the fundamental goal for this IRP, as described by the Legislature in Law 17-2019, and by this Bureau in its Order of May 2018, directing PREPA to file this IRP. Fortunately, experts testifying on behalf of Local Environmental Organizations and other intervenors have provided the Bureau with numerous recommendations for Action Plan requirements that would immediately implement renewables, storage, and energy efficiency programs, and begin the transformation of this grid.

PREPA's Preferred Plans, on the other hand, would ensure decades of continued reliance on large, centralized power plants and long, vulnerable North-to-South transmission lines. This does not promote the resilience of the electricity grid to natural disasters and the impacts of climate change. The experience of Hurricane Maria and the seismic events of this year showed us the importance of decentralizing the network. A distributed generation system will allow that after an emergency we can restore energy service as soon as possible, fulfilling the responsibility of saving lives.

The Energy Bureau must reject the fatally flawed Preferred Plans and Action Plan set forth by PREPA. To immediately begin the transformation of Puerto Rico's grid, Local Environmental Organizations urge the Energy Bureau to instead order PREPA to take the Action Plan steps laid out in this brief. And to continue the process of long-term resource planning, the Energy Bureau should order PREPA to redo its Integrated Resource Plan, correcting for the errors detailed in this brief.

Argument

Law 17-2019 demands a transformation of Puerto Rico's energy grid, to unshackle the island from imported oil and coal and grant true energy independence, through "the use of new technology, alternative energy methods, distributed generation and renewable energy sources, [and] the integration of microgrids."[4]

PREPA's Preferred Plans, Scenario 4 Strategy 2 and the Energy System Modernization Plan, do not offer that transformation, but rather merely a shift from one fossil fuel to another. At every step of this Integrated Resource Plan process, PREPA and Siemens have displayed a bias in favor of large, conventional, centralized fossil fuel plants, and against renewables and distributed generation. As detailed in Point I(a), I(b), and III, Siemens overestimated the costs of renewables and distributed generation, and underestimated the costs of gas and gas-fired plants. As detailed in Points I(c), I(e), and II, Siemens underestimated the capabilities of renewables and distributed generation. And as detailed in Points IV through IX, Siemens has not given the Energy Bureau the full picture of the true economic and environmental costs of its Preferred Plans.

[4] Law 17-2019, Statement of Motives.

Siemens baked all of these biases, in favor of gas-fired generation and against renewables, into its Aurora modeling. And yet that modeling shows that PREPA's gas-heavy Preferred Plans do not outperform a renewable-heavy portfolio on cost:

Net Present Value, Assuming 9% Interest Rate, from 2019-2038	Scenario 3, Strategy 2, Sensitivity 8	Scenario 4, Strategy 2	Energy System Modernization Plan
	$14,357,561,000	$14,350,195,000	$14,431,214,000

Siemens also measured the portfolios' resiliency using a Deemed Energy Not Served metric: "a high-level determination of how the different portfolios resulting from the combination of Scenarios and strategies would perform if every 5 years starting in 2022 a major hurricane impacted the island . . . ."[5] While that metric does not by any means tell the whole story of resiliency, Siemens predicts that PREPA's gas-heavy Preferred Plans would cause much higher losses than the renewable-heavy portfolio:

Net Present Value of Deemed Energy Not Served	Scenario 3, Strategy 2, Sensitivity 8	Scenario 4, Strategy 2	Energy System Modernization Plan
	$205,871,000	$247,445,000	$266,947,000

On both affordability and resiliency, then, Siemens has failed to make a case for its Preferred Plans. In June 2019, in defense of its Preferred Plans, Siemens offered a "scorecard," which it weighted in such a way as to make the Preferred Plans

[5] Puerto Rico Electric Power Authority, Integrated Resource Plan 2018-2019 With Errata, Rev. 2.1, Section 8.2.8 (June 7, 2019) [hereinafter IRP].

look better than the renewable-heavy portfolio.[6] In Panel H, Siemens acknowledged that, in retrospect, the use of the scorecard was a mistake:[7]

> Cmmr. Ángel R. Rivera de la Cruz, PE, Esq.: When was the scorecard developed and the weights assigned? Before or after you had the [modeling] results in hand?
>
> Dr. Bacalao: The scorecard … I looked at the [modeling] results, I looked at the table, and I remembered "Hey, our friends at Pace, they do these scorecards. Let's try to do something like that." I regret that I put the weighted [results], the final results that have the weights. Now I regret it. Because even at Pace, sometimes they think about "should we put the weighted [results] or should we just leave the column the way it is?" On the inside, I regret it.
>
> Cmmr. Rivera: OK. Thank you. So the answer will be: "After."
>
> Dr. Bacalao: Yes.

In Panel H, Anna Sommer, an expert witness for Local Environmental Organizations, pointed out that Siemens had focused too much on abstract modeling and failed to answer the real questions underlying the transformation of PREPA's grid:

> The point is to get to 100% renewable energy. ... The question is ... How do you get to that? What are the restrictions on getting to that? Is it things like the ability of PREPA to raise capital to invest in new generation? Is it things like the establishment of a program to compensate people who are doing behind-the-meter solar with the residents of Puerto Rico? Is a program needed to make sure that bundled DERs from Wildan and their competitors can come online? Those are the sorts of things that are limiting the implementation of these resources. ... What are the things that are standing in our way to get in our goal?

[6] IRP, Exhibit 8-7.
[7] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 6, 2020), https://youtu.be/HO40ImpqKe8?t=13555.

...

> Puerto Rico has expressed a desire for 100% renewable energy. The goal of all of us, who are sitting here as experts, is to figure out how to get to that.[8]

PREPA's Preferred Plans and Action Plan fail to answer those questions. In this brief, Local Environmental Organizations detail the proposals from our expert witnesses, as well as witnesses from other intervenors, that **do** answer these fundamental questions, and offer a path to transform the island's grid as Law 17-2019 requires.

I. PREPA's Action Plan and Preferred Plans fail to adequately integrate distributed generation, renewables, storage, and energy efficiency. Local Environmental Organizations offer several steps for a Proposed Action Plan that does meet this challenge.

Law 17-2019 directs PREPA to "maximize the use of renewable energy", and at the same time "aggressively reduce the use of fossil fuels" and "minimiz[e] greenhouse gas emissions . . . ."[9] PREPA's Preferred Plans and Action Plan not only fail to meet that challenge, but in fact actively "hinder the development of a modern system that integrates distributed generation, renewables, and storage," in gross violation of PREPA's obligation.[10]

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[8] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 6, 2020), https://youtu.be/UGn8uAvm5NQ?t=2908. Ms. Sommer has worked for over 15 years in electric utility regulation. She has reviewed dozens of Integrated Resource Plans and planning exercises. Ms. Sommer has experience reviewing modeling from Aurora and several other modeling software systems. Ms. Sommer has submitted testimony before the Puerto Rico Energy Bureau in a 2017 matter, and contributed to comments in two other cases.

[9] Law 17-2019 Section 1.5(6)(b), Section 1.11(d).

[10] Law 17-2019 Section 1.10(d).

At the outset, we must clarify that we define "distributed generation" as "customer installed generation that is behind the meter," in accordance with the definition in the Integrated Resource Plan.[11] This clarification is necessary because of Siemens' surprising statement at the hearing that Siemens would consider a 300 MW gas-fired plant to fit the definition of distributed generation.[12] Siemens' inclusion of a 300 MW gas-fired plant within the definition of distributed generation speaks to Siemens' bias in favor of gas, and against distributed generation and against renewables.

The Energy Bureau should reject the biased Preferred Plans and the Action Plan, because they fail to facilitate the development of the modern system that Puerto Rico needs, with full integration of distributed generation, renewables, energy efficiency, and storage. The Energy Bureau should instead adopt the Proposed Action Plan set forth by Local Environmental Organizations, which will meet that challenge.

A. Siemens overestimated the cost of Distributed Generation by at least 50%

Siemens forecasts that the Levelized Cost of Energy from onsite distributed solar would be 15.3 cents per kWh today, declining to 8.6 cents per kWh in 2038.[13] The best source of information for these forecasts is real-world market data from existing customer-sited generation, or information from the solar installers on the

[11] IRP, App'x 4, at 3-20.
[12] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001,* YouTube (Feb. 6, 2020), https://youtu.be/UGn8uAvm5NQ?t=9724. "When we're talking about distributed resources, even the 300+ MW in Palo Seco is a distributed resource. We are contrasting that against the 900 MW that are the two Aguirre units in the south or the 530 MW [that is] EcoElectrica."
[13] IRP App'x 4, Section 3, Exhibit 3-14.

island (several of whom are parties to this proceeding). Siemens ignored these sources and instead created its forecasts by applying various multipliers and additions to generic assumptions for distributed solar from the NREL Annual Technology Baseline. Although the Annual Technology Baseline already includes its own forecast for the LCOE of distributed solar, and despite borrowing other figures from the NREL baseline, Siemens chose to create its own LCOE. Siemens now claims that, by the LCOE it generated, distributed solar is twice as expensive in Puerto Rico as on the mainland today, ballooning to four times as expensive in 2038. The testimony of Dr. Agustin Irizarry-Rivera,[14] demonstrates that Siemens's forecasting method has wildly overestimated these costs. The significant errors in Siemens' methods would have been avoided had Siemens used actual real-world market data on the costs of these systems.

Dr. Irizarry has extensive experience with the cost of these systems.[15] Dr. Irizarry conducted the analysis that Siemens should have done: he simply obtained real quotes for costs of equipment at retail price in Puerto Rico, along with costs for a simple personal loan, widely available to Puerto Ricans for these projects. Dr.

[14] Dr. Irizarry has nearly three decades of experience as a licensed professional electrical engineer in Puerto Rico. Local Environmental Organizations' Mot. To Submit Expert Test., Direct Test. of Agustín Irizarry-Rivera at 2, (Oct. 23, 2019), http://energia.pr.gov/wp-content/uploads/2019/10/LEOs-Motion-for-Submission-of-Testimony-with-Testimonies.pdf. [hereinafter Irizarry-Rivera Direct Test.]. Dr. Irizarry has worked as a Professor at the Electrical and Computer Engineering Department of University of Puerto Rico - Mayaguez since 1997. In that role, Dr. Irizarry has researched and written extensively (with over 50 refereed publications) on integration of energy efficiency, renewable energy, and distributed solar systems into the grid.

[15] For example, Dr. Irizarry and other University of Puerto Rico - Mayaguez faculty members have developed a rooftop PV model that is accessible to low-income residents. *See*, Irizarry, A. Montano, K, Alzate, S., Andrade, F., *A Case Study of Residential Electric Service Resiliency thru Renewable Energy Following Hurricane María*, Mediterranean Conference on Power Generation, Transmission, Distribution and Energy Conversion (MEDPower) (Nov. 12-15, 2018).

Irizarry's real-world, Puerto Rico-specific analysis of solar PV costs resulted in a forecast of Levelized Cost of Energy for rooftop PV of 7.8 cents per kWh in 2019, declining to 1.8 cents per kWh in 2038.[16] After Dr. Irizarry obtained his results, he found they were quite similar to NREL". National Renewable Energy Laboratory's (NREL) forecasts for the costs of rooftop solar. This casts doubt, at least for rooftop solar, on Siemens' insistence on increasing all costs by 16% in reliance on the U.S. Department of Defense Cost Factor.

All of Siemens' scenarios included the same forecast that customers would add 1,176 MW of distributed generation by 2038, without any incentives or cost-sharing from PREPA and without any ability for these distributed resources to offer services to the larger grid. If the cost of these systems is closer to Dr. Irizarry's forecast than Siemens' forecast, and if PREPA provides proper incentives and better integration to the grid, then distributed generation could contribute far more to the island's grid than Siemens currently predicts. In turn, less of the burden for building new generation would fall on PREPA and ratepayers. Siemens' overestimation of the costs of distributed generation hinders integration of this critical resource, in violation of Law 17-2019.

B. Siemens overestimated the cost of utility-scale renewables by 30%.

Siemens forecasted a Levelized Cost of Energy for utility-scale solar of $67/MWh in 2019, varying through the planning period, and landing at $68/MWh in

[16] Irizarry-Rivera Direct Test. at 27-29.

2038.[17] Again, the best source of information for these forecasts would have been real-world market data on utility-scale solar resources in Puerto Rico.[18] Instead, as with its distributed solar LCOE forecasts, Siemens chose not to use real-world data, and instead forecasted the LCOE of utility-scale solar by applying various adders and multipliers to the generic assumptions for solar capacity factor and solar capital costs from NREL's 2018 Annual Technology Baseline estimates.[19] However, as explained in pp. 20-21 of the Direct Testimony of Local Environmental Organizations' expert Anna Sommer, Siemens' method included a critical error involving the Inverter Load Ratio.[20]

The Inverter Load Ratio is only appropriate to use when, for example, capacity factor and per unit capital cost are in different units. Conversely, NREL explains that when using capacity factor and capital costs to calculate LCOE, it is inappropriate to apply the Inverter Load Ratio when all variables are using consistent units.[21] Ms. Sommer confirms that NREL ATB figures are indeed using consistent units: "the ATB's capital cost estimates are in $/kW_{DC}$ and capacity factor

[17] IRP, Exhibit 6-34.
[18] This could have been obtained from existing projects, or the forty-seven projects currently under negotiation, listed in Exhibits 4-17 and 4-18. Dr. Elizabeth Stanton, testifying on behalf of Environmental Defense Fund, explains that Siemen also could have obtained this data by conducting a Request For Proposals. Environmental Defense Fund's Mot. Submitting Expert Test., Direct Test. of Dr. Elizabeth Stanton at 28, (Oct. 23, 2019), http://energia.pr.gov/wp-content/uploads/2019/10/20191023-EDF-Expert-witness-Testimony.pdf [hereinafter Stanton Direct Test.].
[19] In addition, NREL does provide its own forecasts for LCOE of utility-scale solar, but Siemens chose not to use those, and to create its own.
[20] The IRP confirms that the Inverter Load Ratio of 1.3 "is included when calculating the LCOE." IRP Section 6.4.1.
[21] Local Environmental Organizations' Mot. To Submit Expert Test., Direct Test. of Anna Sommer at 20-21, http://energia.pr.gov/wp-content/uploads/2019/10/LEOs-Motion-for-Submission-of-Testimony-with-Testimonies.pdf [hereinafter Sommer Direct Test.].

is in units of kWh_{AC}/kWh_{DC}."[22] Therefore, Siemens was mistaken in applying the Inverter Load Ratio in this case, multiplying the solar capital costs by 1.3. "In effect, Siemens has needlessly included a 30% adder to the price of [utility-scale] solar."[23]

PREPA and Siemens asked pointed discovery questions on some issues in Ms. Sommer's testimony, but not this issue. PREPA offered rebuttal testimony discussing some points in Ms. Sommer's testimony, but is silent on her point that Siemens overestimated utility-scale solar costs by thirty percent. The true cost of utility-scale solar is far lower than the erroneous inputs used by Siemens, and lower even than the Low Case Solar PV in Exhibit 6-31 used by Siemens for Scenario 3.[24] And Siemens' modeling demonstrates that PREPA's gas-heavy Preferred Plans, even with this error in their favor, still do not outperform a portfolio choosing renewables and storage over gas-fired plants.

