August 27, 2018

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Re: Comments on PREPA IRP Pre-Filing, In Re: REVIEW OF THE PUERTO RICO ELECTRIC POWER AUTHORITY INTEGRATED RESOURCE PLAN, Case No. CEPR-AP-2018-0001

Honorable Commissioners:

We thank the Commission for the opportunity to contribute our comments in the pre-filing process of Puerto Rico Electric Power Authority's (PREPA) 2018 Integrated Resource Plan (IRP). Stakeholders recognize both that there are numerous parties and interests engaged in restructuring the governance, ownership, regulation, and structure of Puerto Rico's electricity system, and that these interests make the planning process both more complicated and urgent. We also recognize that many of these entities have largely agreed that the IRP should form the basis of new investment, changes to PREPA's infrastructure, and even ownership structures. These interests render this particular IRP potentially one of the most singularly impactful electric resource plans conducted in the United States. At the same time, the scope of issues being assessed in the IRP, ranging from resiliency to fundamental supply to deep penetrations of renewable energy and storage, render it an intensely complicated resource planning exercise. The people of Puerto Rico have the unfortunately distinction of paying the second highest electric rates in the U.S. but being served by an electrical infrastructure that is old, unreliable, highly polluting, and that bears of the devastating effects of Hurricane Maria.

The undersigned are aware that the Commission's deadline for the finalization of the IRP is tight. Typical collaborative IRPs can take between eight months to more than a year. In this case, the demand for the IRP to be submitted by October is necessarily limiting and potentially deeply suboptimal. It has already affected the stakeholder engagement process commenced by PREPA/Siemens in June 2018 and that was supposed to continue with follow-up stakeholder sessions during the month of August 2018. The Commission should note that PREPA/Siemens failed to conduct the announced public stakeholder follow-up in August. Thus, this process being conducted by the Commission becomes even more important in offering participation and the opportunity for stakeholders to contribute to the development of the most robust IRP manageable.

We note more references in the 2018 pre-filed IRP over the 2015 IRP process and assumptions to renewable energy opportunities, resilience in the face of emergency, and improved descriptions of assumptions. We also appreciate the detailed questions of the Commission's examiner during the Technical Conference on August 14, 2018. However, we also express our deep disappointment that we were unable to query or interact with PREPA or its consultants during the Technical Conference. Given the tight timeframe and rapid presentation, there were numerous areas where clarification or deeper insight could have forestalled the need for these comments or additional process. We encourage the Commission to consider a more open framework for future Technical Conferences or public meetings, even if including technical stakeholders requires extended sessions.

Our comments coalesce around a single theme: at the end of the day, the IRP must rigorously examine the deployment of non-emitting, non-imported fuel resource plans – i.e. those built around clean renewable energy (solar, wind, hydro), energy efficiency, and storage – at an aggressive pace. Puerto Rico's electric sector has an unprecedented opportunity to make itself anew. At its current high cost, poor reliability, and storm fragility, nearly any alternative is cost effective relative to the status quo. That is a unique position not experienced by any other utility in the country. At the same time, the dramatically lower renewable energy costs of the last few years, massive advances in grid-level storage, and national attention on Puerto Rico provide an opportunity to vault into a new era, rather than turn back towards large central oil and coal-fired generators or new fossil fuel deployment.

This IRP has an opportunity to deeply explore that space, and find out how to reach ambitious renewable energy deployment and other alternatives while minimizing investments in long-run large fossil fuel-based infrastructure. We are not confident that the pre-filed IRP assumptions allow for the appropriate exploration of that space, and may already be biased towards the selection of gas importation simply through the model's construct.

Technical Comments

The pre-filed IRP scenarios are focused too deeply on natural gas import, and do not provide enough opportunity to examine renewable energy futures.

PREPA[1] proposes to run four scenarios and three additional "sensitivities" for a total of seven different worldviews. In total, four of seven of the proposed worldviews are oriented towards the import of natural gas, either to San Juan via onshore or offshore liquefied natural gas (LNG) hubs, floating offshore LNG ports at Yabucoa and Mayagüez, or a combination of all three locations. Two of the other three scenario/sensitivities are unclear about if new gas import facilities are allowed or expected, and **only one** explicitly tests a world in which no new gas infrastructure is made operational. Even a cursory examination of this design gives the impression that a significant amount of new natural gas infrastructure in terms of pipelines, import terminals, and power stations is a *fait accompli.*

We understand the seven worldviews as follows:

