NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

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

IN RE: OPTIMIZATION PROCEEDING OF MINIGRID TRANSMISSION AND DISTRIBUTION INVESTMENTS	**CASE NO.:** NEPR-MI-2020-0016 **SUBJECT:** Resilience Optimization Proceeding

RESOLUTION AND ORDER

I. INTRODUCTION

On August 24, 2020, the Energy Bureau of the Puerto Rico Public Service Regulatory Board ("Energy Bureau") issued its Final Resolution and Order ("IRP Order"), under Case No. CEPR-AP-2018-0001, with respect to the Integrated Resource Plan ("IRP") of the Puerto Rico Electric Power Authority ("PREPA"). As part of the IRP Order, the Energy Bureau noted that it would commence an Optimization Proceeding and stated:

> The Energy Bureau will open a MiniGrid Optimization proceeding (Optimization Proceeding) following the issuance of this Final Resolution and Order. The Energy Bureau **FINDS** that this proceeding will be the forum to further explore the costs, benefits, and alternative configurations of combinations of wires (*i.e.*, hardened T&D assets) and local distributed resources that best serve Puerto Ricans in safeguarding against the effects of short-term and extended electric system outages that can occur as a result of severe weather events. The Energy Bureau **EXPECTS** that this proceeding will commence in the Fall of 2020.[1]

Through this Resolution and Order, the Energy Bureau initiates the MiniGrid Optimization proceeding ("Optimization Proceeding", as described in the IRP Order. The purpose of this Optimization Proceeding is to begin a sequential process of comparing two approaches to attain increased electric power system resiliency: (i) one based on transmission system hardening, coupled with distribution system reinforcements, to reliably deliver broadly localized power[2] to loads even after extreme weather events have severed the transmission system links between regions; and (ii) another based on providing many points (potentially, thousands) of site-specific or microgrid-provided distributed

[1] IRP Order, p. 19, ¶ 117.

[2] "Broadly localized power" in this context is the capacity and energy presumed available by PREPA in its MiniGrid approach, anchored with thermal resources of at the scale of either existing generation resources on the order of hundreds of MW in size, and smaller new or existing resources on the order of tens of MW of capacity, plus additional battery storage and solar PV resources.

generation and storage to serve critical load and potentially other loads,[3] also after an extreme weather event has severed the transmission system. The second of these approaches avoids some level of transmission and potentially distribution system infrastructure investment that would otherwise be needed to provide resiliency, and also could avoid the need for procurement of utility scale resources.

These two forms of resiliency provision are not mutually exclusive. The framework for this Optimization Proceeding is to determine how to best deploy these two approaches so as to attain a reasonably lowest cost solution for ensuring a greater level of resilience than currently exists across Puerto Rico. The sequences of analyses planned will minimize delay in deploying resiliency solutions by first identifying the "no regrets" solutions such as, for example, the best candidates for transmission hardening and the most obvious site candidates for microgrid or stand-alone distributed generation and storage. Subsequent analyses will then address the more difficult circumstances where the economics of a transmission versus a distributed solution are less obvious.

The Energy Bureau fully expects that some of the MiniGrid transmission projects identified by PREPA as part of the IRP process will comprise the best solution for some, if not many, of the identified "critical" loads, and potentially "priority" and "balance" loads that exist within the most densely loaded regions of PREPA's system. The Energy Bureau recognizes that quickly identifying and approving expenditures for the most technically and economically appropriate set of these projects can likely allow PREPA and PREPA's ratepayers to more speedily take advantage of funding available from the Federal Emergency Management Agency ("FEMA") and potentially other federal agencies.

The Energy Bureau also expects that many essential facilities with critical and priority loads across Puerto Rico are located in less-densely electrically loaded regions, or at the electrical edges of densely loaded areas, and the cost of a transmission and distribution hardening solutions for these relatively isolated (electrically, with respect to the trunk lines of the transmission system) sites would be prohibitive. For these locations, the on-site provision of energy and capacity resources in the form of distributed generation and storage would be economically sensible. The Energy Bureau seeks to quickly identify the critical and priority loads that represent the most technically and economically appropriate candidates for this form of resiliency solution.

This Optimization Proceeding will first specify, and as necessary refine, a framework to identify which of these two solutions is appropriate, for which loads. Specifically, the Energy Bureau seeks to determine which type of infrastructure investments should be deployed to obtain resiliency, at which locations, in what quantities, and at what cost. The

[3] Throughout this Resolution and Order the Energy Bureau makes use of the terms "critical" load, "priority" load and "balance" load, in reference to PREPA's use of these terms in the filed IRP to categorize loads by order of the value associated with losing such load during a weather event. At this point, the Energy Bureau makes no presumptions as to the validity of this particular load segmentation approach, and indeed requests from stakeholders and PREPA additional information and consideration as to how best to characterize all manner of loads for the purposes and objectives of this proceeding.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

anticipated installation timing of each type of solution will also be determined during the Optimization Proceeding. The process will result in assurance that, eventually, both of these types of investments, optimally selected, would lead to increased resiliency in the face of extreme weather events that would damage electric system equipment and disrupt electric service. They would also provide resiliency across less severe, but still disruptive, events such as smaller scale storms or earthquakes.