C. The Queremos Sol plan demonstrates the viability and affordability of distributed renewable generation.

Civil society groups, including community, environmental, labor, professional and academia have come together to promote a platform for the transformation of the Puerto Rico grid known as "Queremos Sol," or, "We Want Sun."[25] The proposal sets forth a vision, objectives and mechanisms to reach the goal of 100% renewable

[22] The NREL ATB gives this exact scenario as an example where the units are consistent, and therefore applying the ILR is inappropriate.
[23] Sommer Direct Test. at 21.
[24] Again, had Siemens used real-world data on utility-scale solar resources, there would have been no opportunity for mistakes in an estimation method.
[25] See Queremos Sol, https://www.queremossolpr.com/ (last visited Mar. 6, 2020). Mr. Sandoval relied on the Queremos Sol plan in preparing his testimony, and the Queremos Sol plan was circulated to all parties as part of discovery.

generation by 2050, which all parties to this proceeding share, through incremental advances in energy efficiency, demand response programs and escalating amounts of distributed, community-sited renewable generation. The Queremos Sol Plan does a better job than PREPA's Preferred Plans of maximizing renewables, encouraging distributed generation, and empowering a customer-centric grid.

Queremos Sol participants are concerned about the impacts of fossil fuel energy generation and climate change in Puerto Rico and seek to promote multisector discussion around mitigation and adaptation alternatives and their viability for the island-archipelago.

An expert report coincides with the type of transformation proposed in Queremos Sol:

> In the short term, the bottom-up approach to build decentralized resiliency from individual solar home systems, to microgrids, and all the way to the main grid needs to be explored as a potential option because a relatively high penetration rate could enable a variety of options for microgrid development that enhance the robustness of community resilience while also provides economies of scales.[26]

Public commenters also urged the Energy Bureau to adopt a plan like Queremos Sol, for example:

> Our path forward is to offer a sound footing to stand on to prove 100% renewable energy is not only possible, manageable, quicker, and in fact cheaper than falling back on failed technology that got the island in the trouble it is in now. We see various proposals that sound nice (like Microgrid, or RFP's to sectionalize the island's transition Roosevelt Roads) but the troubling appearance is that things are being stuck onto a unstable infrastructure to

[26] A. Kwasinski, F. Andrade, M. J. Castro-Sitiriche, & E. O'Neill-Carrillo, *Hurricane Maria Effects on Puerto Rico Electric Power Infrastructure*, IEEE Power & Energy Tech. Systems J., vol. 6, at 85-94, (Mar. 2019), https://ieeexplore.ieee.org/document/8644031.

> prop it up rather than take the rational step to commit to fundamental reform to make the changes needed to provide a solution that everyone would be proud of.
>
> ... The proposals of committing the island to more fossil fuel infrastructure like compressed natural gas rather than seeking a transition from the billions spent yearly now on Fossil Fuels has to be the core value or the ratepayers will never be served. Our science centered solution is based on pier reviewed papers on the practicality of 100% renewable energy.
>
> An analysis leads to breakthrough insight. If we are going to see real reform in reduction of greenhouse gasses and are serious about the concept of the "electrification of everything" as a method of reducing the dependence of fossil fuel in other areas like Transportation and Heating/ Cooling of structures, solutions have to be soundly based on science. In this new study a team led by Dr. Marc Perez brought out an important tool: oversizing of PV systems relative to storage capacity. In an analysis of matching supply and demand on an hourly basis over the course of a year, Dr. Perez showed how over-building solar relative to energy storage results in lower combined system costs, while creating a system that can provide power 24/7. The study shows that Minnesota - a northern state with high seasonal solar variation and little hydro - can reach 95% wind and solar at a generation cost of 3.6 cents per kilowatt- hour (KWh). An ongoing study of another Island with a population of 1,000,000 residents is proving the reliability and cost savings of this method for the larger island and population in Puerto Rico.[27]

Through the Queremos Sol Plan, Puerto Rico can jump-start the transformation of its electric system to rooftop solar communities and businesses.

D. Siemens failed to appreciate the full benefits of renewables and storage, especially for resiliency.

[27] *See Acta Vista Pública - San Juan, Comentarios recibidos en Vista Pública (San Juan – 11 de febrero de 2020)*, Dkt. No. CEPR-AP-2018-0001 (Mar. 4, 2020), http://energia.pr.gov/wp-content/uploads/2020/03/Comentarios-Publicos-11-feb-2020-SJ.pdf.

PREPA's June 2019 Fiscal Plan, the Grid Modernization Plan, and COR3's Energy System Modernization Plan were created outside the Integrated Resource Plan, with no public input or stakeholder input and no model optimization—and all plants include massive gas infrastructure buildout.[28] This reliance on gas infrastructure is the preference of PREPA management, rather than the result of least-cost modeling or ratepayer concerns. One example of where this bias appears in the Integrated Resource Plan is Siemens' unjustified assumption that only thermal units would be "readily available" after a major event.[29] Based on this bias, Siemens forced an uneconomic decision to build 18 gas-fired peaker units of 23 MW apiece in 2021 into its modeling.[30] After being challenged on its assumption, Siemens acknowledged that renewable resources could be available immediately after a major event, and therefore the original assumption was wrong.[31] This is just one example of the pro-gas, anti-renewable bias that infects the Integrated Resource Plan. The Energy Bureau must reject the biased Preferred Plans and Action Plan, and ensure that the next Integrated Resource Plan is free from this bias.

[28] Brief for Rocky Mountain Institute as Amicus Curiae, at 14, *In re: Review of the Puerto Rico Electric Power Authority Integrated Resource Plan*, Dkt. No. CEPR-AP-2018-0001 (Dec. 20, 2019) [hereinafter RMI Amicus Brief].

[29] Puerto Rico Electric Power Authority, 2019 Fiscal Plan for the Puerto Rico Electric Power Authority at 80 (June 27, 2019), https://aeepr.com/es-pr/Documents/Exhibit%201%20-%202019%20Fiscal_Plan_for_PREPA_Certified_FOMB%20on_June_27_2019.pdf. In addition, in response to Local Environmental Organizations' ROI 3.32(a), PREPA claimed that thermal resources "are more likely to be available and capable of serving critical loads during and immediately following an extreme weather event than non-thermal resources, such as solar, wind and battery energy storage facilities."

[30] IRP, Section 8.3.

[31] In addition, Siemens did not take distributed storage into consideration at all. See PREPA response to Local Environmental Organizations' ROI 3.56.

After Intervenors challenged Siemens on this point, Siemens's rebuttal testimony acknowledged that the June 2019 Integrated Resource Plan did not recognize the full value of renewables, stating that solar panels could in fact be certified to withstand major events, and therefore should have been considered to supply critical loads.[32] In December, the Energy Bureau's Energy Storage Study confirmed that "thermal resources are not required to prevent loss of critical loads."[33] In January, the day after a seismic event that put two major gas-fired plants offline, Puerto Rico's renewables stood ready to serve critical load.[34] At the hearing, Dr. Bacalao further explained that if the Integrated Resource Plan had correctly recognized the full resiliency value of renewables, then the fixed decision to build 414 MW of gas-fired peaking units in 2021 may not have been necessary:

> Q: So let's look at the circumstances when a renewable manufacturer brings you a piece of equipment that is guaranteed to match the expectations of availability and can withstand a major event. Would you still include the fixed decision to accelerate gas peakers? Couldn't you accelerate renewables? Or is it possible that renewables that are already added by 2021 would be certified to withstand a major event and be guaranteed to match availability? Wouldn't that change the fixed decision to accelerate gas peakers?
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> A: It would be the second [option, that renewables already added by 2021 would change the fixed decision to accelerate gas peakers].[35]

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[32] PREPA's Mot. to Submit Corrected Rebuttal Test., Direct Test. of Nelson Bacalao, PH.D. at 7, (Jan. 20, 2020), http://energia.pr.gov/wp-content/uploads/2020/01/Corrected-Rebuttal-Testimony-of-Nelson-Bacalao-PH.-D.-in-Support-of-PREPAs-Draft-Integrated-Resource-Plan-CEPR-AP-2018-0001.pdf [hereinafter Bacalao Rebuttal Test.].
[33] Puerto Rico Energy Bureau, *Energy Storage Study For a renewable and resilient island grid for Puerto Rico* at Section 6.1 (Dec. 19, 2019), *filed in* Dkt. NEPR-MI-2020-0002, http://energia.pr.gov/wp-content/uploads/2020/01/NEPR-MI-2020-0002-Estudio-Sistemas-de-Almacenamiento-de-Energi%CC%81a.pdf [hereinafter PREB Energy Storage Study].
[34] Puerto Rico Electric Power Authority, Presentation for Evid. Hr'g Panel A at Slide 20 (Feb. 3, 2020).
[35] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 5, 2020), https://youtu.be/vIXWJt52Hfk?t=2190.

The Energy Storage Study also confirmed that Siemens' incorrect decision to force gas-fired resources into the modeling had improperly lowered the amount of renewables and storage selected:

> The analysis finds that the gas-fired plants (thermal resources) required by PREPA's minigrids approach to meet critical and priority load impact the buildout of solar and storage. Because the model is forced to include thermal resources, it cannot add as much solar and storage as it would if it were allowed to seek out the most cost-effective options for meeting demand.[36]

In sum, the Energy Bureau should reject any spending on gas-fired peakers, until Siemens can correct the mistaken assumptions in its analysis. The main objective of the electric system should be to ensure electricity resilience for people, which is not the same as ensuring the resiliency of the electric grid. Distributed renewable energy systems at the household level can provide more resiliency than centralized gas-fired plants. Siemens' unjustified bias against renewables and distributed generation violates the Regulation 9021, Section 2.03(H)(2)(B) requirement that PREPA place distributed generation and distributed storage in a "competitive framework with supply-side resources." The Integrated Resource Plan must be free from this bias.

E. Siemens' Modeling Includes Extraordinarily High Reserve Level Margins Due to a Misunderstanding of Battery Storage Capabilities.

Law 17-2019, section 1.11 (c) requires PREPA to fix an "optimal reserve margin for Puerto Rico." PREPA failed to do so in this case, opting instead to set a minimum

[36] PREB Energy Storage Study, Section 6.1.

reserve margin of unknown origin that ultimately and counterintuitively had no effect whatsoever on the modeling. The reserve margin should be a critical constraint on resource optimization because it dictates the level of reserves that Puerto Rico finds to be economically optimal. This allows PREPA to create a Resource Needs Assessment that accurately identifies future expected capacity and energy requirements, as required by Regulation 9021, Section 2.03(E). In Law 17-2019, the Legislature highlighted that the Resource Needs Assessment must address the striking difference between energy demand, which decreased to 3,060 MW in August 2017, and generation capacity, which remained quite high at 5,839 MW.[37] That difference has only grown since the passage of Law 17: at present, Puerto Rico's energy demand is 2,302 MW while its generation capacity is now 5,985 MW.[38] The Legislature emphasized this gap to point out that excess capacity creates unnecessary additional costs for ratepayers. However, PREPA exacerbates this problem by allowing extraordinarily high reserve margins, for reasons that are still unsupported by the record. In part, Siemens misunderstands battery storage's ability to replace thermal reserves. Due to this problem, PREPA's Preferred Plans include installed capacity of about 7,000 MW, while Siemens forecasts peak demand to fall to 1,706 MW by 2038.[39] PREPA's Preferred Plans fail to resolve the problem identified by the Legislature, and PREPA's failure to set an optimal resource margin or accurately

[37] Act 17-2019, Statement of Motives.
[38] Puerto Rico Electric Power Authority, Presentation for Evid. Hr'g Panel A at Slides 15, 20 (Feb. 3, 2020).
[39] IRP, Exhibits 3-24, 3-25, & 3-26.

identify the future capacity needs of the island violate Law 17-2019, Section 1.11(c) and Regulation 9021, Section 2.03(E).

Ms. Sommer explains, and no party disputes, that "higher reserve margin equals higher cost."[40] Ms. Sommer further points out the "extraordinarily high" reserve margins of 50% to 90% in S4S2 and 60% to 100% in the Energy System Modernization plan. PREPA must justify these reserve margins because "significant ratepayer dollars are at risk and such significant overbuilding would occur."[41] In the previous Integrated Resource Planning process, the Energy Bureau explained that it assumed planning reserve margins would drop as PREPA's fleet modernized: "As the reliability of PREPA's fleet improves, the amount of surplus capacity that PREPA must plan to hold will decrease, resulting in reduced costs to customers."[42] Siemens' plan does not deliver those reduced costs, because it continues to plan for extraordinarily high reserve margins.

In defense of these extraordinarily high reserve margins, Dr. Bacalao argues they can be "traced back to the economics of renewable generation integration; that is storage, peaking generation and flexible CCGT's all of which are necessary to achieve the optimization objective of least cost supply."[43] Dr. Bacalao's position conflicts with the testimony of other Siemens and PREPA witnesses at the hearing.