1. **[Scenario 1]** No new LNG built.
2. **[Scenario 2]** An on-shore LNG terminal is sited in San Juan port, with a pipeline to Palo Seco, at a cost of $525 million (p73).
3. **[Scenario 3]** New floating LNG facilities are constructed at Yabucoa and Mayagüez, at an unknown cost.
4. **[Scenario 4]** New floating LNG facilities at Yabucoa and Mayagüez, *plus* a new LNG terminal at San Juan.
5. **[Sensitivity 1]** Increase renewable portfolio standard (RPS) to an unknown value, while decreasing the assumed cost of renewable energy. *It is not clear if new gas infrastructure is allowed in this scenario and, if so, which infrastructure and at what cost.*
6. **[Sensitivity 2]** Allow AES to continue operation until otherwise non-economic (after 2027), retire EcoEléctrica in 2022 regardless of cost. *It is not clear if new gas infrastructure is allowed in this scenario, and if so which infrastructure and at what cost.*
7. **[Sensitivity 3]** New floating LNG facility is built offshore of San Juan, with underwater pipelines to both San Juan and Palo Seco stations for $185 million (about half the capacity of the onshore option).

We are concerned that Scenario 1 has been presented as a "business as usual" benchmark, from which PREPA hopes to deviate, rather than a real exploration of how PREPA can meet customer needs efficiently and with on-island resources.

Evidence indicates that PREPA's existing fleet is both non-economic and non-reliable relative to nearly all other options. Therefore, options that are cost competitive will likely seek to replace or repower these units as quickly as feasible. To the extent that PREPA assumes that new renewable energy or storage cannot be acquired rapidly, options that preclude gas may appear more expensive because they require the continued use of the existing fleet.

[1] In general, it is not clear if scenarios and assumptions have been determined by PREPA or PREPA's consultant, Siemens. For the purposes of these comments we will refer to both entities as PREPA.

The Commission's examiner asked if PREPA was restricting the amount of renewable energy that could be procured, to which PREPA answered that it was not limited. However, the Commission's examiner did not ask if PREPA was limiting the pace at which renewables or storage could be procured. Of particular concern, PREPA's consultant indicated that "Scenario 1 would obviously include running the existing oil generators for much longer," implying that PREPA is, in fact, limiting the near-term procurement of renewable energy and storage in the IRP.

In addition, PREPA has not made clear if investments at the existing Aguirre or San Juan combined cycle units may allow those units to help form an interim bridge to a deep renewable future, without incurring the hundreds of millions of dollars of investments required to implement new gas infrastructure.

Rather than being viewed as a benchmark, we see Scenario 1 as PREPA's opportunity to examine all cost effective energy efficiency, renewable energy, storage, demand response, and distributed generation – only then turning to new fossil fuel import options to fill in gaps that modern renewable technologies followed by limited use of the existing power stations cannot yet fill.

As we explain in the next section, we believe that PREPA's pricing and availability of new natural gas import options are speculative. The new fossil fuel import facilities contemplated in the pre-filed IRP are uncertain – at best – in cost, financing, and permitting. At the same time, PREPA has underplayed distributed generation, storage, energy efficiency, and some renewable options under the cover that these options are speculative in cost, financing, and permitting. In the context of this IRP the purpose of even considering gas import options should be to test if such imports might be cost effective or feasible. Similarly, the purpose of looking at extended renewable energy and storage must be to assess if an aggressive adoption of local resources is cost effective.

We are thus concerned that Sensitivity 1, in which the RPS is increased and renewable energy costs are assumed to be "lower" will be characterized as a "red herring," or an alternative to be rejected out-of-hand because it uses assumptions that PREPA will characterize as unrealistic. We strongly support assessing scenarios with uncertainty boundaries on cost, both for fuel and capital costs for renewable energy and fuel infrastructure. However, setting up a *scenario* in which costs are "assumed" to be lower simply may simply be asking for a future debate about the practicality of those assumptions, rather than the potential to actually meet consumer needs.

Rather than Sensitivity 1 combining lower costs for renewable energy *and* increasing the RPS target, we would request that PREPA orient its modeling to have every scenario examine <u>both</u> PREPA's "assumed" renewable energy costs, as well as "lower" renewable energy costs, the latter assuming that with federal aid, PREPA could harness better financing and resource availability on a near-term basis.