The Energy Bureau expects that this Optimization Proceeding will enable the identification of "no regrets" options that can commence in the short term, starting with a holistic overview of the system to determine the most critical needs and then diving deeper into the specifics of each MiniGrid region, starting with the San Juan-Bayamón area as identified in the IRP Order.[4]

II. DISTRIBUTED RESILIENCY

In the IRP Order, the Energy Bureau made clear its finding that developing distributed energy resources ("DERs") should be a key component in developing a modern, least-cost energy system that is not reliant on large centralized fossil fuel plants. This is consistent with the public policy set forth in Act 17-2019.[5] The Energy Bureau identified DERs as being able to serve a dual function of providing capacity and energy on "blue sky" days[6] while also providing distributed resiliency during periods of severe weather events that disrupt or sever the transmission system.[7] In the IRP filing, PREPA offered a solution that focused on providing resiliency in significant part through extensive transmission system hardening (its MiniGrid approach). In this Optimization Proceeding, the Energy Bureau will focus on how to best provide "resiliency solutions" for critical and other loads in Puerto Rico.

The goal is for PREPA's system to exhibit a degree of resilience such that for severe transmission system disruptions, likely coupled with extensive distribution system disruption, load service (especially for critical load at essential facilities,[8] but also for other load) is minimally interrupted or not interrupted at all. System wide, the Energy Bureau frames two components of resiliency solutions: (i) an extensively-hardened transmission system as described by PREPA for its MiniGrid approach, consisting primarily of the undergrounding of existing or new transmission infrastructure and selective substation

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

[4] IRP Order, pp. 279 – 280, ¶¶ 895 – 902.

[5] *See* Statement of Motives, Act 17-2019, known as *The Puerto Rico Energy Public Policy Act.*

[6] IRP Order, p. 279, ¶ 898.

[7] IRP Order, p. 227, ¶ 734.

[8] Act 17-2019 defines the term "Essential Service Facilities" as ". . . health facilities, police and armed forces stations, fire stations, emergency management offices, emergency shelters, prisons, ports, airports, telecommunications facilities, water supply and waste water treatment facilities, educational institutions, and any other facility designated by the Energy Bureau as an 'Essential Service Facility' through regulations." *See also,* IRP Order, p. 280, ¶ 901.

hardening;[9] and (ii) the deployment of DERs that provide site-specific or microgrid (multiple buildings or sites) capacity and energy resources that operate and provide electric power when the transmission (and/or distribution) systems are disrupted. The latter—DER deployment—provides a measure of distributed resiliency. The former—PREPA's MiniGrid approach—provides resiliency through more extensive transmission and distribution system hardening.

The Energy Bureau supports deployment of distributed resiliency to the extent it is practical, feasible and cost-effective. This proceeding will set out a methodology to assess cost-effectiveness of the two resiliency solutions. It will also identify specific combinations of resiliency solutions comprised of both DERs and incremental transmission system investment for deployment across Puerto Rico. As it relates to the electric grid and this Optimization Proceeding, the Energy Bureau notes that resiliency considers the ability to withstand and reduce the magnitude and/or duration of disruptive events, which includes the capability to anticipate, absorb, adapt to, and rapidly recover from a potentially catastrophic event.[10] It is with this lens that we will focus on developing a new, resilient system in Puerto Rico.

III. OBJECTIVES OF THIS PROCEEDING

The Energy Bureau has determined that this Optimization Proceeding will use an iterative process which will allow the rollout of certain grid resiliency projects as soon as possible, for both transmission and DER solutions. The Optimization Proceeding will commence first with a focus on developing a set of guiding principles and concepts which will be used to analyze various options for either the entire island (*e.g.*, DER solutions), or for each Minigrid region (*e.g.*, for specific transmission solutions). The discussions and analysis will start with the development of parameters as to how to measure and quantify the benefits and costs when comparing transmission and substation (new or existing) hardening options with distributed resiliency options.

The cost benefit analysis will include an examination of avoided costs among other relevant variables that may be identified in the course of the proceeding. The first step will be to develop the general framework that can be applied to the decision-making on options for each region. The process will also include a determination of quantities, costs, types, location and deployment/procurement methods for specific distributed generation projects along with the mix of microgrid and stand-alone projects and their size and location. Appendix A of this Resolution and Order sets forth a preliminary proposal for the elements of this framework, for which the Energy Bureau seeks comments, as established in Part V of this Resolution and Order.

[9] *E.g.*, PREPA IRP Appendix 1, Exhibit 2-93 (page 2-102), showing $5.9 billion in MiniGrid transmission expenditures across eight regions and differentiated by voltage class.

[10] As noted in FERC Docket AD18-7-000, noted in PREPA's IRP filing, pp. 7-32 to 7-33.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

The Energy Bureau's IRP Order lists the elements envisioned for the Optimization Proceeding.[11] These elements compose the "framework for resilient system operation at reasonable cost" and they inform the preliminary "Analytical Approach" below:

1. Identify and define classes of customers regarding the criticality of electricity service and associated expected levels of resiliency.

2. Identify and describe the customers' roles in providing energy supply and DR.

3. Provide microgrid and related single-site (individually, or in the aggregate as Virtual Power Plants) local capacity and energy solutions for both resiliency and normal energy and capacity needs where cost-effective.