[40] Sommer Direct Test. at 17; IRP, Exhibit 3-26. Peak demand forecast includes reductions from expected energy efficiency and distributed generation deployment.
[41] Sommer Direct Test. at 18.
[42] Puerto Rico Energy Bureau, Final Resolution and Order on the First Integrated Resource Plan of the Puerto Rico Electric Power Authority, para. 68, Dkt. No. CEPR-AP-2015-002 (Sept. 23, 2016).
[43] Bacalao Rebuttal Test. at 19. Siemens' position on this issue is further illustrated by its assumption that solar and wind provide no accredited capacity, i.e., cannot contribute to the reserve margin.

Looking specifically at the effect of battery storage on reserve margin, Mr. Efran Paredes explained that battery storage can indeed replace thermal reserves, and that from 1994-2001, PREPA actually used the Sabana Llana battery system successfully for daily frequency control and spinning reserve.[44] Mr. Paredes further stated that "[t]echnically speaking, we have no doubt that the batteries can do the work [of replacing thermal reserves]."[45] Later in Panel H, Dr. Saenz explained that the replacement of thermal generation with battery storage saved money, and actually saved the most money in S3S2 precisely because that portfolio included the highest level of renewables.[46] The testimony of Mr. Paredes and Dr. Marcelo Saenz show that, contrary to Dr. Bacalao's argument, integration of renewables and storage should actually lower reserve margins, not cause extraordinarily high margins.

The question that remains unanswered on this record is, then, why are the reserve margins of PREPA's Preferred Plans so high? In October 2019, Ms. Sommer's Direct Testimony explained that the Bureau and intervenors could have thoroughly investigated this question, had PREPA provided electronic copies of its modeling files to the Bureau and intervenors, as contemplated by Regulation 9021 Section 2.02(F)(2). Ultimately the Bureau agreed that these modeling files must be part of the record, through an order in January 2020.

[44] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 6, 2020), https://youtu.be/HO40ImpqKe8?t=1847. See also PREB Energy Storage Study at 3.
[45] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 6, 2020), https://youtu.be/HO40ImpqKe8?t=1969.
[46] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 6, 2020), https://youtu.be/HO40ImpqKe8?t=2836.

Without the benefit of those modeling files, the parties set forth several possible reasons why PREPA's Preferred Plans include extraordinarily high reserve margins. Ms. Sommer explained that the extraordinarily high reserve margins may have been caused, in part, by declining load.[47] Ms. Sommer also pointed out that since Siemens only accounted for 576 hours per year, instead of 8,760,[48] if Loss of Load Hours is somehow a constraint on the optimization, the model may return a portfolio with much higher capacity than is necessary.[49] Third, Ms. Sommer explained that Siemens may have modeled forced outage rates in a manner that encourages the model to overbuild capacity. Finally, the Bureau's Order on Evidentiary Hearing Format raised the possibility that PREPA's minigrid vision may be having an impact on reserve requirements.[50]

Without Siemens' Aurora modeling files, the parties were not able to explore any of the possibilities for the extraordinarily high reserve margins of PREPA's Preferred Plans. What we do know, is that PREPA and Siemens have failed to justify a need for these extraordinarily high reserve margins or give a reasonable explanation of why the model would choose to build so much capacity. Keep in mind that because Siemens assumed that solar and wind provide no accredited capacity, i.e., cannot contribute to the reserve margin, the total nameplate capacity in any of

[47] Sommer Direct Test. at 18.
[48] Wartsila North America, Inc.'s Mot. Submitting Initial Pre-Filed Test. of Expert Fladger at 11, (Oct.23, 2019), http://energia.pr.gov/wp-content/uploads/2019/10/20191023-Wartsila-Initial-Prefiled-Testimony-of-Brian-T.-Fladger.pdf [hereinafter Fladger Direct Test.].
[49] Sommer Direct Test. at 19.
[50] Panel F, Issue 7 notes the "[i]mpact of PREPA minigrid vision on reserve requirements." Puerto Rico Energy Bureau, Order on Evidentiary Hearing Format and Guidelines, Appointment of Hearing Examiner, Exhibit A at 3 (Jan. 17, 2020).

these scenarios is even higher than the 60 to 100% reserve margins. The Resource Needs Assessment containing these reserve margins fails the standards of Regulation 9021, Section 2.03(E), and warrants rejection of PREPA's Preferred Plans.

F. Siemens' treatment of energy efficiency does not satisfy Law 17-2019.

The IRP assumes that PREPA will comply with the 2% annual reduction in load due to energy efficiency as required by Law 17, culminating in a 30% reduction in PREPA's total load by 2040, yet the Action Plan does not explain how PREPA would accomplish this.[51] Dr. Bacalao acknowledges that in order to increase energy efficiency uptake, PREPA must offer a greater variety of energy efficiency programs,[52] and indeed Law 17-2019, Section 1.9(3)(B) requires the IRP to include "an evaluation of the conservation resources available in the market, including electricity demand management… and the necessary programs to improve energy conservation." Just as it did in the previous Integrated Resource Plan, PREPA "displayed insufficient appreciation of the potential for energy efficiency and demand response," leading to "conclusions that over-emphasized costly construction, while under-emphasizing the roles of renewable energy and consumer behavior as ways to achieve … energy independence."[53] PREPA has a critical role to play in the island's energy efficiency efforts; PREPA' Action Plan fails to carry out that role. The Energy

[51] Act 17-2019, Section 1.6 (11).
[52] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 4, 2020), https://youtu.be/-RXb0bf5ScY?t=12664.
[53] Puerto Rico Energy Bureau, Final Resolution and Order on the First Integrated Resource Plan of the Puerto Rico Electric Power Authority, para. 13, Dkt. No. CEPR-AP-2015-002 (Sept. 23, 2016).

Bureau should adopt the Action Plan steps, set forth by Local Environmental Organizations, that would satisfy the requirements of Law 17-2019 on energy efficiency.

Faced with the absence of any PREPA plan on energy efficiency, the Energy Bureau directed PREPA to develop "low energy efficiency" and "no energy efficiency" scenarios to compare to the base case IRP.[54] In Panel D, the Bureau's consultant, Dr. Asa Hopkins, highlighted the most important conclusion of ROI 9: the initial $300M investment in energy efficiency would save PREPA $1B in avoided generation costs over the planning period, and then next $700M in energy efficiency spending would save an additional $1.8B in avoided generation costs over the planning period.[55] In contrast to the June 2019 IRP, which assumes strict compliance with the energy efficiency requirement, Dr. Saenz testified at the evidentiary hearing that due to PREPA's refusal to take any action on energy efficiency, "we have the view that the most likely scenario could be actually the no energy efficiency case—either the low or the no energy efficiency case."[56] Under the no energy efficiency scenario, demand would only drop by 5%, instead of 30%, over the study period.[57] At the hearing, Dr. Elizabeth Stanton testified, on behalf of intervenor Environmental Defense Fund,

[54] Puerto Rico Energy Bureau, ROI 9 to Puerto Rico Electric Power Authority (Oct. 29, 2019).
[55] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001,* YouTube (Feb. 6, 2020), https://youtu.be/HO40ImpqKe8?t=3669. The above $300M investment in energy efficiency is the cost of moving from the "no energy efficiency" scenario to the "low energy efficiency" scenario, while the $700M cost represents moving from the "low energy efficiency scenario" to the base case scenario. Each increase in the level of energy efficiency investments generates savings at well over a factor of two. Id.
[56] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001,* YouTube (Feb. 4, 2020), https://youtu.be/-RXb0bf5ScY?t=2970.
[57] See Puerto Rico Electric Power Authority Additional Responses To The Puerto Rico Energy Bureau Ninth Requirement Of Information at 3 (Dec. 6, 2019).

that "if what materializes is the energy efficiency represented in the low energy efficiency sensitivity . . . demand—load—would be much higher in that case and for that reason PREPA's obligation to provide renewables under Law 17 would be much higher."[58] Neither in the responses to ROI 9 or elsewhere do PREPA or Siemens explain how the utility would account for this increase in demand without violating the mandatory renewable portfolio standard (RPS) targets of Law 17.[59] In sum, the load forecasts in PREPA's June 2019 Integrated Resource Plan are incorrect because of PREPA's inaction on energy efficiency. PREPA's faulty load forecasts are especially harmful to its Preferred Plan, the Energy System Modernization Plan. The ESM will fail to meet the Renewable Portfolio Standard if the actual load is higher than forecasted—the very circumstance for which the ESM was designed.[60] The RPS, coupled with PREPA's faulty load forecasts, therefore compel the Bureau to reject the ESM.

The key takeaway from Siemens' analysis of energy efficiency is that the Action Plan approved by the Bureau must include specific steps PREPA can take to fulfill its critical role in the island's energy efficiency efforts. "While the [Energy Bureau] may ultimately decide that energy efficiency programs should be handled by a third-party administrator rather than PREPA, PREPA should still incorporate into its

[58] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 4, 2020), https://youtu.be/-RXb0bf5ScY?t=13395.
[59] Act 17-2019, Section 1.6 (7) (mandating PREPA's renewable generation reach a "minimum of forty percent (40%) on or before 2025; sixty percent (60%) on or before 2040; and one hundred percent (100%) on or before 2050.").
[60] IRP, Exhibit 1-9 (showing that the ESM, under the High Load sensitivity, achieves only 53% renewables by 2038, in violation of the RPS).

Action Plan whatever actions are necessary to accomplish energy efficiency-related goals (for example, coordination with such an administrator)."[61] Since PREPA's Action Plan does not include adequate actions on energy efficiency, Local Environmental Organizations set forth a number of steps that the Energy Bureau could order PREPA to take to improve energy efficiency immediately.

During Panel D, witnesses identified a number of Quick-Start Energy Efficiency programs, likely to be deemed to be cost-effective by all parties:

- Solar water heaters. At the hearing, Dr. Bacalao readily agreed that the Siemens experts were wrong to reject solar water heaters.[62] PREPA could facilitate communications between providers and customers, provide technical assistance with installation, incentivize adoption through PREPA budget allocations, and educate customer through engagement.
- Refrigerator incentive programs. Local Environmental Organizations' expert witness, Ronny Sandoval, pointed out that these programs have already had success in the past in Puerto Rico.[63] In addition to the steps detailed above, PREPA could provide historical data from these programs.

[61] Puerto Rico Energy Bureau, Final Resolution and Order on the First Integrated Resource Plan of the Puerto Rico Electric Power Authority, para. 191, Dkt. No. CEPR-AP-2015-002 (Sept. 23, 2016).
[62] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 5, 2020), https://youtu.be/vIXWJt52Hfk?t=8350.
[63] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 4, 2020), https://youtu.be/-RXb0bf5ScY?t=8970. Mr. Sandoval has more than a decade of management experience with energy utilities. Mr. Sandoval's experience includes work in transmission and distribution system planning, demand side management, grid efficiency, grid transparency, and clean energy.

- PREPA could provide free energy audits, including providing customers with energy efficiency measures, as well as solar and storage options. [64]
- Various expert witnesses listed other programs that would be cost-effective and popular:[65]
    - appliance replacement program
    - tuning up air conditioners
    - replacing very old air conditioners
    - expanding the Office of Public Policy's low-income weatherization program, which has served 15,000 homes already

Local Environmental Organizations also urge the Energy Bureau to adopt, to the extent compatible with a customer-centric system, the workgroup recommendations to improve energy efficiency, distributed renewables, and storage in the following PREB dockets:

- NEPR-MI-2019-0015: Regulation for Energy Efficiency and Demand Response
- NEPR-MI-2019-0019: Public Policy on Energy Efficiency
- NEPR-MI-2019-0011: Process for the Adoption of Regulation for Distribution Resource Planning

Finally, the Energy Bureau should direct PREPA to meaningfully pursue peak savings from commercial and industrial customers through Demand Response and

[64] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 4, 2020), https://youtu.be/-RXb0bf5ScY?t=13532.
[65] *Id.*

Interruptible Load. Law 17 requires that PREPA reach out to these customers to discuss "demand response, demand-side management and energy efficiency programs and strategies that take into account short… term goals and incentivize customers to become more energy efficient, with a focus that results in a reduction in costs and energy consumption, as well as greater stability and reliability . . . ."[66] Unfortunately, PREPA has no active contracts for demand response or curtailable loads, nor has it made any attempt to reach out to large commercial and industrial customers to establish any such programs.[67] Puerto Rico has a strong base of commercial, institutional, and industrial customers.[68] Many have already set up self-generation options, and are therefore especially well positioned to begin demand response and demand-side management programs.

G. PREPA failed to meaningfully consider the impact of electric vehicle (EV) adoption across the study period.

Law 17-2019, Section 1.2(p) requires PREPA's Integrated Resource Plan to incorporate "changes in the energy market conditions" and "changes in technology." One such change that PREPA failed to incorporate into the Integrated Resource Plan is the penetration of electric vehicles into Puerto Rico's market. Witnesses in Panel D explained that accounting for EVs would help mitigate risks associated with the load forecasts across PREPA's system planning efforts. Even though Dr. Bacalao has

[66] Act 17-2019, Section 1.5(5)(f). See also id. Section 1.9(3)(B) (requiring PREPA to evaluate the available electricity demand management options).
[67] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 4, 2020), https://youtu.be/-RXb0bf5ScY?t=8435.
[68] In 2018, these customers accounted for more than sixty percent of PREPA's annual sales. IRP, Exhibit 3-2.

previously given a presentation counting the shift to EVs as one of the "changes that will dramatically impact" the electricity industry in the near future,[69] Dr. Bacalao testified at the hearing that Siemens chose to exclude any possibility of increased demand from EVs. Dr. Bacalao bases this contention on a "preliminary analysis" conducted by Siemens[70] that did not include real, on-the-island conditions. PREPA Engineer Paredes likewise conceded that PREPA does not monitor EV sales, and had no knowledge of the current number of EVs in Puerto Rico.[71] Mr. Gerardo Cosme explained that to do so, PREPA needed only to contact the Department of Transportation, which affixes a special license plate to electric vehicles and therefore should have an exact count for not only the current number of vehicles, but also the number of plates issued for the preceding months or years.[72] Moreover, Dr. Stanton testified at the hearing that even Siemens' most ambitious scenario for EV adoption in Puerto Rico fell far below those contemplated by the high EV penetration scenarios in comparable IRPs in other jurisdictions.[73] Ultimately, the exclusion of EVs in the load forecast represents another failure to consider "changes in the energy market conditions" and "changes in technology" and casts further doubt on whether PREPA's Preferred Plans comply with Law 17.