Sensitivity 2, assessing the value of the AES and EcoEléctrica contracts, is seriously flawed, as it combines both contracts and thus would be unclear as to cost and impact of each. The plants operate on different fuels, have different corporate owners, different contract terms with PREPA, and different environmental impacts to Puerto Rico's residents. AES has a long history of producing toxic waste streams and violating environmental regulations. While PREPA is in the process of re-

evaluating contracts, it must assess if the AES contract can be terminated cost effectively in the near future. Rather than including a sensitivity that continues AES past the 2027 contract termination, we would ask that this sensitivity specifically focus on a nearer term termination of that contract. We are in a price environment such that utility scale solar energy can provide electricity with a levelized cost cheaper than the costs for fuel to run the AES plant.

We encourage PREPA to invert its view of renewable energy, storage and demand-side measures. PREPA must look at using these indigenous resources to the maximum extent feasible prior to examining fuel import options.

Requests:

- Use Scenario 1 to model all cost effective energy efficiency, renewable energy, storage, demand response, and distributed generation (EE/RE/St/DR/DG). All cost effective EE/RE/St/DR/DG should then form the baseline for later scenarios.
- Use Sensitivity 1 to test rapid expansion of EE/RE/St/DR/DG to avoid extended use of existing oil generators.
- Run all Scenarios and Sensitivities with "expected" and "lower cost" renewable energy costs.
- Use Sensitivity 2 to characterize the cost of early termination for AES.

The pre-filed IRP natural gas infrastructure options have not been vetted and are likely priced incorrectly

PREPA's IRP pre-filing presents eight different new fuel import options, many of which have never been priced or vetted (see p71). Most importantly, PREPA failed to provide justification, cost, explanation, background, or feasibility of two brand new gas import facilities at Mayagüez and Yabucoa. The prices that PREPA presents on gas import facilities are inconsistent with prices paid for other similar facilities and mainland gas pipelines, suggesting that the projects are likely underpriced.

Most astonishingly, the IRP pre-filing includes two new gas import facilities at Mayagüez and Yabucoa. These are not simply "test" facilities for a sensitivity; *rather, they form the basis of half of PREPA's core scenarios.* We note that these facilities have not been raised in any other context previously before this commission (or, as far as we can discern, in any other forum). Even PREPA's Compliance Filing of August 1, 2018, just ten days before this presentation was delivered to the Commission for the Technical Conference, did not contemplate these two facilities. In contrast to all of its other natural gas options, PREPA has not provided any costs, reliability implications, environmental impacts, public concerns or flaws with these facilities, stating instead that such considerations are "pending."

It is not clear how the facilities at Mayagüez and Yabucoa would be connected to PREPA's primary grid, or their relative value to the grid.

At Mayagüez, the current combustion turbine (CT) units are diesel fired and are considered some of the more reliable units on PREPA's system (p45). It would make little sense to install substantial

new gas-fired combined cycle facilities at Mayagüez, as the transmission path rating to load centers in San Juan or Ponce are relatively limited (p31). Indeed, from a physical distance and transmission perspective, Mayagüez is about as far as you can get from PREPA's primary load requirements.

There are no generation facilities at Yabucoa. A new gas import facility at Yabucoa would entail either siting completely new generation near the Yabucoa substation, building substantial new transmission to the Yabucoa port, or building a large pipeline project to the Aguirre facility, over thirty miles away. Since it is unclear how much gas PREPA would envision bringing through Yabucoa, it is unclear what a reasonable cost would be for an offshore or onshore import facility, and it is very late in PREPA's process to just introduce this new information.

PREPA owes the public and the Commission an explanation of the basis of the Mayagüez and Yabucoa facilities, a detailed basis of the cost, expectations of permit and environmental risk, and which parties, if any, have specifically advocated for these facilities.

PREPA is no longer proposing the Aguirre Offshore Gasport (AOGP), a change with which we agree. This change in PREPA's plans was made public in the period between PREPA's August 1st compliance filing and the delivery of the presentation to the Commission during the Technical Conference. In fact, PREPA's consultant was dismissive during the presentation that the option was even viable, a position we have long articulated. Considering that the vendor asked to cancel the contract, this isn't particularly surprising. What is surprising is that PREPA retained the construct of AOGP all the way through the August 1st compliance filing, and is now revisiting three new options with potentially similar problems and downfalls. We think that the challenges in financing and permitting the AOGP should highly inform any plans that include major LNG terminals and pipelines on other parts of the island.