4. Optimize the transmission and distribution system expenditures for resiliency, including aspects of PREPA's MiniGrid concept.

The IRP Order indicated the proceeding would "further explore the costs, benefits, and alternative configurations of combinations of wires (*i.e.*, hardened transmission and distribution assets) and local distributed resources...".[12] The analytical approach contained in Appendix A of this Resolution and Order effectively sets out an initial economic evaluation approach for the different alternatives and provides more detailed steps to represent the above framework.

The second step of this proceeding will be to apply the framework with no-regrets expenditures in which the cost and the specific projects are identified for each MiniGrid region. Examples of the kinds of resiliency investments that shall be considered include, but are not limited to, the following:

1. Direct customer installation (energy or energy and capacity resources behind the meter), with or without PREPA tariff-based or procurement-based support;

2. PREPA resource procurement through Requests for Proposals for Power Purchase Operating Agreements, Demand Response tariffs, and other forms of feed-in tariffs;

3. PREPA installation of transmission or distribution equipment; and,

4. A combination of these mechanisms.

For transmission infrastructure, undergrounding, substation protection, and other hardening technologies will be considered. Critical areas requiring immediate attention will be identified. This will be followed with specific attention to each region starting with the

[11] IRP Order, pp. 18-19, ¶ 116.

[12] IRP Order, p. 19, ¶ 117.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO
NEPR

San Juan-Bayamón region. This will allow PREPA to move forward quickly with the first segment of any transmission grid hardening program revealed to be cost effective and initialize or continue efforts to seek funding,[13] while other MiniGrid regions are reviewed, and resiliency deployment solutions determined. The Energy Bureau envisions a continuing sequence of decisions relating to deployment of resiliency solutions concerning PREPA's transmission system, microgrids and stand-alone distributed generation and storage, in addition to possible decisions concerning distribution system hardening efforts.[14]

IV. ENERGY BUREAU AUTHORITY

The legislature intentionally broadened the scope of the Energy Bureau's authority in order to ensure that the public policy of moving away from fossil fuels towards distributed energy technologies, including storage, are carried out.[15] Pursuant to Section 1.7 of Act 17-2019, the Electrical System planning and regulatory function is entrusted to the Energy Bureau.[16] In order to maximize the resources available for the reconstruction and modernization of the Electrical System, Act 17-2019 requires PREPA to adopt "...technologies, in coordination with the Energy Bureau, such as the Distributed Energy Resources Management System (DERMS); the Advanced Distribution Management System (ADMS); the Fault Location Isolation and Service Restoration (FLISR); the Volt/VAR Optimization (VVO); and other technologies that improve the stability, resilience, and efficiency of the system as well as its capacity to integrate distributed generation and renewable energy, insofar as the use of resources inure to greater public benefits."[17] Further, the Energy Bureau is responsible for carrying out the public policies with respect to the electric power grid and the electric power infrastructure, including taking, "... the necessary regulatory actions to guarantee the capacity, reliability, safety, efficiency, and reasonability of the rates of Puerto Rico's electrical system."[18]

The legislature also stressed the importance of the IRP as the main tool for developing the roadmap to lead Puerto Rico towards a clean energy, reliable and resilient electric system. To this end, it is required that every electric power service company complies with

---

[13] It is the Energy Bureau's understanding that PREPA is already in the process of applying for "hazard mitigation" from FEMA and other federal agencies to support "building back better" from the damage incurred during Hurricanes Irma and Maria.

[14] While this proceeding is focused on transmission system and DER expenditure optimization, efforts to harden the distribution system overlap with the aims of obtaining resiliency for Puerto Rico through this proceeding. As part of this proceeding, the Energy Bureau will directly consider ongoing progress in Integrated Distributed System Planning processes currently underway and will strive to include their effects when analyzing DER and transmission options for resiliency.

[15] Act 17-2019, Section 5.10, amending Section 6.3 of Act No. 57-2014.

[16] *Id.*, Section1.7.

[17] *Id.*, Section 1.15(o).

[18] *Id.*, Section 5.10, amending Section 6.3(c) of Act No. 57-2014.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

the Integrated Resource Plan approved by the Energy Bureau.[19] Further, "any amendment or modification to the Integrated Resource Plan shall be approved by the Bureau prior to its implementation."[20] Thus, PREPA is bound by the decisions contained in the IRP Order and cannot deviate from the Modified Action Plan, as determined by the IRP Order, without the express approval of the Energy Bureau.

This proceeding to develop a resiliency deployment optimization plan is centered around determining necessary transmission system and DER resource investments. It is being carried out under the authority granted to the Energy Bureau and the provisions of the IRP Order. Therefore, PREPA shall carry out the orders of the Energy Bureau with respect to each segment of the optimization plan as approved by the Energy Bureau; and for the transmission components, or DER components if or as applicable,[21] shall only seek FEMA funding or funding from other federal agencies for those expenses that are consistent with what the Energy Bureau has explicitly approved in the IRP Order or in this Optimization Proceeding.

V. THE PROCEDURE FOR DEVELOPING THE TRANSMISSION GRID OPTIMIZATION PLAN

As stated above, Appendix A of this Resolution and Order includes a framework for the overall analytical approach and expected timelines for workshops and ongoing resolutions of issues under consideration by the Energy Bureau. The Energy Bureau seeks comments from PREPA and other stakeholders on the Preliminary Proposal contained in Appendix A. Comments to Appendix A shall be filed within twenty-one days from the notification date of this Resolution and Order.