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[69] Nelson Bacalao et al, Siemens, *Integration of Renewable Generation Maintaining Reliability and Economics* at Slide 3 (2018), https://www.ccaps.umn.edu/documents/CPE-Conferences/MIPSYCON-PowerPoints/2018/IntegrationofRenewableGeneration.pdf.
[70] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 4, 2020), https://youtu.be/-RXb0bf5ScY?t=1564.
[71] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 4, 2020), https://youtu.be/-RXb0bf5ScY?t=1646.
[72] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 4, 2020), https://youtu.be/-RXb0bf5ScY?t=5998.
[73] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 4, 2020), https://youtu.be/-RXb0bf5ScY?t=2730.

H. Local Environmental Organizations propose several steps to facilitate full integration of distributed generation, renewables, and storage.

Ultimately, all parties to this proceeding, including PREPA, agree that the very best way to improve affordability, reliability, and resiliency is to "add[] as much PV as practical … as soon as possible."[74] PREPA's Action Plan does not meet that challenge, because it includes no specific plans to actually accomplish that task. Integrated Resource Plan Exhibit 10-5 includes vague references to planning for deployment of utility-scale PV and battery storage, alongside plans for no less than **ten** gas infrastructure projects. This demonstrates no urgency to add renewable resources, and certainly not to add them up to the practical limits of PREPA's ability. Local Environmental Organizations urge the Energy Bureau to reject PREPA's Action Plan, and instead direct PREPA to take the following steps that could be implemented right away, either regionally or across the island, to immediately add distributed generation, renewables, and storage to the grid to achieve the Customer-Centric grid that is one of the PREPA Governing Board's five key pillars.[75] For any items that require budget reallocations, PREPA's Director will have to submit a request to the Governing Board and Fiscal Oversight and Management Board (FOMB).[76]

[74] IRP, Section 10.1.1.
[75] "Customer-Centric: The IRP includes costumer participation via energy efficiency, customer side energy resources and demand response with a predominant role in the supply and consumption matrix of Puerto Rico, and empowering customers to participate and take ownership on their energy security and affordability." IRP, at 1-1.
[76] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001,* YouTube (Feb. 6, 2020), https://youtu.be/UGn8uAvm5NQ?t=3343.

First, PREPA must provide an expedited timeline to actually implement Comunicado Técnico 19-02, which would allow automatic interconnection of distributed PV systems, as well as net metering for those systems, once an independent engineer has done an inspection.[77] Law Section 1.5(8)(b), requires "expedited processes under the regulations for the interconnection of generators to the distribution system" and "an effective process to reduce the interconnection time." This comports with Puerto Rico's declared public policy to "empower the consumer to be part of the energy resources portfolio through . . . the installation of distributed generation . . . ."[78]

Second, PREPA must coordinate with owners of current distributed renewable generation & storage to gain visibility of these resources, and PREPA must offer to compensate customers for the services these resources could then provide to the grid. Regulation 9021 2.03(H)(2)(C) requires PREPA to take advantage of the low level of utility-borne costs from demand-side resources. Puerto Ricans have currently installed 172.75 MW of distributed generation, with a significant but unknown accompanying amount of distributed storage.[79] Even without any incentives at all, Siemens forecasts distributed generation to rise to 1,176 MW by 2038. At the hearing, an expert witness called this "the biggest untapped Virtual Power Plant resource in the world."[80]

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[77] PREPA's February 24th Information Response to the Independent Consumer Protection Office made it clear that implementation has not yet been completed.
[78] Law 17-2019 Section 1.5(2)(e).
[79] IRP, App'x 4, Exhibit 3-1. See also RMI Amicus Brief at 22 (referencing reports from solar developers, and explaining that about ninety percent of installations following Hurricane Maria are coupled with battery storage).
[80] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 7, 2020), https://youtu.be/zkGmgsj6OTs?t=13114.

Fourth, PREPA must coordinate with the Bureau, the Energy Efficiency program administrator, and stakeholders on designing a customer engagement plan "to educate citizens and electric power service customers on energy efficiency consumption reduction, distributed generation strategies, and other available tools to empower consumers to have more control over their energy consumption," as required by Law 17-2019 Section 1.5(4)(b). We note that PREPA titled Part 3 of its Action Plan "Engaging the Customer" but did not actually include a customer engagement plan.[81] A customer engagement plan would also help PREPA develop a "reasonable set of assumptions for econometric and/or end use variables" as required by Regulation 9021 Section 2.03(C)(2)(c). Gerardo Cosme Núñez, an engineer with the Independent Consumer Protection Office, testifies that the greatest weakness of this IRP is "the lack of endemic data on consumer's energy behavior and preferences . . . ."[82] Eric Ackerman, a witness for the Not For Profit Entities with decades of experience in the energy sector, puts it succinctly: "PREPA needs to analyze its customers!"[83] Local Environmental Organizations urge the Energy Bureau to require, as part of the Action Plan, the comprehensive customer engagement program recommended by Not-For-Profit Intervenors. This would help PREPA understand its customers and raise awareness of distributed generation programs, energy efficiency programs, and demand response programs. The public comment of the Renewable

[81] IRP, Section 10.3.
[82] Independent Consumer Protection Office's Mot. to Submit Expert Test., Direct Test. of Núñez, PE, CPI at 2, (Oct. 23, 2019), http://energia.pr.gov/wp-content/uploads/2019/10/20191023-OIPC-Informative-Motion-filing-intervenors-written-testimony.pdf [hereinafter Nuñez Direct Test.].
[83] Not For Profit's Mot. to Submit Expert Test., Direct Test. of Eric Ackerman at 17, (Oct. 22, 2019), http://energia.pr.gov/wp-content/uploads/2019/10/CEPR-AP-2018-0001-Motion-Submitting-expert-witnesses-statements.pdf [hereinafter Ackerman Direct Test.].

Energy Coalition offers one tool that could be part of customer engagement on distributed generation: a map combining "LIDAR, street level utility mapping, PV detailed design analysis tool with best in class layout sizing electrical design, coupled to a bankable economic analysis, all linked to an interconnection tool evaluating the viability of the local grid and substation connection."[84] PREPA could also coordinate with the Energy Office to provide education about storage, as recommended in the Energy Bureau's Energy Storage Study.[85]

Finally, PREPA should implement a system to incentivize customers to build distributed solar and storage systems, and share implementation costs with customers. Senate Bill 1879 details such a program. There is precedent for PREB orders requiring PREPA to implement legislative proposals: In May, the Energy Bureau ordered PREPA to redo the Integrated Resource Plan to comply with Law 17-2019, before it was signed by the Governor. Senate Bill 1879 would require PREPA to cover up to 80% of the total cost and installation of renewable energy systems in the residences of the participating owners that have the average consumption of a family of four members, or 800 kilowatts of energy per month, whichever is greater. In turn, it provides that the excess energy produced by the systems installed and acquired through the incentive must be used to reduce the energy cost in Puerto Rico.

[84] Renewable Energy Coalition, Ron Leonard, *Comments on PREB Dkt. No. CEPR-AP-2018-0001* (Feb. 11, 2020), http://energia.pr.gov/wp-content/uploads/2020/02/Comentarios-Publico-s-11-feb-2020-1.pdf.
[85] PREB Energy Storage Study, Section 6.2.

The funds for onsite/rooftop initiative can come from short term and long term sources that would not result in rate increases. In fact, people who adopt rooftop solar technologies would experience an overall decline in electricity costs.[86]

If Puerto Rico is truly serious about adding as much PV and storage as practical, then the steps to do so, as laid out in this section, must be part of PREPA's Fiscal Year 2020 budget.[87]

Longer term additional funding can be made available if PREPA delivers on some of its planned savings. There are many initiatives in the Fiscal Plan that will either raise additional revenues or support expenditure reductions.

II. The Energy Bureau must reject the Action Plan's proposal to spend $3.8B in the next three years on Siemens' MiniGrids concept.

In August 2018, Siemens first issued public notice of its MiniGrids proposal, proposing billions of dollars of spending in new transmission lines and hardened transmission lines.[88] Eighteen months later, Siemens admits the proposal has not advanced beyond the planning level and urges PREPA **not** to spend any money on MiniGrids before yet more studies are completed. The COR3 team that authored the GridMod plan expressed deep skepticism of the MiniGrids concept, and urged that it

[86] The levelized cost for distributed solar, whether the customer stays on the grid or defects, even with PREPA's overestimations, is lower than PREPA's total rate. Sommer Direct Test. at 9.
[87] Puerto Rico Electric Power Authority, Monthly Report to the Governing Board (Dec. 2019), https://aeepr.com/es-pr/investors/FinancialInformation/Monthly%20Reports/2019/December%202019.pdf.
[88] Siemens first publicized the MiniGrids concept in a paper titled *Resilient by Design: Enhanced Reliability and Resiliency for Puerto Rico's Electric Grid*. This paper was first mentioned on this docket in an August 7, 2018 document titled *Intervenors' Topics and Questions For Consideration In Establishing the Agenda For the August 14, 2018 Conference*.

go forward gradually, if at all.[89] At the hearing, Siemens acknowledged they did not know the exact amount of critical load that the MiniGrids would serve, and were no longer clear on the specific resources necessary to serve the MiniGrids' critical loads. In light of all of these uncertainties, the Bureau must reject PREPA's Action Plan proposal to immediately spend $3.8B in the next three years on transmission-level investments related to the MiniGrids concept. The proposals of Local Environmental Organizations' Proposed Action Plan, on the other hand, are actionable items PREPA can take right away to deliver tangible resiliency benefits: greatly expand renewables, storage, and distributed renewables, and make investments at the distribution level.

Siemens' MiniGrids concept is the foundation of the Integrated Resource Plan, and the Preferred Plans: "The IRP is centered on the concept of MiniGrids, defined as zones of resiliency into which the system can be segregated during and after a major weather event ensuring that the load can be served using local resources."[90] Local Environmental Organizations' expert witness Ronny Sandoval sums up the MiniGrids as "prioritizing centralized generation resources and redundancy in its delivery system across eight broad geographic areas to address future potential large disruptions to its customers."[91]

Mr. Sandoval pointed out that the MiniGrids approach is vulnerable to critical failures that could force an entire MiniGrid out of service.[92] If each of the MiniGrids

[89] Central Office for Recovery, Reconstruction, and Resiliency (COR3), Grid Modernization Plan for Puerto Rico, at 63 (2019) [hereinafter GridMod Plan].
[90] IRP at 1-2.
[91] Sandoval Direct Test. at 9.
[92] *Id.* at 11.

rely on a large, centralized fossil fuel plant as Siemens intends, then the outage of that plant from a seismic event or other disaster would cause such a failure. In addition, Siemens took a very narrow approach to defining the events that the MiniGrids would respond to, specifically, a "major hurricane every five years, placing the system in MiniGrids operation for one month."[93] The January 2020 seismic events demonstrate that this scope is too narrow to define Puerto Rico's resiliency challenges.

Finally, Mr. Sandoval criticized the MiniGrids concept for lack of transparency.[94] Many of the critical details in the MiniGrids plan have been withheld from the public. And Siemens has analyzed this concept in isolation, completely bypassing peer review by the Resilience Working Group conducting the Bureau's Distribution System Planning process. PREPA must begin a customer engagement process that allows the people of this island to educate PREPA which facilities and locations should truly be considered "critical loads."[95] Mr. Sandoval explains that any resiliency planning should be integrated into this process, to allow customers and third parties to be part of the solution, in accordance with shall be devised with The

[93] *Id.*
[94] *Id.*
[95] Dr. Irizarry-Rivera testimony at the evidentiary hearing also supports this view. "In the case of Puerto Rico, the microgrid is an option, but we don't need to wait to develop that to build great resiliency. Our proposal to achieve resiliency is to begin with the citizens and work with the communities to have a minimum of energy [available to] a citizen, a family, or a group of homes, when a catastrophic event occurs. We can do that now. [. . .] This is a bottom up approach to building the microgrid." Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001,* YouTube (Feb. 5, 2020), https://youtu.be/8nIYVqDaEb8?t=5700.

Legislature's intent that the Integrated Resource Plan be created with "broad participation from citizens and other interested groups."[96]

For its initial analysis, Siemens approximated critical load with the total load at the feeders that critical facilities used, knowing that this was an overestimate, since not all of the load at these feeders was critical load.[97] However, after eighteen months of working on the MiniGrids concept, Siemens and PREPA still have not been able to calculate the specific amount of that critical load. The Energy Storage Analysis determined that in some zones, critical load was less than forty percent of the feeder load: and that MiniGrids were not the best resiliency solution in those zones.[98]

Siemens also does not know what resources will serve that critical load. As detailed above in Point I(c), Siemens originally assumed, because of a bias against renewables, that only thermal resources could serve critical load.[99] Ultimately, Dr. Bacalao acknowledged that renewables and storage were just as capable, invalidating Siemens' decision to force a fixed decision to build gas-fired peakers in 2021 into the model as part of the MiniGrids concept. The Energy Bureau's December 2019 Energy Storage Study further points out that PREPA has failed "to determine[] whether longer duration storage systems provide a viable alternative to the gas-fueled plants currently required as part of the IRP's MiniGrid construct."[100]

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[96] Act 57-2014, Section 1.3 (ee).
[97] Sandoval Direct Test. at 12.
[98] PREB Energy Storage Study, Executive Summary, at 5 ("Synapse also compared a microgrid strategy whereby distributed solar and battery systems satisfy critical and priority loads to the minigrid strategy identified in the IRP. Microgrids are likely to be less costly and produce greater value in most zones, if critical and priority loads make up 40 percent or less of the feeder loads.")
[99] IRP Section 1.2.1: "The need to serve critical and priority loads within the MiniGrids resulted in the necessity to add 17 to 18 small GTs (23 MW each) at selected locations across the island."
[100] PREB Energy Storage Study, Executive Summary at 6.