PREPA notes in the IRP pre-filing that AOGP has an operations and maintenance cost (O&M) of $81 million per year "(+ fuel)." It is not clear if the AOGP O&M cost includes just the operations and maintenance of the gas port, or if it also includes the rental cost of the Floating Storage and Regasification Unit (FSRU). In contracting for AOGP, PREPA signed both a labor agreement for O&M, as well as a fifteen year rental agreement, with a present value of $422 million.[2] This serves as a useful benchmark, because PREPA's assumption of an onshore gas port in San Juan reports an O&M of $45 million per year. This port would have half the capacity of Aguirre, and therefore should be expected to have a somewhat smaller O&M cost. However, the estimate of $45 million per year, an order of magnitude cost reduction, appears unreasonably low: according to PREPA, the smaller port at San Juan would require smaller "shuttle" LNG facilities, the cost of which is substantially higher per volume of gas delivered.[3]

[2] See Fisher and Horowitz Expert Report on 2015 rate case, docket CEPR-AP-2015-0001, page 117.

[3] ERIA (2018), 'Investment in LNG Supply Chain Infrastructure Estimation', in Uemura T. and K. Ishigami (eds.), Formulating Policy Options for Promoting Natural Gas Utilization in the East Asia Summit Region Volume II: Supply Side Analysis. ERIA Research Project Report 2016-07b, Jakarta: ERIA, p68. "…the unit cost for an ocean tanker serving a large primary terminal is US$6,000/m3 , while the cost for a coastal tanker serving a secondary terminal is US$15,000/m3 . The unit cost is much higher for a small tanker."

PREPA did not disclose the basis of its gas facility price assumptions, the derivation of estimated costs, or uncertainty bounds on those costs. These costs will be critical in developing a credible IRP.

We request that PREPA provide a full description of the facilities it has modeled, the expected online date assumed in the model, a detailed derivation of the costs of those facilities and uncertainty boundaries, and the costs of interconnection with the existing electrical system.

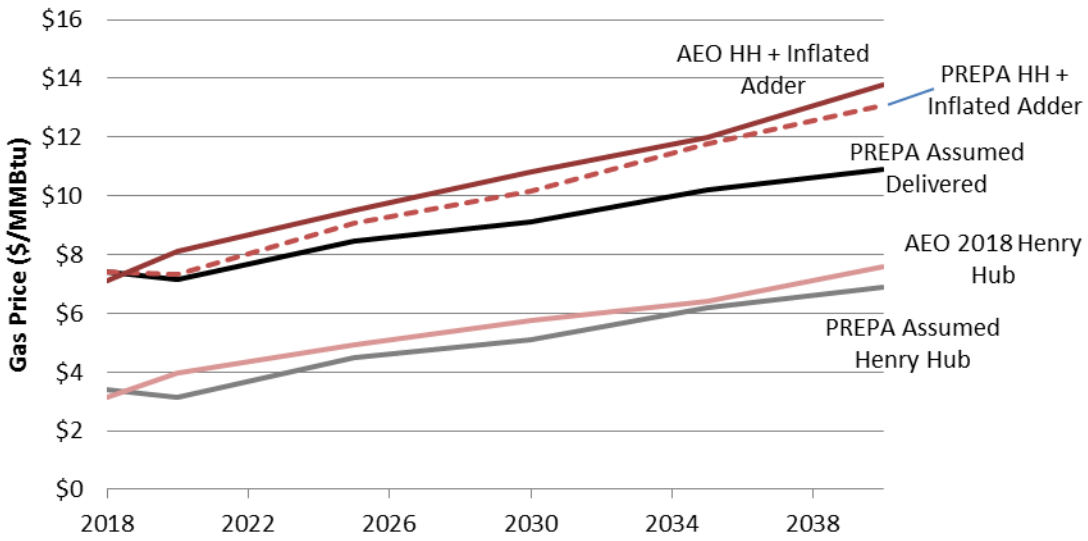
Requests:

- Explain of the basis of the Mayagüez and Yabucoa facilities, a detailed basis of the cost, expectations of permit and environmental risk, and which parties, if any, have specifically advocated for these facilities.
- Provide a full description of all LNG facilities modeled, the expected online date of these facilities, a detailed derivation of the costs of those facilities and uncertainty boundaries, and the costs of interconnection with the existing electrical system.