Additionally, Appendix B of this Resolution and Order contains requests for data and information to be filed by PREPA. The Energy Bureau **ORDERS** PREPA to file responses to Appendix B of this Resolution and Order within fifteen days from the notification date of this Resolution and Order.

Finally, Appendix C of this Resolution and Order contains specific questions for stakeholders regarding their requirements, preferences, and other aspects of specific resiliency or needs for reliable power for critical, priority and balance loads. Comments to Appendix C shall be filed within twenty-one days from the notification date of this Resolution and Order.

As part of this proceeding, the Energy Bureau will hold an initial 2-day technical workshop, commencing on January 21, 2021, open to all stakeholders and PREPA for the

---

[19] *Id.*, Section 1.6(15).

[20] *Id.*, Section 1.9(1).

[21] To the extent that FEMA funding or other federal agency funding is available to cover costs of resiliency deployment associated with distributed generation resources (and not just transmission expenditures), the Energy Bureau expects, supports, and strongly encourages PREPA to expeditiously apply for such funding.

NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO
NEGOCIADO DE ENERGÍA DE PUERTO RICO

primary purpose of establishing the guiding principles and criteria that will be used to select the most cost-effective options for achieving resiliency solutions across Puerto Rico.

Depending on the nature of comments received in response to Appendix A of this Resolution and Order, the Energy Bureau may also address, by inclusion in a finalized agenda for the initial technical workshop, specific considerations for two elements associated with resiliency solutions: (i) segmenting load by size and/or nature of criticality; and (ii) a placeholder value for the benefit associated with deployed DER resources providing distributed resiliency. Further information on these considerations is included in Appendix A of this Resolution and Order.

The primary purpose of a determination on load segmentation approaches at the very outset of the proceeding is to appropriately define baseline criteria for which load constitutes truly "critical" or "priority" load for purpose of examining the cost-effectiveness of alternative resiliency solutions. The purpose of an early signaling of the value of DER resource deployment is to allow, as best as possible, for the commencement of a "rapid deployment"[22] of such resources. As this Optimization Proceeding continues, refinement of this value would be expected based on analysis of DER resource deployment cost effectiveness.

Thereafter, the Energy Bureau will schedule a series of regular technical workshops to develop optimization plans for all the MiniGrid regions, commencing with the San Juan-Bayamón region in the second technical workshop. The Energy Bureau intends at each workshop to start with an identification of the most critical, and reasonably obvious, transmission grid needs for infrastructure upgrades, dependent in significant part on identification of the location and size of the most critical larger loads, their proximity to the transmission system, and the relative density of all such critical loads in proximity to the transmission system in each region (*i.e.*, a "top down" approach to identifying transmission resiliency solutions). The Energy Bureau will plan to treat as confidential all customer-specific data and other data (*e.g.*, critical energy infrastructure information (CEII) - transmission) in this proceeding. The Energy Bureau will work to rely on aggregated data and keep the information flow available to the public to the greatest extent feasible. Where necessary, the Energy Bureau will restrict access to such information according to its rules and regulations.

Simultaneously, each workshop will identify those locations where a DER approach to providing resiliency is likely more reasonable than a transmission investment, by examining, for example, smaller size critical loads in lightly loaded areas furthest from the transmission grid or critical loads regardless of size or geographical location, but electrically distant from a transmission connection point (*i.e.*, a "bottom up" approach to identifying DER resiliency solutions). Appendix A of this Resolution and Order describes the analytical approach associated with these steps.

[22] IRP Order, p. 227, ¶ 736.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

The information the Energy Bureau will require from PREPA to undertake an initial review and prepare for the workshops is expected from responses to questions included in Appendix B of this Resolution and Order, in addition to the framework set out in the Preliminary Proposal in Appendix A. Stakeholder responses to questions in Appendix C of this Resolution and Order, and stakeholder comment on the overall approach in Appendix A will also support the initial review and preparation for the workshops.

After the second technical workshop, which starts examination of the San Juan-Bayamón MiniGrid region, each subsequent workshop shall develop an optimization plan for approval by the Energy Bureau. Once approval of the optimization plan is granted through an Order issued by the Energy Bureau, PREPA shall commence resiliency solution deployment. As noted earlier in this Resolution and Order, given the urgency of building up a resilient electric power system, once one area of review is completed, the Energy Bureau will issue an Order setting forth technical workshops for the next MiniGrid region to be reviewed.

As indicated in the Preliminary Proposal, for the analytical approach, the nature of the optimization problem can be somewhat complex for some load areas (*e.g.*, some critical load locations and sizes might be served at equal cost with a transmission solution, or a DER solution). However, for other load areas – such as a series of large critical loads adjacent to existing overhead transmission circuits, or conversely critical load in rural areas (*e.g.*, a remotely located clinic far from the transmission grid) – the economics may easily point to one resiliency solution or the other. The Energy Bureau will strive to not have "perfect" mathematically optimal solutions be the enemy of "good enough" resiliency solution approaches at the outset of this proceeding and plans to make determinations that reasonably and cost-effectively provide resiliency deployment in an expedited manner.