At the hearing, faced with these uncertainties, Dr. Bacalao admitted that the MiniGrids was in no way ready to implement, and actually urged the Energy Bureau **not** to spend the sums proposed in the Action Plan without further study:

> I've never, ever seen a case where you spend this type of money [$3.8B in three years] without more detailed planning. Each of those investments, you can think of those investment accounts as needs that were identified. There's a need to get power to this substation, to this load…
>
> Before you can actually start spending that money, you need to convert that need to a more detailed plan and then to a specification of that plan to actual needs. So there's a process. So are we going to be spending that amount of money? Not before you do this analysis.[101]

Dr. Bacalao put it succinctly later on: "You would never invest that type of money [$3.8B in three years] without doing some additional detailed planning."[102] The Energy Bureau's Energy Storage Study urges that a full analysis comparing MiniGrid concept to microgrid strategies be done **before** the Energy Bureau authorizes investments into MiniGrids, or generation resources needed to power MiniGrids.[103] In accordance with the Grid Modernization Plan, the Energy Storage Study, and Dr. Bacalao's testimony at the hearing, the Energy Bureau must reject the Action Plan's proposed spending on the MiniGrids concept.

Ultimately, because the MiniGrids concept is not ready to be implemented, PREPA's Action Plan does not include tangible, immediate steps to improve

[101] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 5, 2020), https://youtu.be/vIXWJt52Hfk?t=8482.
[102] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 5, 2020), https://youtu.be/vIXWJt52Hfk?t=9369.
[103] PREB Energy Storage Study, Executive Summary at 6 (emphasis added).

resiliency. Local Environmental Organizations urge the Energy Bureau to order PREPA to "investigate the potential for the deployment of distributed energy resources to serve as non-wire alternatives that could defer or avoid the need for investment in conventional, more costly utility infrastructure."[104] This is not a mere theoretical exercise like Siemens' MiniGrids concept. The Hispanic Federation's public comments explain how that organization's "Solar Saves Lives" initiative has already installed distributed solar microgrids at fifteen health centers; the solar resources both serve critical load and save hundreds of thousands of dollars annually.[105]

The Energy Bureau can also direct PREPA to consider the contributions of distributed storage to resiliency, which Siemens refused to do in this IRP.[106] Siemens' refusal violates Law 17's mandate to "encourage the use of energy storage technology at **all** levels."[107] The Rocky Mountain Institute's amicus brief provides numerous examples of utilities and IRPs that successfully incorporated the ability of distributed to provide grid services under normal operation, and resiliency benefits during extreme weather events.[108] Those Integrated Resource Plans maximized that benefit by having the utility split the costs of distributed storage with customers, as envisioned by Senate Bill 1879.

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[104] Sandoval Direct Test. at 28.
[105] Hispanic Federation, Maritere Padilla, *Comments on PREB Dkt. No CEPR-AP-2018-0001* at 2, (Feb. 13, 2020), http://energia.pr.gov/wp-content/uploads/2020/02/Comentarios-de-Ciudadanos-1.pdf.
[106] PREPA Response to Local Environmental Organizations' ROI 3.56.
[107] Act 17-2019, Section 1.6(9) (emphasis added).
[108] RMI Amicus Brief at para. 21-22.

III. PREPA significantly understated the real cost of imported methane.

Regulation 9021 Section 2.03(G) requires PREPA to accurately forecast methane gas import costs. This is especially critical to understand the true costs of PREPA's gas-heavy Preferred Plans. As with all resources, the best information source for PREPA to forecast gas prices would be real-world market data. In this case, that would be the two existing contracts PREPA has for gas imports, for the (now-offline) Costa Sur plant and the San Juan 5 & 6 plants. PREPA ignores the real-world data on gas prices from these contracts and claims, without justification, that going forward, PREPA can obtain gas for several dollars per MMBtu cheaper than its existing gas contracts allow. Local Environmental Organizations' expert witness, Anna Sommer, provided a detailed description of the overestimation in Siemens' methane gas cost forecasts on pp. 23-26 of her Direct Testimony. PREPA's Rebuttal Testimony did not respond to Ms. Sommer's testimony on this point. PREPA's deliberate ignorance of real-world market data on the cost of importing gas to Puerto Rico violates Regulation 9021 Section 2.03(G) and invalidates PREPA's claims about the costs of its gas-heavy Preferred Plans.

In IRP Exhibits 7-11 and 7-12, PREPA acknowledges that the most accurate way to forecast the cost of imported gas at the Costa Sur gas plant, would be to base it on the existing contract to purchase gas from EcoElectrica:

Cost of Gas in $/MMBtu	EcoElectrica	Costa Sur
2018	9.02	9.02
2019	8.89	8.89
2020	8.98	8.98

2021	9.42	9.42
2022		9.51
2023		9.71

Another real-world market data point that PREPA could have relied on to forecast gas prices, is the cost of gas in the fuel delivery contract for San Juan 5 & 6. The formula for this contract is 115% of Henry Hub prices, plus an adder of $8.50 in the first year, $7.50 in the second year, and $6.50 in following years. Using Siemens' Henry Hub price forecasts, this works out to:

	Henry Hub Forecast	115% of Henry Hub	San Juan 5 & 6 Adder	San Juan 5 & 6 Final Price
2018	$2.91	$3.347	$8.50	$11.85
2019	$2.72	$3.13	$7.50	$10.63
2020	$2.79	$3.21	$6.50	$9.71
2021	$3.16	$3.63	$6.50	$10.13
2022	$3.27	$3.76	$6.50	$10.26
2023	$3.49	$4.01	$6.50	$10.51

Siemens claims that PREPA will be able to buy gas for four new gas-fired plants at significantly cheaper prices than it currently pays for gas at Costa Sur/EcoElectrica and San Juan 5 & 6:

Cost of Gas, $/MMBtu	San Juan 5 & 6	Costa Sur	PREPA's claims for the costs of gas at proposed new gas-fired plants at San Juan, Palo Seco, Mayagüez, and Yabucoa
2018	$11.85	$9.02	$7.70
2019	$10.63	$8.89	$7.48
2020	$9.71	$8.98	$7.56
2021	$10.13	$9.42	$7.99
2022	$10.26	$9.51	$8.11
2023	$10.51	$9.71	$8.37

PREPA claims that the San Juan 5 & 6 contract includes an additional cost for gas revaporization, but PREPA makes no effort to present the contract gas costs with that cost removed. PREPA also acknowledges that the Costa Sur contract does not include those costs, and therefore is directly comparable to PREPA's forecasted costs for gas at other locations.[109] PREPA CEO José Ortiz has acknowledged that gas from Trinidad and Tobago will cost PREPA $3-$4/MMBtu more than gas from the United States would cost.[110] Ms. Sommer also points out, in pp. 21-23 of her Direct Testimony, that Siemens has underestimated the capital costs of gas-fired power plants. Siemens claims, without justification, that PREPA will be able to procure gas-fired power plants with capital costs as low as $816 per kW of capacity, when the average of similar CCGTs in the S&P Global list of Tracked Projects is $1101/kW.

In sum, PREPA's gas-heavy Preferred Plans rely on an unrealistically low forecast for the cost of methane gas, which violates Regulation 9021 Section 2.03(G) PREPA has deliberately ignored the real, current cost of importing gas to the island, which improperly biased its analysis in favor of additional gas generation, and against renewables and storage. And Siemens' modeling demonstrates that PREPA's gas-heavy Preferred Plans, even with this error in their favor, still do not outcompete a portfolio choosing renewables and storage over gas-fired plants.

[109] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 3, 2020), https://youtu.be/weJfs72YtvE?t=11566.
[110] José Javier Pérez, *José Ortiz alega que es posible bajar la facture eléctrica en un 40%, El Nuevo Día* (Aug. 8, 2018), https://www.elnuevodia.com/noticias/locales/nota/joseortizalegaqueesposiblebajarlafacturaelectricaenun40-2440246/.

IV. The Bureau should reject PREPA's Action Plan "hedge" proposal.

The Bureau should reject PREPA's Action Plan proposal to dedicate tens of millions of dollars of PREPA's budget to "preliminary permitting and engineering" for CCGTs at Yabucoa and Mayaguez, as well as new gasports to supply gas to these CCGTs.[111] PREPA's "hedge" is not backed by any of Siemens' modeling: Aurora never selected either of these gas plants as an economic option, even under high load sensitivities.[112] Rather, this is a fixed decision coming from PREPA senior management, due to an unjustified bias in favor of gas and against renewables and distributed storage.

PREPA refuses to disclose the cost of the "hedge." The "hedge" will involve two years of "developing, preliminary engineering, permitting, and financing" and four years of "engineering, procurement and construction."[113] In September 2019, the Bureau's very first Request Of Information sought the cost of hiring outside consultants for six years' worth of this work: specifically "the estimated costs for preliminary permitting and engineering for each of the Yabucoa and Mayaguez Ship-Based LNG Terminal and 302 MW F-Class CCGT."[114] PREPA never provided a satisfactory response.[115] In February 2020, during Panel H, the Bureau repeated its

[111] IRP, Section 10.1.7
[112] RMI Amicus Brief at 16.
[113] IRP, Exhibit 10-5.
[114] PREB-PREPA ROI 1.15. (the Bureau directed PREPA to "[i]nclude all component-level estimates used to determine a total.").
[115] PREPA Response to PREB-PREPA ROI 1.15. PREPA's response merely regurgitated estimates for construction of the completed CCGTs and terminals themselves, rather than the costs of permitting and engineering for these

request for the cost of the "hedge" and highlighted the urgency of this information.[116] To date, PREPA has still refused to provide an answer on the cost of the "hedge." In PREB's Order on PREPA's first IRP, PREB only approved a similar plan, to explore permitting and engineering of **one** gasport,[117] because PREB was able to cap the total cost of permitting and engineering ($15M).[118] PREB must reject PREPA's proposal to spend unknown tens of millions of dollars for consultants to examine **two** gasports and **two** gas-fired power plants.

The price tag of the "hedge" is critical because the "hedge" creates an opportunity cost: it takes valuable PREPA resources away from the task that PREPA claims is the highest priority, namely, "the urgency of adding as much PV as practical . . . as soon as possible."[119] In Panel H, Mr. Paredes explained that PREPA budgeting is a matter of priorities—the Action Plan approved by the Energy Bureau will determine which tasks are prioritized in PREPA's budget.[120] Therefore, adding the "hedge" to PREPA's strained budget delays PREPA's work on deployment of PV and batteries, energy efficiency, and clearing its long backlog of distributed generation systems waiting to be added to the system. The record demonstrates that these are

facilities. The figures in PREPA's response were already listed on Page 10-7, so they clearly were not responsive to the question asked.

[116] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 6, 2020), https://youtu.be/UGn8uAvm5NQ?t=1194.

[117] The Aguirre Offshore Gasport. Ultimately this project was never built, and the $15M spent on consultants was a complete waste of ratepayer money.

[118] Puerto Rico Energy Bureau, Final Resolution and Order on the First Integrated Resource Plan of the Puerto Rico Electric Power Authority, para. I(A)(1)(a), p.2, Dkt. No. CEPR-AP-2015-002 (Sept. 23, 2016).

[119] IRP, Section 10.1.1.

[120] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 6, 2020), https://youtu.be/HO40ImpqKe8?t=11494.

more affordable and more resilient resources than more large, centralized gas-fired plants.

Siemens' assumption, that PREPA can afford to spend tens of millions of dollars on gas projects that may never even be built, is at odds with PREPA's financial reality.[121] As detailed above, in 2016, PREPA spent $15M of ratepayer funds on planning and permitting for the Aguirre Offshore Gasport, which was never built. Before that in 2012, PREPA spent tens of millions more on planning and permitting for the Via Verde gas pipeline scheme, which also was never built. PREPA's IRP must be based on fiscally disciplined steps that make the best use of ratepayer funds. The modular nature of renewables, and especially distributed renewables, means PREPA investments can have a steady rate of successful deployments, as opposed to PREPA's proposal to risk tens of millions of dollars on developing gas-fired projects that may ultimately not add a single megawatt to the system. Counsel for AES explained it as follows: ". . . as you work to build up renewables, you can add them in smaller chunks . . . than other resources . . . ."[122] Dr. Bacalao affirmed, "Correct. It [renewable generation] is inherently more flexible."

The hedge also pits clean energy, as demanded by the people of Puerto Rico, against gas-fired generation, as favored by senior PREPA management and its consultants. Testimony from Gerardo Cosme Núñez, CPI, on behalf of the Independent Consumer Protection Office, warned that in this circumstance, PREPA

[121] "Given the budgetary and financial uncertainties that have accumulated over the last decade, neither PREPA nor the Government have the necessary financial resources to carry out its operational restructuring, achieve financial recovery, and make the substantial infrastructure changes it requires." Law 17-2019, Statement of Motives.
[122] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 6, 2020), https://youtu.be/HO40ImpqKe8?t=13142.

may delay or raise the costs of renewables and distributed generation through "unreasonable or not authorized, or 'improvised' requirements or processes from PREPA . . . rather than global free market trend."[123] In Panel D, Ms. Cosme reiterated that PREPA "might underperform in its acquisition of efficiency and renewables that then might result in needing to fall back on fossil fuel generation."[124] Such a result would be unconscionable given that all of Siemens' modeling demonstrates that

renewables, distributed generation, and energy efficiency are by far the most affordable and most resilient resource options available to PREPA.

In sum, the Energy Bureau must reject PREPA's "hedge" proposal, for three reasons. First, PREPA refuses to tell the Bureau or the public the costs of hiring consultants to spend six years on permitting and engineering for gas-fired plants and gasports. Second, regardless of the price tag, the "hedge" will have some opportunity cost by taking money out of PREPA's budget from the resource options that all acknowledge are PREPA's least-cost and most resilient—renewables, distributed generation interconnection, and energy efficiency. Finally, the "hedge" also pits the clean energy favored by ordinary Puerto Ricans, against the gas-fired resources favored by PREPA's senior management and consultants. Experts for intervenors, experienced with PREPA's sordid history, warned against setting up that kind of scenario.

[123] Núñez Direct Test. at 3.
[124] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 4, 2020), https://youtu.be/-RXb0bf5ScY?t=5950.