The pre-filed IRP appears to misprice natural gas imports

PREPA indicated that it is using approximately a $4/MMBtu natural gas price adder to US mainland wholesale gas prices to estimate the cost of delivery to Puerto Rico (p69). During the presentation, the Commission's examiner asked if the delivery adder was held constant over time, or inflated. PREPA indicated that the adder was held at $4/MMBtu for every year of the analysis, with no inflation, and added that [paraphrased] it was difficult to know what would happen in the future, so the price was held constant. We disagree with this treatment of the price adder. Holding the price constant in nominal dollars is an implicit assumption that the price actually drops in constant year dollars, because all other factors increase with inflation. There is no evidence that the cost of gasification or transportation could be expected to drop over the next two decades.

The outcome of this assumption is that gas is likely substantially underpriced in future years. As shown in the chart below, PREPA's assumed delivered gas price (black line) minus the $4/MMBtu adder results in a Henry Hub price (gray) below that assumed by the Energy Information Administration's (EIA) Annual Energy Outlook (AEO) 2018 by about $0.50/MMBtu (AEO forecast in light red). Adding the proper inflator to the LNG adder results in a gas price substantially higher than PREPA's base case (dotted red line), and even higher if the gas adder is applied to AEO's assumed baseline gas price (dark red) – on the order of $1/MMBtu in 2020 and around $2/MMBtu by 2030.



This error and assumption is substantial. A gas price differential of $1/MMBtu translates to an energy cost differential of about $6.5-8.0/MWh in 2020.

As one key example, in 2023, PREPA's assumed price is around $8/MMBtu, which translates to an energy cost of ~$60/MWh (assuming 7,000 MMBtu/MWh heat rate and $3.5/MWh variable O&M). Using a correctly inflated adder and AEO's projections, a gas price of $9/MMBtu would result in a gas energy cost of **$66.5/MWh**, before capital or O&M costs for the gas port. In contrast, PREPA's solar price in 2023 of $1,300/kW would result in a project of roughly **$67/MWh** (not including Puerto Rico adders or federal subsidies). This result would suggest that relatively small differentials in gas price assumptions can make tremendous impacts in model choices.

Additionally, it should be noted that according to PREPA CEO Jose Ortiz, PREPA does not currently import natural gas from the United States, but mainly from Trinidad and Tobago. This information was repeated during the Technical Conference. A recent news article quoted Mr. Ortiz as stating that natural gas from Trinidad and Tobago costs PREPA $3-$4/MMBtu more than natural gas from the United States would cost.[4] Given that PREPA's natural gas supply currently comes into the island at EcoEléctrica via Gas Natural Fenosa, it appears that PREPA is assuming in the IRP that Gas Natural Fenosa will change its supply source to mainland U.S. gas and that new natural gas supply will also be from the mainland U.S. No assessment of the reasonableness of either of these assumptions was provided. In addition, it was noted during the Technical Conference that there are no US-flagged natural gas "shuttles" of the type that would be required to bring gas into port at San Juan, meaning the IRP assumes a Jones Act waiver. This also seems a speculative assumption, at best.

The best source of information that we have today indicates that gas supplies to Puerto Rico would likely come from non-US-flagged ships from non-US sources. It would follow that default gas has a baseline cost $3-$4/MMBtu higher than PREPA's assumptions, an impact of $20-$30/MWh.

[4] José Javier Pérez, "José Ortiz alega que es possible bajar la facture eléctrica en un 40%," El Nuevo Día, August 8, 2018.

Finally, it is notable that the delivery option for fuel prices shown by PREPA are for "Aguirre Delivered Fuel Prices," (p69) despite the fact that PREPA no longer anticipates AOGP. It is not clear that delivery prices would be the same for gas delivered through San Juan, Yabucoa, or Mayagüez. In fact, delivery of gas by smaller "shuttles" may be substantially more expensive, a factor that needs to be taken into account.

Requests:

- Vet the gas price assumptions and adders, adding inflation.
- Use consistent, non-speculative basis for the forecast of prices for natural gas imports, including source region.
- Ensure that any variable costs of delivery are appropriately incorporated into the gas price forecast for individual gas delivery options.

The pre-filed IRP fails to examine a wide enough array of renewable energy measures

Simply stated, the IRP must consider wind. PREPA states that its renewable energy prices are derived from the US Department of Energy's (DOE) National Renewable Energy Laboratory's (NREL) Annual Technology Baseline and are subject to change. PREPA's forecast wind prices at $1,850/kW in 2018 are above the high end of NREL's recently released 2018 estimates, which range from $1,500-$1,750/kW, unsubsidized. NREL indicates that prices will drop faster than shown by PREPA, to a range of $1,200-$2,000/kW by 2030, rather than PREPA's $1,500/kW.