This sequential technical workshop process will be repeated until the MiniGrid transmission infrastructure in all the MiniGrid regions have been reviewed, with plans for their optimization approved. As each segment is approved, PREPA shall begin the process of seeking funding from FEMA or other federal agencies to support deployment of transmission and DER resources required to implement the resiliency solutions.

Below is a summary of the preliminary timeline for this Optimization Proceeding and associated workshops.

Summary Preliminary Timeline Goals for Proceeding / Workshops:

Date	Event	Comments
December 2020	Order opening proceeding	Appendices including Preliminary Proposal for Analytical Approach and Questions for PREPA and stakeholders
December 2020/January 2021	Responses to Appendices A, B, C	Energy Bureau to finalize agenda for first technical workshop after responses / Issue workshop notice

NEPR
NEGOCIADO DE ENERGÍA DE PUERTO RICO
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

Date	Event	Comments
Mid-late January 2021	1st technical workshop	Energy Bureau determinations on the criteria for cost effectiveness of resiliency solution options, and 1) load segmentation approaches, 2) placeholder value DER solutions to apply island-wide
February/March 2021	2nd technical workshop	Determinations – initial MiniGrid transmission solutions for San Juan – Bayamón, additional DER solutions
April 2021	3rd and 4th technical workshops	Determinations – initial MiniGrid transmission solutions for next 2-4 MiniGrid regions, additional DER solutions
May 2021	5th and 6th technical workshops	Determinations – initial MiniGrid transmission solutions for next 2-4 MiniGrid regions, additional DER solutions
June and later months, 2021	Additional workshops if/as necessary	Continuing Energy Bureau determinations on additional transmission solutions, additional DER solutions, as necessary

VI. CONCLUSION

Based on the above, the Energy Bureau requires interested stakeholders to provide comments to Appendix A and Appendix C of this Resolution and Order within twenty-one days from the notification date of this Resolution and Order. The Energy Bureau **ORDERS** PREPA to provide its comments to Appendix A in the same timeframe.

Further, the Energy Bureau **ORDERS** PREPA to provide the data set forth in Appendix B of this Resolution and Order within fifteen days from the notification date of this Resolution and Order.

Be it notified and published.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

Edison Avilés Deliz
Chairman

Ángel R. Rivera de la Cruz
Associate Commissioner

Lillian Mateo Santos
Associate Commissioner

Ferdinand A. Ramos Soegaard
Associate Commissioner

Sylvia B. Ugarte Araujo
Associate Commissioner

CERTIFICATION

I hereby certify that the majority of the members of the Puerto Rico Energy Bureau has so agreed on December 22; 2020. I also certify that on December 22; 2020 a copy of this Resolution and Order was notified by electronic mail to: astrid.rodriguez@prepa.com; jorge.ruiz@prepa.com; n-vazquez@aeepr.com; c-aquino@prepa.com.

I also certify that today, December 22, 2020, I have proceeded with the filing of the Resolution and Order issued by the Puerto Rico Energy Bureau and I have sent a true and exact copy to:

PUERTO RICO ELECTRIC POWER AUTHORITY
ATTN.: NITZA D. VÁZQUEZ RODRÍGUEZ
ASTRID I. RODRÍGUEZ CRUZ
JORGE R. RUÍZ PABÓN
PO BOX 363928
SAN JUAN, PR 00936-3928

I sign this in San Juan, Puerto Rico, today December 22, 2020.

Sonia Seda Gaztambide
Interim Clerk

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

Appendix A:
Preliminary Proposal - Analytical Approach for Optimization

I. Introduction

The goal of the Optimization Proceeding is to determine a reasonable, near-optimal mix of: (i) additional transmission investment for the PREPA identified[1] MiniGrid regions[2]; and (ii) local distributed resource deployment. Both these investments would lead to increased resiliency in the face of extreme weather events that would damage electric system equipment and disrupt electric service. They would also provide resiliency across less severe, but still disruptive events such as smaller scale storms and earthquakes.

Refinement of the analytical approach presented here will continue throughout this proceeding. Mathematically optimizing between transmission and distributed generation (DG) is complex. The Energy Bureau does not foresee "perfect" solutions because the time and effort required to achieve such outcomes would hinder sustaining progress towards real, practical, cost-effective resiliency solutions deployed across Puerto Rico. However, the Energy Bureau does anticipate that the solutions will be solid and defensible. There are many variables to consider: *e.g.*, treating each load location as unique would risk unnecessary delay in achieving the aims of this proceeding. Data limitations and parameter uncertainty (*e.g.*, actual value of lost load, extent of truly critical load, randomness of the locational effect and intensity of extreme storm events) likely mean that simpler, workable-though-not-perfect solutions will rise to the top of the Energy Bureau's preferred determinations for resiliency solutions.

This proceeding will consider to a limited extent distribution system planning impacts,[3] such as how distribution system investments for increased DG contribute to distributed resiliency solutions. However, the analytical approach will not extend into a form of Integrated Distribution System Planning ("IDSP"), which is a separate Energy Bureau effort.[4] This Optimization Proceeding will consider how to address the boundary between the two analytical exercises.