V. PREPA's plans still leave Puerto Rico vulnerable to hurricanes, seismic events and other disasters.

PREPA's "past mistakes . . . now hold us hostage to crude oil."[125] PREPA's Preferred Plans repeat those mistakes, merely trading one imported fossil fuel for another. The island would still be overly reliant on large, centralized power plants connected to a long-distance transmission system; we have learned that the power plants are vulnerable to earthquakes and the transmission system to hurricanes.

Public commenter, Engineer Marcel Castro Sitiriche, exposed once again the failure of the electric system after Hurricane María: On average we suffer an estimated 94 days without light. There are communities that were more than 300 days without electricity. Approximately 200,000 families spent more than 150 days without electricity . . ." In analyzing the problems with the IRP, such as the investment in natural (methane) gas and in microgrids, Engineer Castro asks two crucial questions: "How many deaths could this investment prevent in the event of a severe hurricane? How many CHoLES (Customer Hours of Last Electricity Service) after the scourge of an intense hurricane would be avoided with this investment?"[126]

Another public commenter, Reverend Sary Rosario Ferreira, revealed the deadly consequences of the system's vulnerability to earthquakes by narrating her experience:

[125] Law 17-2019, Statement of Motives.
[126] Negociado de Energía en vivo, *Vista Pública Plan Integrado de Recursos - CEPR-AP-2018-0001*, (Feb. 22, 2020), https://youtu.be/WMCInOws0j8?t=13380 (citing Castro-Sitiriche, M., J. Gomez, Y. Cintrón, The Longest Power Blackout in History and Energy Poverty, Int'l Conference on Appropriate Tech. 2018, Porto-Novo, Benin (Nov. 2018), http://bit.ly/CHoLESpaper.

> For me, the use of renewable energy means life, health and safety. Life because many people depend on specialized medical equipment to have quality of life. On January 7, the day of the Earthquake, the cousin of a member of my Church died because when the power went out, the equipment that assisted him stopped working. Renewable energy such as solar energy on the roofs of houses with its storage system would provide an energetic stability that unfortunately we do not currently have because of our dependence on fossil fuels.[127]

PREPA's Preferred Plans, proposing to spend billions of dollars on gas infrastructure and then billions more on North-to-South transmission lines to prop up those gas plants, is an unnecessarily expensive approach that fails to address the resiliency inadequacies that recent hurricanes and seismic events highlighted.

Hurricanes Irma and Maria demonstrated that the 230kV and 115 kV lines that carry power from the large, centralized power plants in the South to the North were a key vulnerability to the system. PREPA's plan requires continued reliance on these plants and these transmission lines, and even contemplates more large, centralized plants, also connected to the grid through the same vulnerable transmission lines. The North-to-South transmission lines are vulnerable to extreme weather events, vegetation growth, wildlife impacts, lack of investment in maintenance and difficult access to servitudes and easements, among others. At the hearing, PREPA witnesses Daniel Hernandez and Arthur Deliz acknowledged that PREPA could not obtain insurance for these transmission lines, subjecting PREPA ratepayers to the full cost of repairing them when the next hurricane arrives.

[127] Sary Rosario Ferreira, *Comments on PREB Dkt. No. CEPR-AP-2018-0001* (Feb. 11, 2020), http://energia.pr.gov/wp-content/uploads/2020/02/Comentarios-de-Ciudadanos-1.pdf.

The seismic events further demonstrated the vulnerability of large, centralized plants: Costa Sur and EcoElectrica are both damaged. The U.S. Geological Survey has determined that the areas where the San Juan and Palo Seco plants are located present high risk of liquefaction in the event of earthquakes.[128] The Great Southern Puerto Rico Fault Zone runs through the Jobos Bay area where the Aguirre Power Complex and the AES coal burning power plants are located. [129]

A. The London Economics Institute Report Reveals Billions of Dollars in Planned Transmission Spending That PREPA Failed To Include In the Action Plan

Shortly before the commencement of hearings on PREPA's IRP, the public learned about the London Economics ("LEI") report commissioned by the Official Committee of Unsecured Creditors of PREPA and intended to critique "Government Parties' Assertions that the 9019 Settlement Will Not Affect Non-settling Creditors and Will Avoid a Subsequent Title III Filing by PREPA."[130] The report is relevant in many respects to the operation of PREPA, the rebuilding of its electrical system, the potential privatization of portions of PREPA, etc. But as it directly relates to this IRP, the report is most useful in its assessment of the transmission system capital expenditures that have not been accounted for by PREPA in this IRP.

[128] Bachhuber, Hengesh, & Sunderman, Liquefaction Susceptibility of the Bayamon and San Juan Quadrangles, Puerto Rico, at Figure 6, PDF p. 30 (2008), https://earthquake.usgs.gov/cfusion/external_grants/reports/03HQGR0107.pdf (noting very high susceptibility zones in areas along the Bayamon coastal plain, Bahia de San Juan, and Laguna San Jose); Hengesh, & Bachhuber, *Liquefaction susceptibility zonation map of San Juan, Puerto Rico*, in Mann, P. (ed.), *Active tectonics and seismic hazards of Puerto Rico, the Virgin Islands, and offshore areas: Geological Society of America Special Paper 385*, at 249–262 (2005).

[129] *Id.* at 250.

[130] The LEI Report was referenced in the public comments and hearings held by PREB.

Specifically, LEI sought to estimate PREPA's total revenue requirements under conservative assumptions including:

- LEI has higher levels of year-over-year cost reductions (operating efficiency gains) in the short term as compared to the assumptions in [Certified Fiscal Plan] 2019;
- LEI has assumed that population trends will stabilize (e.g., no further declines) after 2038;
- LEI has calibrated the amount of generation investment needed to the load forecast; lower levels of demand growth require lower levels of generation investment which is less costly for the overall system;
- LEI has continued PREPA's optimistic assumptions from CFP 2019 that 90% of its transmission investments over the next 10 years would be funded by Federal funds, although that is very uncertain;
- LEI has deferred the renewable generation targets in order to slow down the rate increases that would have otherwise been incurred due to higher PPOA costs and larger transmission capital investment associated with integrating more renewables;
- LEI has used a very conservative estimate of future transmission investments, limiting total capital spend for the transmission network to $30 billion over the forecast timeframe (although Puerto Rico's COR3 has suggested that as much as $90 billion may be needed, as discussed in Section 12.3);
- LEI has not incorporated any management fee or profit margin for the operators of PREPA's existing generation assets as that would have otherwise required further rate increases); and
- LEI has capped compensation to the concessionaire on the basis of the net present value ("NPV") of the 20-year contract rate to be paid equally over 20 years, which means that the concessionaire's compensation is growing at a smaller pace than the transmission system.

These assumptions constitute LEI's "Base Case." Further, LEI created an "Alternative Case" that assumed that only $16.4 billion would be spent on transmission upgrades, of which 90 percent would be federally funded, but otherwise kept the same conservative assumptions. It considers this a proxy for a switch in PREPA's business model to one that is "DER-focused."

Including the RSA charge, LEI estimates that PREPA rates would have to rise to 27.8 to 30 cents per kWh (nominal) over the next five years under the "Base Case." However, then rates will rise even more to 103 cents per kWh in 2047 (65 cents per kWh in real 2019 dollars) under the Base Case, see Figure 1, and 60 cents per kWh (38 cents per kWh in real 2019 dollars) under the Alternative Case

In sum, PREPA's gas-heavy Preferred Plans would rely on tens of billions of dollars in transmission spending that PREPA has not accounted for in its Action Plan. The imposition of these costs on ratepayers would have devastating implications for customer rates, further encouraging outward migration from the island and defection from the grid.

B. The Grid Modernization Plan Reveals Billions of Dollars in Planned Transmission Spending That PREPA Failed To Include In the Action Plan

PREPA has also hidden necessary spending in the Grid Modernization Plan, outside of this Integrated Resource Plan and outside of public participation. Public comments from Malu Blázquez Arsuaga, on behalf of ReImagina Puerto Rico, captured Puerto Ricans' concerns about PREPA's activities outside of the Integrated Resource Plan:

> We are very concerned that there are several processes related to the energy transformation of the country, such as privatization processes, the renegotiation of PREPA's debt with bondholders, the development of the GridMod Plan and the request for federal funds to FEMA, which are occurring at the same time as the IRP evaluation process without clear definition of sequence, relationships and dependencies between these processes. No long-term generation concession agreement should be signed without a final IRP approved by the [Energy Bureau]. The IRP should guide the investments made, identifying the sources and locations

> where to invest to meet the demand for energy in a reliable, resilient, and economic way complying with the mandate of Law 17-2019.[131]

The purpose of the Grid Mod Plan is to request $20.3 billion or $21 billion from FEMA of which $12.2 billion are for the reconstruction rather than transformation of the existing transmission and distribution systems and some substations. GridMod Plan Table 4-5 details a list of North-to-South Transmission Reinforcements, describing this as the "North-to-South Transmission Backbone." Table 4-12 proposes to spend $1.7B on hardening that backbone. Generation and fuel, i.e., fossil infrastructure, would be $3.8 billion according to the Grid Mod Plan.

These figures strongly resemble the numbers in the ESM plan as laid out in different parts of the draft IRP.

> The Working Group estimates a total of approximately $21 billion of investments is needed to **rebuild** the Puerto Rico power system to industry standard levels, as shown in Table 1. **The largest spend[ing] requirements are focused on the direct rebuild[ing] of transmission, substation, and distribution systems to harden the power grid and improve its ability to withstand hurricane conditions. Total expenditures in those categories are $12.2 billion, or 60% of the total.[132]**

It lists multiple methane gas facilities, including San Juan, Mayagüez, Palo Seco, Yabucoa and other peaking units but admits that having four gas import points increases costs and is not optimal. However, the government's consultants go on to discuss multiple options / mechanisms to deploy new natural gas infrastructure, including gas pipelines that have been the subject of stiff civil society opposition.

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[131] Malu Blázquez Arsuaga, ReImagina Puerto Rico, *Comments on PREB Dkt. No. CEPR-AP-2018-0001*, (Feb. 11, 2020), http://energia.pr.gov/wp-content/uploads/2020/02/Comentarios-Publico-s-11-feb-2020-1.pdf.
[132] GridMod Plan at ix.

On page 55 of the plan, Figure 4-10 shows that natural gas constitutes 43.72% of "Total Production per Fuel Type Accumulated," while diesel is at 13.53% and bunker C at 19.36%, totaling 32.89% for oil combustion generation. That is, the generation with gas exceeds oil. This undermines the argument of increasing gas generation as a "transition" to renewable energy or for "fuel diversification" purposes. Instead, any increase in gas generation would necessarily further exacerbate reliance on a single, imported fuel source.

The ESM/GMP proposes to perpetuate centralized generation with fossil fuels, especially new "natural," highly explosive, methane gas infrastructure that involves investments of billions of dollars with continued dependence on the transmission of electricity from southern Puerto Rico to the San Juan area. It should be noted that methane gas plants and pipelines are usually taken out of operation during earthquakes to minimize explosions of this highly volatile fuel. This implies that the gas infrastructure would be inoperative during earthquake aftershocks that can go on for months as is currently the case in Puerto Rico.

VI. PREPA failed to account for fossil fuel plants' environmental costs.

Law 17-2019 Section 1.93(H) requires that the IRP include an environmental impact assessment. Public commenters detailed the decades of devastating health and environmental impacts of Puerto Rico's fossil fuel plants, and especially the AES coal plant, on the island and its environmental justice communities. Public commenters also urged the Energy Bureau to reject PREPA's gas-heavy Preferred

Plans based on its environmental and health impacts in the decades to come. The brief discussion by PREPA and AES of environmental impacts fails to meet Law 17-2019 because it focuses on legal compliance—the bare minimum of what federal environmental law requires them to do. Even putting aside the numerous violations that PREPA and AES have incurred, as detailed below, Law 17-2019 requires PREPA to evaluate climate and health impacts beyond the floor legally required by federal law. Under Law 17, PREPA must "aggressively reduce the use of fossil fuels, minimiz[e] greenhouse gas emissions, and support[] initiatives in Puerto Rico that focus on the issue of climate change . . . ." Critically, the Legislature listed this requirement separately from environmental compliance: so environmental compliance, even if PREPA could achieve it, would not satisfy Law 17's climate mandate. Similarly, Regulation 9021 2.03(H)(2)(b)(ii)(F) requires that PREPA's resource plan sensitivity analysis account for environmental costs or restrictions, and which it also lists separately from environmental regulations.

PREPA's Integrated Resource Plan fails to satisfy Law 17-2019, Section 1.9(H)(3), because it refuses to measure its Preferred Plans' impact in four key areas: (1) contribution to the climate crisis, (2) safety hazards, (3) water pollution, and (4) air pollution.

A. <u>PREPA has failed to account for its Preferred Plans' contribution to the climate crisis.</u>

PREPA failed to include upstream greenhouse gas emissions from its gas-fired plants.[133] These emissions must be counted in order to properly quantify the

[133] PREPA responses to LEO ROI 2.28, LEO ROI 3.25.

contribution to climate change. In mainland gas plants, upstream impacts are as much as 25% of a gas plant's impacts;[134] The methane gas used in Puerto Rico has to be stored under cryogenic conditions and revaporized at gasports before it can used at the plants; PREPA refuses to acknowledge any emissions from its planned gasports at all. Puerto Rico plants must also incorporate the emissions and leakage during liquefication, shipping, revaporization, and hoteling. Methane gas combustion also emits increased Volatile Organic Compounds (VOCs) such as formaldehyde, benzene, toluene, hexane, and styrene.[135]

Through Law 17-2019, the Legislature challenged Puerto Rico to be a world leader on eliminating GHG emissions that contribute to climate change. Puerto Ricans embrace this challenge: "Puerto Rico could be the best in the Americas in energy. The sun that bathes us, … the breeze that caresses us is the ideal engine for the energy of the future."[136] PREPA's refusal to acknowledge upstream methane emissions, and PREPA's refusal to acknowledge any emissions at all from gasports that would be right on this island, violates Law 17's mandate to consider the Preferred Plans' contribution to climate change.