During the Technical Conference, PREPA's IRP team indicated that they are not modeling new wind, and wind "is not worth bothering to think about" because it has relatively low performance in Puerto Rico. Because under a high solar future PREPA would lack evening generation, wind is a potentially critical resource providing non-daylight energy. While NREL has poorly characterized wind in Puerto Rico (the last update having been produced in 2007),[5] even marginal wind speeds at 50 meters of 5.9-6.8 m/s along the northern and southern coasts could yield useful and cost effective energy.

The marginal effort entailed to "bother thinking about" wind is far outweighed by the potential this resource could yield during key hours.

Requests:

- Incorporate new wind options into all modeling.

The pre-filed IRP fails to examine a wide enough array of demand-side measures

PREPA's pre-filed IRP gives relatively little attention to demand-side resources. The pre-filed IRP lists four energy efficiency program categories and two demand response categories, short of the numerous programs and program categories used in advanced energy efficiency jurisdictions. Under residential programs, PREPA lists only air conditioning ("A/C") programs and lighting programs. More specifically, PREPA actually proposes specific and narrow A/C and lighting programs, potentially to the exclusion of larger scale programmatic choices.

[5] https://windexchange.energy.gov/files/u/visualization/pdf/pr_vi_50m.pdf

PREPA claims that the programs examined here are derived from a third-party "potential study" which had been received only recently by PREPA. It is not clear if the study was performed by a credible institution conducting potential studies, that institution's experience in Puerto Rico, or what elements of the study were adopted (or rejected) by PREPA.

In general, the use of a potential study as the basis for an IRP can be problematic. Potential studies are necessarily limited to the technology and pricing available today, and may be myopic in envisioning how future energy efficiency programs could be implemented given technological change. In this case, the potential study or PREPA appears to have missed substantial opportunities, as per below.

- **Residential lighting:** PREPA states that "this measure provides free LED bulbs to residential customers with 5 per customer and 60W equivalent bulbs" (p63) and assumes that participation is limited. PREPA could go much deeper. For example, the utility could facilitate and subsidize the wholesale purchase of LED bulbs by major retail outlets in Puerto Rico, with the requirement that these bulbs be sold at below-market prices, competitive with traditional bulbs. In addition, PREPA could provide marketing, customer research, and outreach to retailers to ensure the rapid adoption of such bulbs.

- **Residential A/C:** It is not clear what form of subsidy or incentive PREPA will offer to ensure the installation of high efficiency A/C.

- **Residential thermal storage:** PREPA states that the late evening peak is primarily residential air conditioning use. To the extent that abundant future mid-day solar could provide low-cost energy mid-day, PREPA should deeply examine residential thermal storage (i.e. ice creation or similar) to migrate use to the mid-day. PREPA stated that such programs are not currently popular. This is not surprising considering that PREPA's mid-day costs are similar to evening generation costs. With high penetrations of solar, this calculus will change.

- **Window and thermal sealing:** A large fraction of residential and commercial facilities rely on natural ventilation during the day, but then turn to air conditioning during evening hours. Effective thermal sealing may substantially increase the effectiveness of air conditioning.

Other efficiency measures that may have substantial savings in Puerto Rico include:

- Improve/upgrade commercial refrigeration
- Improve commercial and industrial motors and pumps
- Reduce solar heat gain in commercial buildings through window films / shading
- Use thermal controls to isolate working areas of office buildings after hours to conserve A/C
- Upgrade street lighting to LEDs
- Improve motor efficiency for fans in residential and commercial spaces

The development of rigorous energy efficiency studies for the purposes of long-term system planning is an intensive process. As an interim measure, many utilities simply assume that either the utility or a third-party provider will be able to achieve savings if properly incentivized and found to be least cost. In these cases, the utility simply assumes a level of achievement on a year-by-year basis, and then implements a detailed plan to achieve those savings as part of an action plan .

Requests:

- Make third-party energy efficiency potential study publicly available.
- Review all cost effective energy efficiency measures.
- Identify target level of savings and action plan measure to achieve such savings.

The pre-filed IRP assumes a slow deployment of distributed generation and customer-sited generation projects

We are aware that the New York State Smart Grid Consortium (NYSSGC) is performing distribution system modeling under contract with PREPA.[6] While we understand that it may not be feasible within the timing of this IRP to integrate the results of the NYSSGC modeling effort with Siemens generation and transmission system modeling, we would request that PREPA make NYSSGC's results available to the Commission and stakeholders in a timely manner.