The distinction between this proceeding and the IDSP efforts is that this proceeding focuses on optimizing the use of distributed energy resources ("DERs") (vs. transmission

---

[1] The Energy Bureau will maintain the use of the term "MiniGrid region" during this proceeding solely to maintain continuity with geographical and administrative district naming conventions used in the IRP process. Neither PREPA nor stakeholders should presume Energy Bureau approval of any aspect of PREPA's MiniGrid approach except as is explicitly noted throughout the Energy Bureau IRP Order.

[2] The IRP Order approved $2 billion in transmission system investment for the existing system, to bring it up to Codes and Standards, but did not approve "additional" MiniGrid transmission investments, pending this new Proceeding.

[3] IRP Order, ¶¶ 756 and 759.

[4] The Energy Bureau has been conducting workshops on Integrated Distribution System Planning over the 2019-2020 period, under Case No. NEPR-MI-2019-0011.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

alternatives) and adopting least cost solutions; the IDSP effort, while also seeking least-cost solutions, aims to provide a form of distribution grid mapping to determine the best locations for DERs going forward. The Energy Bureau welcomes stakeholder comment on the analytical overlap between the IDSP efforts and this Optimization Proceeding.

The San Juan-Bayamón MiniGrid region will be the first region of focus. The structure of the analysis will be built around the costs and value of MiniGrid transmission investment to serve critical (and other) load needs. The analysis must address the value of distributed resiliency in this region and compare this with the MiniGrid approach. The Energy Bureau expects that other MiniGrid regions with lower average load density than the San Juan metropolitan area may be more likely to have greater amounts of critical load be more economically served with distributed resiliency solutions.

Clusters of critical loads, with relatively dense feeder and transmission loading, is predominant in the San Juan-Bayamón region,[5] and such critical loads may best be served with MiniGrid-like transmission solutions which source capacity in part from conventional resources (*e.g.*, San Juan 5&6, Palo Seco peakers), new renewable and battery sources connected within the region, and hardened interconnections to other regions. However, the region's critical load is spread across numerous T&D delivery source points, not all of which will be closely tied to the hardened wires assets. There are likely many points of critical load in this region where distributed resilience solutions – microgrid or stand-alone sources – will be most economical. For example, load that is more than a certain threshold distance (physically and/or electrically) from, undergrounded hardened transmission or distribution source points would be a candidate load for distributed resiliency solutions. Determining such a threshold distance (or a range) will be a key part of the analytical construct of the Optimization Proceeding.

While the initial focus will be on one MiniGrid region, the proceeding will first set out a valuation mechanism that would be applied island-wide, with the specific transmission options and costs varying across the MiniGrid regions, while the parameters for distributed resiliency solutions would likely be similar across all regions. An initial approach is described below in Section II.

The IRP Order also directly notes that "any overlap between transmission investments required for existing infrastructure hardening and those that may be required to effect optimized MiniGrid investments will be considered."[6] The existing infrastructure hardening (~$2 billion for transmission, and ~$911 million for distribution) is likely to have a critically important impact on ensuring or at least supporting the security of resource supply along many of the transmission/distribution system interfaces, and along feeder trunklines. This value will need to be reflected in the overall analytical construct.

[5] This is seen visually in the MiniGrid region maps in the confidential version of Appendix 1, where critical and priority load points are shown, and proposed transmission investment is indicated. Additional supporting data is also seen in the response to ROI 2-9(e)) and in the confidential Appendix 1 workpapers.

[6] IRP Order, p. 232, ¶ 753.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

The proceeding will be used to understand, and help determine, the manner in which resiliency investments would be made, for example, through:

1. Direct customer installation (energy or energy/capacity resources behind the meter), with or without PREPA tariff-based or procurement-based support;

2. PREPA resource procurement (direct RFPs/PPOA, DR tariffs, other forms of feed-in tariffs);

3. PREPA installation of transmission or distribution equipment (traditional); or,

4. A combination of these mechanisms.

The mechanisms for investment affect the overall costs, and thus will directly inform the comparative economics of different resiliency solutions.

The proceeding should address the timing of the resource investments and could consider the extent to which funding is available from the Federal Emergency Management Agency ("FEMA") or other agencies (*e.g.*, Housing and Urban Development ("HUD"), United States Department of Agricultural Rural Utilities Service ("USDA RUS"), US Department of Energy ("DOE"))[7] to cover parts of the overall costs. The IRP Order incorporated a need for "rapid deployment of points of distributed resiliency"[8] including microgrids, Virtual Power Plants (VPPs) and single-site solutions and thus the optimization construct could place a premium value on those solutions that can be deployed quickly. If a particular transmission solution – or, critically, DER solutions such as microgrids – is likely to receive FEMA or other agency financial support this could be considered in the economic evaluation, but underlying uncertainties around the timing and contributions to total costs must be accounted for.

The Energy Bureau's IRP Order lists the elements envisioned for the Optimization Proceeding.[9] These elements make up the "framework for resilient system operation at reasonable cost" and they inform the "Analytical Approach" below:

1. Identify and define classes of customers regarding the criticality of electricity service and associated expected levels of resiliency.

2. Identify and describe the customers' roles in providing energy supply and DR.

[7] Based on a US General Accounting Office (GAO) report, FEMA and HUD are the primary federal funding sources for grid recovery. The DOE can provide technical assistance to local and federal entities to support grid recovery efforts. In addition, FEMA is to coordinate federal capabilities to support and expedite recovery. US GAO agency coordination report (GAO-20-141 at https://www.gao.gov/products/GAO-20-141).