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[134] At the hearing, Matt Lee discussed the National Renewable Energy Laboratory studies on upstream emissions from gas-fired power plants. The study Mr. Lee was referencing also notes that "In terms of 100-year [Global Warming Potentials], upstream natural gas accounts for 26% to 27% of life cycle GHG emissions for power systems without carbon capture systems." J. Littlefield et al., Skone, Nat'l Energy Tech. Lab, *Life Cycle Analysis of Natural Gas Extraction and Power Generation* at 2, Ex. 7-1 & 7-2 (Apr. 5, 2019), https://www.netl.doe.gov/energy-analysis/details?id=3198.

[135] Pediatric Environmental Health Specialty Unit (PEHSU), Mount Sinai Medical School, *Comments on Draft Aguirre Offshore Gasport Environmental Impact Statement*, FERC Dkt. No. CP13-193, at 1-2., *in* Responses to Comments on the Draft Environmental Impact Statement (document pages CO-65 & CO-66) (Sept. 9, 2014), https://www.energy.gov/sites/prod/files/2015/02/f20/EIS-0511-FEIS-Volume2-Part2-2015.pdf.

[136] Adriana Rivera, *Comments on PREB Dkt. No. CEPR-AP-2018-0001*, (Feb. 10, 2020), http://energia.pr.gov/wp-content/uploads/2020/02/Comentarios-de-Ciudadanos-1.pdf.

B. PREPA has failed to account for the safety risks of its Preferred Plans.

PREPA has refused to consider the risks involved with importing LNG into San Juan Harbor, and how this impacts the viability of the gas infrastructure proposed in the draft IRP. The Department of Energy issued a temporary two year authorization to import methane gas that expires in early 2021. The Army Corps studies indicate that LNG carriers cannot safely transit the navigation channel without dredging to widen and deepen the bay and that the ship traffic is already congested and accident prone even if smaller LNG carriers could navigate in the bay.

The Coast Guard has conducted an analysis of the risks that LNG traffic in San Juan Harbor could pose to the public health and welfare, critical marine infrastructure, and the marine environment.[137] PREPA refuses to even read that Analysis. The Analysis may well contain safety and security measures, warnings, limitations, or conditions that must be followed to ensure safety in the harbor but PREPA relies entirely on New Fortress Energy to conform its conduct to the Coast Guard's analysis. In other words, PREPA has abdicated its responsibility for the safety of San Juan harbor to NFE.

In response to LEO ROI 3.57, Siemens acknowledged that it had not considered the risk presented by sea level rise, storm surge, or flooding could affect the facilities close to water in its Preferred Plans. In December 2018, PREPA disclosed to the COR3 team preparing the GridMod plan that the Palo Seco plant, depot and

[137] PREPA Response to LEO ROI 3.6.

accompanying infrastructure are in a tsunami flood area.[138] PREPA/Siemens failed to respond to ROI 3.57 and the IRP fails to consider how much of the existing or proposed energy infrastructure is in flood prone areas or to provide documents related to sea level rise, storm surge, or other flooding risk for the plants and T&D infrastructure.[139]

C. PREPA has failed to account for its Preferred Plans' water impacts.

Power plants' water use, and the resulting water contamination, has been a citizen concern since the first Integrated Resource Planning process.[140] The Applied Energy System (AES) Corporation power plant and the Aguirre Power Complex, located in southeastern Puerto Rico are the two primary sources of toxic emissions in Puerto Rico[141] and disproportionately impact some of the poorest communities. The AES coal burning power plant in Guayama which transmits electricity to the San Juan metro area accumulates hundreds of thousands of tons of coal ash waste at its plant site that have already contaminated part of the South Coast Aquifer, the sole source of potable water for tens of thousands of people in Puerto Rico.

[138] GridMod Plan, at 107, Figure 6-6 ("Map of Palo Seco Plant and Depot in Flood Area," listing PREPA as the source of this information).
[139] The terms "Storm surge" and "Flooding" each appear only once in PREPA's IRP, while "Sea Level Rise" is left out completely. *Cf* Puerto Rico Climate Change Council (PRCCC), Puerto Rico's State of the Climate 2010-2013: Assessing Puerto Rico's Social-Ecological Vulnerabilities in a Changing Climate at 7 (2013), http://pr-ccc.org/download/PR%20State%20of%20the%20Climate-FINAL_ENE2015.pdf (noting the demands of the scientific and academic community in Puerto Rico for "an immediate halt to the endorsement and approval of projects in coastal areas vulnerable to the effects of sea level rise").
[140] PREB September 23, 2016 Resolution and Order, CEPR-AP-2015-0002, para. 49 ("ELAC expressed concern about the amount of water used to cool down the plants and the discharges of thermally polluted water waste back into the aquifer, contaminating important water sources that serve many citizens.").
[141] U.S. Envtl. Prot. Agency, *2018 TRI Factsheet: State – Puerto Rico* (Nov. 12, 2019), https://enviro.epa.gov/triexplorer/tri_factsheet.factsheet_forstate?pZip=&pParent=NAT&pCity=&pCounty=&pState=PR&pYear=2018&pDataSet=TRIQ1&pPrint=0.

i. Impacts of the Aguirre Power Complex on the Drinking Water of the Salinas Communities

The Aguirre Power Complex holds a franchise to extract water from the South Coast Aquifer in Salinas for up to two million gallons of water per day (MGD). Currently, AEEPR extracts 655,342,000 gallons per year, which is equivalent to 1.79 MGD. The municipality of Salinas depends on the Aquifer for all public water supply. Due to the critical status of the South Coast Aquifer and recurring droughts, the Department of Natural Environmental Resources (DNER) activated the Drought Executive Committee and adopted contingency plans and reduction of extractions from the South Coast Aquifer, with special attention to the Salinas "pocket." That is, in the summer of 2019, there was water rationing in the Salinas communities with cuts in the potable water service two days per week.

According to the Puerto Rico Aqueduct and Sewer Authority (PRASA), it identified a concern about the water levels of the Sentinel Well from 2014 to 2019, evidenced and supported by graphs. Since December 2017, the water levels of the well have been consistently decreasing. There is also an issue about the concentration of total dissolved solids (TDS) because this parameter is considered a standard of water quality and there is an upward trend of TDS in the municipality of Salinas which could culminate in excluding the Aquifer for potable water supply. Continuous water withdrawals like the PREPA Aguirre Power Complex franchise endanger this water source.

The AES coal burning power plant in Guayama, Puerto Rico also extracts large amounts of water from the South Coast Aquifer. The AES water franchise allows it to draw down 87 million gallons per year. DNER Franchise No. RO-06-10-99-PFI-70380. It is crucial that the IRP consider how the extraction from the central station fossil plants impact public water supplies.[142]

Furthermore, the AES plant has contaminated the South Coast Aquifer with coal combustion residuals, also known as coal ash waste. The Corrective Measures Assessment proposed by AES does not consider implementing a single option that would clean the contaminated water and simultaneously prevent further leaching of contaminants in to the Aquifer.[143]

ii. Impacts of the PREPA by the Sea Water Intake Structures and Thermal Water Discharges to Jobos Bay in Salinas and Impacts to Artisanal Fishing

The Aguirre Plant historically has been the only single point source discharge within Jobos Bay. The facility has obtained a NPDES permit from the EPA allowing discharge to the bay. Power station cooling water discharges through an

[142] *See, e.g.*, Puerto Rico Departamento de Recursos Naturales, Orden Administrativa 2016 - 018 Para Declarar como Área Crítica los Acuíferos del Sur de los Municipios de Ponce, Juana Díaz, Santa Isabel, Salinas, Guayama, y Arroyo (June 28, 2016), http://www.drna.pr.gov/documentos/orden-administrativa-2016-018-para-declarar-como-area-critica-los-acuiferos-del-sur-de-los-municipios-de-ponce-juana-diaz-santa-isabel-salinas-guayama-y-arroyo/; Jason Rodríguez Grafal, *Acuífero del Sur: Retrocede la única fuente de agua potable de 30 mil sureños*, La Perla del Sur (May 29, 2019), https://www.periodicolaperla.com/acuifero-del-sur-retrocede-la-unica-fuente-de-agua-potable-de-30-mil-surenos1/; U.S. Geol. Survey, *USGS Water Use Data for Puerto Rico*, https://waterdata.usgs.gov/pr/nwis/wu (last visited Mar. 5, 2020); Franquicia para el uso y aprovechamiento de aguas de AES-RO-06-10-99-PFI-70380.

[143] See DNA-Environment, LLC, 2017 Annual Groundwater Monitoring Report AES Puerto Rico LP, Guayama, Puerto Rico (Jan. 31, 2018), http://aespuertorico.com/wp-content/uploads/2018/02/2017_01_31_AES_Groundwater-Monitoring-and-Corrective-Action_Annual-Report.pdf.

approximately 0.8-mile-long (1.3 km) pipe to a point at the western edge of the bay just offshore of Punta Colchones.

The Aguirre Power Complex has been granted dispensation for a maximum discharge temperature of thermal waters of 106 ºF (41 ºC). This maximum temperature exceeds EQB's thermal compliance value of 90º F (32 ºC).

There are cumulative impacts of the Aguirre Power Complex on fisheries. The Draft Environmental Impact Statement (EIS) in the Aguirre Offshore GasPort (AOGP) case notes that:

> The PREPA 2003–2004 316 Demonstration Study within Jobos Bay reported a bimonthly pattern of fish egg abundance, which suggests continuous reproduction of fishes that spawn planktonic eggs (Washington Engineers PSC, 2005). There was a relatively high abundance of fish eggs entrained possibly due to the in-situ production of resident shoreline fishes and the alongshore transport from nearby reef and seagrass habitat sources.[144]

AES' multiple CWA violations resulted in Consent Agreements (Nos. CWA 02-2015-3102; CWA-02-2012-3452) and the requirement of a NPDES permit although the AES plant was designed as a zero-discharge facility.

None of these environmental impacts to water bodies were even mentioned, much less considered in the draft IRP in gross violation of Regulation 9021 and Law 17-2019 cited above.

[144] Federal Energy Regulatory Commission, Aguirre Offshore Gasport Draft Environmental Impact Statement at 4-58 (Aug. 7, 2014), https://www.energy.gov/sites/prod/files/2016/08/f33/EIS-0511-DEIS-2014.pdf.

D. PREPA has failed to account for its Preferred Plans' air pollution impacts.

PREPA plants, including the Aguirre Complex are subject to a Consent Decree (the Decree) agreed by PREPA, the United States Environmental Protection Agency (EPA) and the Department of Justice in Civil Case No. 93-2527.

The communities close to the Aguirre Power Complex and the other PREPA plants have a particularized interest as to the continuous and systematic historical violations of environmental laws and regulations by PREPA. The residents of these communities suffer from a high incidence of diseases related to air pollution to which they are exposed. According to the Puerto Rico Cancer Registry, between 2002 and 2016, Salinas had the sixth highest cancer rate in Puerto Rico.

The communities close to the Aguirre Power Complex are exposed to excessive air pollution and, as several experts point out, they are at greater risk of suffering from diseases related to these excessive emissions, in particular, sulfur oxides. The LEO's expert, Dan Gutman, noted these hazards in his testimony:

> Short-term peaks of sulfur dioxide cause constriction of bronchial passageways and respiratory symptoms in susceptible populations, which includes children, older adults, those with pre-existing respiratory disease, those who spend exercising outdoors, persons of lower socio-economic status, and asthmatic individuals. Notably the prevalence and severity of asthma is higher among Puerto Ricans (75 FR 35527). The health data, epidemiological, human exposure, and other data on the relationship between short-term sulfur dioxide exposure and respiratory effects is convincing enough for the relationship to be characterized as causal, the strongest finding EPA can make (75 FR 35520 [2010]).
>
> [. . .]
>
> Sulfur dioxide is only one of the pollutants emitted from PREPA's power plants. . . . Of particular concern are emissions of nitrogen

> oxides, which contribute to formation of ozone (80 FR 65292 [2015]). and emissions of particulate matter—PM_{10} and $PM_{2.5}$—which exacerbate asthma symptoms and adversely impact respiratory function, especially of children, in the short term and increase death rates, especially of the elderly, in the long term (78 FR 3085 [2013]).[145]

The Aguirre Plant is currently a PSD major source for every regulated NSR pollutant except VOC. Emissions of nitrogen oxide from PREPA's fossil fuel power plants continue to pose a health hazard for island residents.

In addition, PREPA power plants emit a wide variety of Hazardous Air Pollutants (HAPs) inherent in the burning of oil or natural gas. For example, Table 5, below, lists the numerous HAPs emitted by PREPA's Aguirre power complex.

Table 5. Hazardous Air Pollutants Emitted by PREPA Aguirre in 2011.

Pollutant Name	Pounds/year
Antimony	1,974
Arsenic	185
Benzene	137
Beryllium	10
Chromium(lll)	214
Chromium(VI)	47
Cobalt	664
Formaldehyde	4,462
Hydrochloric acid	120,627
Hydrofluoric acid	3,978
Manganese	1,221
Mercury	3
Naphthalene	566
Nickel	15,592
Polycyclic aromatic hydrocarbons	155
Selenium	135

[145] Local Environmental Organizations' Mot. to Resubmit Expert Test., Direct Test. of Gutman at 5, 11, (Oct. 25, 2019), http://energia.pr.gov/wp-content/uploads/2019/10/Motion-for-resubmitting-testimony-of-D.-Gutman-testimony.pdf [hereinafter Gutman Direct Test.]. In more than a dozen matters, Mr. Gutman has provided expert analysis of the harmful impacts of emissions from utility projects on human health. Mr. Gutman has testified before administrative agencies as an expert, on behalf of the Environmental Protection Agency and local environmental organizations. Mr. Gutman holds a Bachelor of Science degree from the Massachusetts Institute of Technology and a Master of Science degree from the University of Illinois.

EPA's guideline concentrations for HAPs represent total concentrations that include the impact of emissions from large sources, such as the Aguirre power plant, as well as background concentrations that represent the impact of smaller sources. Background concentrations of HAPs are rarely monitored. However, EPA has conducted computer modeling of background HAP concentrations for every area of the country, including Salinas and Guayama counties, where the PREPA Aguirre power plant is located. EPA's modeling includes contributions from area sources, on-road and off-road sources, long-range transport, unidentified sources, natural sources, and atmospheric transformation. All of those sources can be considered background for emissions from major stationary sources, such as the Aguirre Power Complex. The 2005 report of these results shows that background concentrations of some HAPs, including benzene and formaldehyde, which are carcinogens and cause respiratory irritation and a variety of other health effects, is already above the guideline concentrations, before adding the impacts of the Aguirre Power Complex. Thus hazardous emissions from PREPA Aguirre also cause significant adverse health impacts on residents of the surrounding area.