The IRP assesses a relatively slow penetration of distributed generation, despite the high cost effectiveness of rooftop solar relative to grid costs to retail customers. Stakeholders understood that PREPA intended on matching the pace of update in Puerto Rico with national estimates of distributed generation uptake. The adoption of rooftop solar in Puerto Rico may happen far faster than the continental United States simply due to the economics of rooftop solar in Puerto Rico.

There are approximately 10-15,000 residential rooftop solar customers in Puerto Rico today, mostly having installed in the last few years. Given the arrival of new rooftop solar competition and rapid uptake of this technology, we might expect a penetration of 5,000 or more rooftops in the next year, or up to a 50% year-over-year growth rate. At that pace (even if tapered), we might expect 100,000 customers by 2025, amounting to 500 to 600 MW of rooftop capacity. We understand that many new customers are also installing battery storage systems with rooftop solar. At this pace, distributed generation quickly becomes a substantial component of PREPA's generation system. Assessing the pace of distributed generation fairly, and looking at scenarios in which PREPA customers accelerate adoption with a more rapid interconnection process is an important part of transforming the electric system of Puerto Rico.

Request:

- Provide NYSSGC distribution system study results with the IRP.
- Assess rapid distributed generation growth, in line with current adoption rates.

Benefits of battery storage technology to the electric grid in Puerto Rico

[6] http://nyssmartgrid.com/nyssgc-announces-partnership-with-the-puerto-rico-electric-power-authority-prepa-and-prosumergrid-inc-to-study-options-for-strengthening-and-enhancing-the-resiliency-of-puerto-ricos-powe/

As a key component to a new electric grid for Puerto Rico, PREPA should fully evaluate the benefits of robust deployment of battery storage technologies. A traditional view of batteries would be to value them principally for their ability to provide backup power during times when the electric grid goes down. Modern battery storage technology, however, can provide an entire series of incredibly valuable grid services beyond simply acting as power backup. These include:

- **Frequency and voltage/VAR control.** Fast-ramping batteries can provide valuable ancillary grid services such as frequency and reactive power control. These help maintain the grid's electric frequency and stability on a second-to-second basis. In addition, batteries can help perform these functions over time scales of milliseconds, seconds, minutes, or hours.

- **Balancing and smoothing renewable generation.** Storing solar- and wind-generated electricity and supplying it back to the grid at a later time can reduce the need to curtail otherwise excess renewable generation, prevent the need for curtailments of wind or solar farms, and prevent supply gaps related to evening peak ramping needs. Locating solar and wind generators with batteries allows grid operators to manage the power supplied to the grid by renewable systems with more precision.

- **Avoiding significant generation or transmission infrastructure investments**. Localized pockets of growing electricity demand from residential, commercial, or industrial consumers could require PREPA to build expensive new infrastructure such as additional distribution lines or upgraded substations. These could carry significant costs. Alternatively, batteries installed at strategic locations, at a much lower cost, could enable PREPA to manage growing demand without these kinds of capital outlays.

- **Peak shaving and value opportunities.** By charging batteries during low load (non-peak) periods, and then discharging during peak periods, batteries can flatten daily load shapes or fill in the gaps from a short term loss of generation. Shifting a slice of generation from peak hours to other times of day also reduces the amount of typically less efficient, less reliable, and higher-cost generation that needs to be carried by the system day to day, year to year. The ability of batteries to peak shave, therefore, can result in more efficient plant dispatch and allowing for the retirement of less efficient traditional peaking power.

- **Reducing end-use consumer demand charges.** Large power consumers such as industrial facilities and large commercial operations can reduce their demand charges, which are established on the facilities' highest observed instantaneous quantity of electricity consumption, by using on-site energy storage during peak times to reduce the amount demanded from the grid by satisfying a portion of the facilities demand with battery-stored power.

- **Microgrid support.** As part of a new and more resilient electric grid for Puerto Rico, microgrids can help make the overall system for resilient by creating islands of stable power that can be isolated from island-wide system problems. Batteries can be an

integral part of advanced microgrid setup by providing community-wide power when a microgrid is temporarily electrically separated from the rest of the grid.