[8] IRP Order, p. 227, ¶ 736.

[9] IRP Order, p. 18, ¶ 116.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

3. Provide microgrid and related single-site (individually, or in the aggregate as VPPs) local capacity and energy solutions for both resiliency and normal energy/capacity needs.

4. Optimize transmission and distribution (T&D) system expenditures for resiliency, including aspects of PREPA's MiniGrid concept.

The IRP Order indicated the proceeding would "further explore the costs, benefits, and alternative configurations of combinations of wires (*i.e.*, hardened T&D assets) and local distributed resources…"[10]. The analytical approach described below sets out an economic evaluation approach for the different alternatives and provides more detailed steps to represent the above framework.

II. Analytical Approach

The analytical approach envisioned contains six elements, some of which require input and discussion from stakeholders, and some of which are more directly determined from existing data. ***Phrases in bold italics note particularly complex/important areas:***

1. Obtain load data from PREPA and stakeholders (both public data and data subject to confidential treatment).

   - Peak load and energy needs, hourly patterns, load factor of critical and less critical load.
   - Define and identify aggregations where reasonable (*i.e.*, combination of specific customers (identity masked), and aggregations of customer classes).

2. Further identify, segment, aggregate, and characterize customers and loads (Table 1)

   - Essential facility indication and classification.
   - By size (kW or MW peak demand, and kWh consumption patterns), and by criticality of load.
   - By location (MiniGrid region, feeder, substation, nearest transmission point).
   - By need. ***Determine resiliency needs (MW, MWh) by estimating what portion of load service (all, or partial) would meet minimum requirements for essential facilities***. Consider the practicalities of whether "non-critical" load is reasonably assumed to be part of overall need. Also requires information on what self-supply or microgrid solutions are already installed (e.g. backup generators, storage, renewables).
   - ***Identify the value of lost load (VOLL) for these customers to be used in optimization, possibly by tier*** (*e.g.,* retaining service to some minimum load is very valuable; additional load service is less critical). Consider which

[10] IRP Order, p. 19, ¶ 117.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

starting point VOLL levels are sensible, and how VOLL levels should vary based on marginal effects (e.g., the value of the last kWh of lost load at an essential facility may be much lower than the value of the first kWh of lost load; conversely, the value of the first kWh of lost load at a non-critical facility (e.g., a residence) may still be high enough to merit some level of PREPA support for a targeted resiliency solution).

3. Obtain/determine MiniGrid region transmission cost data and determine costs to serve load with the MiniGrid approach.

4.

- Determine transmission costs ***for specific MiniGrid enhancements (IRP data), by segment and by ability to serve load.***
- Map MiniGrid transmission to essential facility / customer loads (allocation of costs across customers served by MiniGrid)
- Determine load density metrics (e.g., Peak MW/mile by feeder)
- ***Determine distance from grid and related threshold parameters for identified load.***

5. Obtain data/determine estimate of distributed resiliency resource costs and determine the costs to serve load with a distributed resiliency approach.

- Use and refine the Sandia National Labs (Sandia)/Rocky Mountain Institute (RMI) approach,[11] and use standard sources (National Renewable Energy Lab (NREL), Lazard)[12] for the costs of large-scale deployment of microgrids to all appropriate critical load – by more comprehensive assessment of required deployments.
- Estimate stand-alone resiliency (not microgrid) costs and coverage, average basis (*e.g*., costs and coverage for one residence).
- Use a complete distributed resiliency approach by expanding costs and coverage for distributed resiliency beyond microgrid points and adding stand-alone site coverage.
- Determine how to consider Photovoltaic (PV)/Battery Energy Storage (BESS), and other existing DG in all DER analyses.
- Consider self-supply options and participation by customers in any PREPA demand response programs as part of cost determination.

[11] IRP Order, pp. 215-216, ¶¶ 698-699 and pp. 225-226, ¶¶731-732 (Sandia); p. 219, ¶ 709 (RMI); and in footnote 1035.

[12] These industry standard sources for renewable energy and battery storage were used and referenced by PREPA and other stakeholders during the IRP proceeding.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

6. Avoided transmission cost determination

- ***Determine average or specific transmission cost avoidance when considering use of distributed resiliency solution for a set of customers that would otherwise require incremental transmission.***

7. Formulate the detailed economic comparison construct: simple, but not oversimplified:

- Synthesize the first five steps above.
- Perform a backstop computation: Directly compare a full distributed solution to a full MiniGrid transmission solution for a region.
- Define metrics for the optimization exercise – valuation of Microgrids (MG) and DER solutions.
    - ***E.g., avg. cost per MW/MWh, critical load served (MG and DG approaches).***
    - Determine if and how to place a premium value on resources that can be deployed rapidly for resiliency solutions.
    - Other – to be determined after responses to Appendix B and Appendix C questions and during the workshops.
- Core outcome: Matrix of facilities to be made resilient – define aggregate load needs by grouping with costs for MiniGrid vs. distributed solutions (Table 1 as anchor matrix).
- Include:
    - Definition of feeder load densities (*e.g*. MW/mile) to help allocate different critical loads to different groupings.
    - Identification of one-off priority transmission hardening needs (urban clusters).
    - Identification and quantification of the class of critical load needing distributed resiliency (isolated loads far from transmission).