E. PREPA has failed to provide access to information, to the Environmental Justice Communities Close to the Aguirre Power Complex and Other Plants.

PREPA is required to comply with the Emergency Planning and Community Right to Know Act but historically has not complied with this requirement. The PREPA

Recovery Plan indicates that DuPont performed a safety analysis which indicates that PREPA performs below fundamental levels on each metric.[146]

The Municipality of Salinas has one of the highest unemployment rates in Puerto Rico. Consequently, poverty and low mean household income prevail; the mean household income and the per capita personal income are lower in Salinas than in Puerto Rico.[147] The communities adjacent to the Aguirre Power Complex meet the environmental justice criteria in that the percentage of low-income population within that area is substantially greater than the state low-income percentage and the percentage of persons in low-income populations within the area is greater than 50 percent. Aguirre has substantially lower mean household and per capita income, and substantially higher percentages of families below the poverty line. Unemployment within Aguirre is more than double that of the average in Puerto Rico. In addition, all other poverty data in Aguirre and Salinas were substantially higher than in Puerto Rico as a whole.

The median household income in Guayama from 2013-2017 was $15,296, compared to the national average of $57,652. Moreover, the percent of persons in poverty is 55.1%, compared to the national average of 11.8%.[148] This is consistent with national patterns of siting coal ash disposal in low-income communities and communities of color, and of areas where coal ash has been introduced to experience

[146] Puerto Rico Electric Power Authority, *PREPA'S Transformation, A Path to Sustainability* (2015) [PowerPoint Presentation] http://www.gdb-pur.com/documents/PREPARecoveryPlan6-1-15.pdf.
[147] U.S. Census, *QuickFacts: Salinas Municipio, Puerto Rico* (July 1, 2018) https://www.census.gov/quickfacts/fact/table/salinasmunicipiopuertorico/PST045218?.
[148] U.S. Census, *QuickFacts: Guayama Municipio, Puerto Rico* (July 1 , 2018), https://www.census.gov/quickfacts/fact/table/guayamamunicipiopuertorico/PST045218.

further economic depression due to the undesirability of living near toxic waste impoundments.[149]

F. Noise Impacts of the Aguirre Power Complex.

Noise generated by the Aguirre Power Complex is extremely high. Noise levels from the Aguirre Power Complex have exceeded 100 decibels. This is compounded by the fact that the Complex shares direct and proximate borders with the Aguirre community of Montesoria. For many years, Aguirre residents and Diálogo have attempted to achieve agency action on this issue. Noise pollution has serious implications for public health and for wildlife. PREPA is required to ensure that the noise levels are at or below the federal criteria of 55 decibels at the nearest noise sensitive areas (NSAs.)

VII. PREPA's IRP consultants continue to suffer conflicts of interest.

Today, as in 2015, Siemens' manufacturing arm offers equipment to PREPA at the same time that Siemens' consulting arm advises PREPA on how much equipment, and what types, to purchase. This was not, and still is not, a prudent practice. In addition, PREPA has now hired another consultant with another potential for conflict.

[149] *See, e.g.*, Earthjustice, *Mapping the Coal Ash Contamination* (Nov. 6, 2019), https://earthjustice.org/features/map-coal-ash-contaminated-sites.

In the 2015 IRP, the Commission critiqued PREPA for the use of Siemens as a consultant:

> Where the consultant conducting resource planning has a business interest in resource selection, there is a risk of bias, intentional or unintentional. That risk rises when the modeling technique used by the consultant involves subjectivity. … Utility deference to a consultant with a potential for bias is not a prudent practice.[150]

The Commission noted that Siemens' consulting arm and Siemens' manufacturing arm are commonly owned, and that "[a]t a time of deep citizen concern about PREPA's rates and performance, perceptions of bias and favoritism matter.[151] Since that time, those citizen concerns have only grown larger.

Today, just as in 2015, Siemens continues to have a business interest in the outcome of the resource selection of the IRP, because Siemens is one of the largest turbine manufacturers in the world and has participated in requests for proposals (RFP) for new generation options in Puerto Rico. Regardless of whether Siemens' turbine division is truly separated from its consulting division: employees in both divisions know that the company will benefit if PREPA buys Siemens turbines. And employees in both divisions also know that the chance of that purchase increases with the number of turbines PREPA decides to buy. Put another way: a bias towards gas-fired equipment could benefit Siemens' manufacturing arm.

[150] Puerto Rico Energy Bureau, Final Resolution and Order on the First Integrated Resource Plan of the Puerto Rico Electric Power Authority, para. 110 (September 23, 2016).
[151] *Id*. para. 112.

An IRP needs to be completely agnostic to the interests of PREPA's consultant, focusing on the development of a clean, safe, and reliable grid that provided energy at the lowest feasible cost.

In early summer 2018, PREPA again chose Siemens as its consultant for the current Integrated Resource Plan. In early July, 2018 Siemens released a public paper entitled "Resilient by Design: Enhanced Reliability and Resiliency for Puerto Rico's Electric Grid."[152] The paper explained that "Siemens [had] commissioned this report to inform the next IRP that will guide the grid rebuilding and development for Puerto Rico."

In this paper, Siemens explains that the Integrated Resource Plan would consider a new resource type: "small thermal units that will complement the fleet."[153] The only two small thermal units considered by Siemens were two industrial gas turbines manufactured by Siemens: the SGT-400 and the SGT-750. Siemens urges that these Siemens units are "a critical element of the mini-grids' power supply" and "highly efficiency and flexible."

This is far more troubling than the 2015 IRP, where Siemens considered equipment manufactured by its own manufacturing arm, but at least also allowed equipment from other manufacturers to compete. The August 2018 paper shows Siemens considering **only** its own equipment. In 2015, the Commission opined that

[152] Siemens, *Resilient by Design: Enhanced Reliability and Resiliency for Puerto Rico's Electric Grid* (2018), https://assets.new.siemens.com/siemens/assets/api/uuid:ece862442ca24d0cfce7ff0a9a0f94ac1b3cb9de/version:1532100326/puertoricoresiliency-wp-fprint.pdf.
[153] *Id.* at 8.

the IRP should consider "resource options in generic terms only," and "a choice of specific manufacturers . . . is typically considered only after . . . the IRP process is concluded.[154] Today, we are faced with the worst of both worlds: Siemens is still considering its own equipment, but also creating generic, and in many cases badly flawed, estimates for all other equipment.

Local Environmental Organizations also urge the Energy Bureau to consider the potential for conflict in PREPA's retention of King & Spalding. King & Spalding advises PREPA in its business with New Fortress Energy. Obviously, a thorough investigation of New Fortress Energy's financial situation, and New Fortress Energy's parent company, Fortress Investment Group, would be part of PREPA's due diligence. Instead, in Panel C, representatives from PREPA and King & Spalding acknowledged they had not taken those steps.[155] At the same time, King & Spalding represents other Fortress Investment Group entities, which sit side by side on the Fortress Investment Group webpage with New Fortress Energy.[156] The same man founded, and serves as CEO, of both New Fortress Energy and Fortress Investment Group.[157]

The potential conflict of interest is clear: King & Spalding advises PREPA on its business with New Fortress Energy, knowing that King & Spalding's clients benefit if that business increases. Mr. Bowe explained that King & Spalding

[154] Puerto Rico Energy Bureau, Final Resolution and Order on the First Integrated Resource Plan of the Puerto Rico Electric Power Authority, para. 110 (September 23, 2016).
[155] Negociado de Energía en vivo, *Evidentiary Hearing / CEPR-AP-2018-0001*, YouTube (Feb. 3, 2020), https://youtu.be/weJfs72YtvE?t=11644.
[156] Fortress Investment Group LLC, https://www.fortress.com/ (last visited Mar. 6, 2020).
[157] New Fortress Energy, LLC, https://www.newfortressenergy.com/about (last visited Mar. 6, 2020).

acknowledged, and examined, the potential for a conflict of interest here. The Energy Bureau has made it clear that it is not prudent for PREPA to defer to a consultant that has even a potential for bias. Local Environmental Organizations request that the Energy Bureau demand more information on the relationship between New Fortress Energy and Fortress Investment Group, investigate the potential conflict of interest, and ultimately determine whether King & Spalding's continued business with PREPA is prudent.

VIII. Siemens failed to incorporate the economic effects of the Restructuring Support Agreement.

Law 17-2019, Section 1.9(3)(A) requires that the Integrated Resource Plan include an examination of the economic factors that affect electricity consumption. The Restructuring Settlement Agreement (RSA), which PREPA and its Board are seeking as part of PREPA's ongoing PROMESA Title III case, is absolutely an economic factor that must be considered because it would substantially prejudice the energy system, and particularly PREPA's ability to encourage onsite customer renewable generation (without driving customers off its grid), in accordance with both the Law 17 RPS requirements, and PREPA's customer-centric mandate.

If approved, the PREPA-endorsed RSA will raise electricity rates through a non-bypassable surcharge, dubbed a "Transition Charge," reaching 4 cents per kwh within several years. In the first years of the Transition Charge ratepayers will be asked to pay hundreds of millions to service PREPA's debt. That is, customers could

see a roughly 20% increase in rates that does not correspond to any spending on reshaping the grid to be resilient, reliable, clean, and affordable, as directed by the legislature. If this amount were reduced additional revenues could be available to meet forward looking needs. The excessive amount now planned to pay back debtis unconscionable. Pushing forward with the RSA will simply crowd out the possibility of new expenditures for much needed resilient and affordable electricity initiatives for the people of Puerto Rico. Passage of the RSA will frustrate the ability to plan for initiatives like rooftop solar.

Local Environmental Organizations' expert witness, Anna Sommer, conducted the analysis that Siemens should have done: she analyzed the risk of grid defection by comparing a customer's cost of self-supply against PREPA's rates, with the proposed RSA Transition Charge built in. Figure 3 of Ms. Sommer's testimony demonstrates that residential and commercial customers stand to save hundreds of dollars per MWh by defecting from PREPA's grid, if they are able either to raise initial the capital investment required for installing the self-supply option or if they can access financing or third party leasing (where a developer shoulders the upfront costs). Put simply, if PREPA insists on adopting the RSA, customers who are able to exit the system are likely to do so, leaving customers with the fewest resources behind and subject to PREPA's rising rates. This violates the solidarity principle outlined in Law 17-2019, section 1.4 (vi): "the design of the rate structure shall take into account the goal of providing affordable electricity prices to all consumers, particularly to low-income consumers."

Law 17-2019, Section 1.9(3)(A) compels that PREPA examine the obvious economic effect of the RSA Transition Charge on electricity consumption, and advise the government of these effects.

IX. Penalties for Early Termination of the AES PPOA Contract Are Likely Unenforceable

In this IRP case, AES has argued that the AES Power Purchase and Operation Agreement (PPOA), if terminated would require the payment by PREPA to AES of hundreds of millions of dollars. However, the United States Bankruptcy Code provides for the rejection of executory contracts like the AES PPOA. The Bankruptcy Code furnishes no express definition of an executory contract, 11 U.S.C. § 365(a), but the legislative history to Section 365(a) indicates that Congress intended the term to mean a contract on which performance is due to some extent on both sides, such as with the AES PPOA.

11 U.S.C. § 365(a) allows a debtor in possession, subject to the court's approval, to assume or to reject a prepetition executory contract. The debtor in possession may make this decision at any time prior to the confirmation of the plan, unless the court orders otherwise upon request of the non-debtor contracting party. *Id.* § 365(d)(2). This latitude allows the debtor in possession an opportunity to determine which of the prepetition executory contracts are beneficial to the estate and which should be assumed or rejected. If the contract is rejected, the contract is deemed breached on the date immediately before the date of the filing of the petition, *id.* § 365(g)(1), and

the non-debtor party has a prepetition general unsecured claim for breach of contract damages, one not entitled to administrative priority. 11 U.S.C. § 502(g).

Under the Bankruptcy Code, a rejected contract is considered to have been in breach prior to the bankruptcy petition, leaving the non-debtor party to the contract with a general unsecured claim for contract damages. 11 U.S.C.S. §§ 365(g)(1), 502(g). "By permitting debtors to shed disadvantageous contracts but keep beneficial ones, Section 365 advances one of the core purposes of the Bankruptcy Code: to give worthy debtors a fresh start."[158]

The case law cited above applies to the AES PPOA. The PPOA is subject to rejection by the debtor's representative in the PREPA PROMESA Title III case, in which event, AES' claims under the PPOA would be an unsecured debt that could receive as little as zero cents on the dollar in the plan of adjustment. The IRP clearly establishes that the least cost energy option is customer-sited solar.[159] In addition to the financing options referenced earlier in this brief, the rejection of the AES PPOA could liberate as much as $300 million per year of funds for customer-sited solar, which admittedly is the most cost-efficient option.

[158] *In re Hotel Airport, Inc.*, No. 11-06620 ESL, 2014 WL 4661943, at *24 (Bankr. D.P.R. Sept. 18, 2014) (citing *Eagle Ins. Co. v. Bankvest Capital Corp.* (*In re Bankvest Capital Corp*.), 360 F.3d 291, 296 (1st Cir. 2004).
[159] IRP at 8-59.

Conclusion

For the reasons detailed above, the Energy Bureau should reject the two Preferred Plans and Action Plan set forth by PREPA, and instead adopt the Action Plan items proposed by Local Environmental Organizations.

Respectfully submitted on March 6, 2020

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CERTIFICATE OF SERVICE

We hereby certify that, on March 6, 2020 we have filed this Legal Brief via the Energy Bureau's online filing system, and sent to the Puerto Rico Energy Bureau Clerk and legal counsel to: secretaria@energia.pr.gov; astrid.rodriguez@prepa.com; jorge.ruiz@prepa.com; n-vazquez@aeepr.com; c-aquino@prepa.com and to the following persons:

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