As these examples show, batteries can and are today providing a full suite of ancillary and high value services, in addition to traditional back-up power during short-term outages. As PREPA moves forward with the analysis in its IRP, the full value that batteries can provide to the system should be evaluated. We believe a complete evaluation will demonstrate that the electric grid in Puerto Rico can be more resilient and less expensive with proper investments in battery storage.

Requests:

- Provide a robust evaluation of storage technologies, assessing the full grid benefits.

The pre-filed IRP appears to use an overestimated load forecast.

PREPA's load forecast (p55-56) appears to be overestimated. As brought out in the Technical Conference, the PREPA forecast is significantly higher than the FOMB's forecast for the next five years. In FY 2023, for example, the PREPA forecast appears to be about 17% higher than the FOMB's forecast. This difference of over 2,000,0000 MWh is significant; it is, for example, larger than the FY 2016 output of the San Juan combined cycle units that PREPA is currently seeking to convert to natural gas.

PREPA explained in the technical conference that its load forecast was based on the same underlying GDP and population projections as the FOMB's forecast and that PREPA and the FOMB are in the process of reconciling their models. Nevertheless, the existence of this large initial discrepancy illustrates the difficulty in producing a load forecast given the recent shocks to the Puerto Rican economy, and the importance of exploring sensitivities. Assessing future load uncertainty is critical in protecting consumers against unnecessary power purchase agreements to meet demand that will not ultimately materialize.

It was not clear to us, based on the presentation at the technical conference, how load forecast sensitivities were being generated or how they would be represented in the final IRP.

Request:

- Provide in the final IRP the results of Aurora modeling using a lower load forecast case corresponding to the FOMB's forecast in the August 1, 2018 fiscal plan or a forecast projecting similar levels of sales.

PREPA's IRP consultant continues to suffer a conflict of interest

In the 2015 IRP, the Commission critiqued PREPA for the use of Siemens consulting, stating "where the consultant conducting resource planning has a business interest in resource selection, there is a risk of bias, intentional or unintentional."[7] As in 2015, the IRP appears that it will be "written and

[7] CEPR-AP-2015-0002, Final Resolution and Order, ¶110

constructed almost entirely by Siemens PTI."[8] And like in 2015, Siemens continues to have a business interest in the outcome of the IRP.

In the next year and a half, the Commonwealth of Puerto Rico will develop plans to privatize PREPA, selling its generation assets and seeking new generation. Siemens explained during the IRP meeting that they assume that because PREPA has no access to capital, all new generation will be built by private entities [paraphrase]. Siemens is one of the largest turbine manufacturers in the world, and given the opportunity will no doubt seek to participate in requests for proposals (RFP) for new generation options in Puerto Rico.

The slate of new gas generation options put forward in this pre-filed IRP (p50) is problematic and hints at a continued conflict of interest, "intentional or unintentional." An IRP needs to be completely agnostic to the interests of the developers of the IRP, focusing on the development of a clean, safe, and reliable grid that provided energy at the lowest feasible cost.

In early July, 2018 Siemens released a public paper entitled "Resilient by Design: Enhanced Reliability and Resiliency for Puerto Rico's Electric Grid."[9] 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." The statement is not accurate – the IRP team developed the report, and released it as a Siemens paper. The paper explicitly acknowledges Nelson Bacalao, Senior Manager "for leading the project team and development of this report." Dr. Bacalao is the project manager of PREPA's 2015 IRP and 2018 IRP. The paper mirrors many of the assumptions and modeling structures of the 2018 IRP, detailed to the shape of the mini-grids and transmission constraints. The Siemens report explicitly models Siemens gas technologies, including small CC's ("SGT-750" and "SGT-400").

While stakeholders appreciate that the Siemens report provided some transparency into the pre-filed IRP, we are **deeply** concerned that the release of a report by a private company inappropriately used proprietary data unavailable to private parties and stakeholders. We note that the 2015 IRP heavily redacted all information about the transmission system and PREPA has not provided public information on the shape of its loads, a key component of Siemens paper. The fact that the paper was meant to specifically influence the IRP and was developed by the IRP team appears to be an inappropriate use of the data and indiscreet on the part of that Company.

We thank the Commission for its consideration of these comments, and look forward to a robust, public-interest IRP.

Sincerely,

Adriana González-Delgado
Jeremy Fisher, PhD

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[8] *Id.*

[9] https://www.siemens.com/content/dam/webassetpool/mam/tag-siemens-com/smdb/regions/usa/company/topic-areas/onsite-power-generation/documents/puertoricoresiliency-wp-fprint.pdf

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