Determining the optimal mix of resiliency investment will require comparing the costs of different solutions for the load or set of loads whose electricity delivery, or onsite electric service provision will be made more resilient.

Table 1 below illustrates one possible form of outcome of the steps above. To optimize wires expenditures, the Energy Bureau must first identify and define the critical load service across customer classes and respecting both the size and location of that load. After identifying the loads, the costs of potential solutions will be determined, if and as applicable. Next, the costs across those solutions will be compared to see if microgrid or related single site solutions are preferable to serving those loads through a reinforced, hardened MiniGrid network.

NEPR
NEGOCIADO DE ENERGÍA DE PUERTO RICO
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

The "default form of service" listed in Table 1 attempts to estimate what the most reasonable resiliency provision path would be for the essential facilities in question.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

Table 1. Illustrative Matrix of Essential Facility Groupings, Characteristics, and Initial Considerations for Resiliency – and Format for Outcomes

San Juan / Bayamón							**Comparison Metrics and Outcomes – MiniGrid (MG) and microgrid/DER Solutions**			
Essential Facility Category	**Customer Type**	**Example: Peak Load of Essential Facility Category**	**Example: Energy % of normal for resiliency**	**Comment**	**Default form of service for resilience**	**Total load served by solution**	**Cost – MiniGrid**	**Cost – Microgrid/DER**	**Cost of Resiliency ($/MWh) MiniGrid**	**Cost of Resiliency ($/MWh) DER**
1 – Very Large/ Critical Loads	Airports, Large Hospitals, Major PRASA (water/sewer)	5-10 MW	Actual load factor (100% of all load)	Site specific, customized solution, highly critical infrastructure	MiniGrid connected					NA
2 – Large	Hospitals, nursing homes, large pumping stations, arenas, military installations, government buildings serving essential services	1-5 MW	50-100%	Site specific, customized solution, highly critical infrastructure but not optimally located for MiniGrid	Minigrid connected or Microgrid					
3 – Medium/ Large	Fire, police, water/sewer pumping, large town centers	250-1000 kW	50-100%	Opportunistic connection to Minigrid if <1 mile away	Microgrid or stand-alone					
4 – Medium/ Small	Small town centers/dense residential areas	50-250 kW	25-50%	Opportunistic connection to Minigrid/microgrid if < ½ mile away	Stand-alone					
5 – Small	Grocery store/gas stations	5-50 kW	25-50%	PV/BESS/IC units	Stand-alone PPOA/FIT/DR					
6 – Very Small	Telecommunications towers	<5 kW	100%	PV/BESS/Integrated Circuit (IC) units	Stand-alone PPOA/FIT/DR					
7 - Other	Residences, other single sites	<10 kW	25-50%	PV/BESS	NEM/DR					

Notes: "Default forms of service for resilience" is an initial estimate of the primary form of service likely to provide resiliency for the Essential Facility Category listed. For any given Category, multiple resilience solutions may be in place across different facilities, depending on circumstances.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

III. Additional Discussion of Analytical Approach

The analytical approach the Energy Bureau envisions would start with identifying and defining customers and customer classes, and the expected critical load levels and resiliency needs across that load. This will require a sufficiently detailed understanding of the nature, load magnitude, and location of at least essential facilities, as they are categorized in Act 17-2019 and by PREPA:

- Act 17-2019: "Essential Service Facilities": Shall mean health facilities, police and armed forces stations, fire stations, emergency management offices, emergency shelters, prisons, ports, airports, telecommunications facilities, water supply and waste water treatment facilities, educational institutions, and any other facility designated by the Energy Bureau as an "Essential Service Facility" through regulations.[13]

- PREPA: In response to ROI 2-9 (a), PREPA indicated its modeling considers critical load at the following locations:
  - Police stations
  - Firefighter stations
  - Airports and piers
  - Schools used as refuge during emergencies v
  - Telecommunications towers
  - Nursing homes
  - Emergency management and operation centers
  - Puerto Rico Aqueduct and Sewer Authority (PRASA) infrastructure (i.e. water treatment plants and water pumps)
  - PREPA technical district infrastructure
  - Town halls where people can get services (food, water, medical treatment, etc.)
  - Some commercial centers where people can get supplies (water, food, etc.)

  PREPA characterized priority loads for these types of buildings:
  - Commercial buildings
  - Industrial buildings
  - High-density residential areas
  - Federal and governmental agencies

Establishing this foundation will require data similar to that provided in confidential attachments (responses to Energy Bureau ROI 2-9(e)) from the IRP, which for each region listed the feeder, load level, identification (critical or priority), and commentary on the type of load for connected critical and priority loads. Maps provided by PREPA in the confidential portion of Appendix 1 to the IRP filing also illustrated the location of such loads with respect to the transmission system. This foundational structure for load segmentation would need to be determined first for the San Juan and Bayamón region in total, for all "essential facilities", and eventually for the other regions.

[13] Section 1.2(h), Act 17-2019.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

The Energy Bureau will consider drawing on further resources to identify or define potential critical or priority loads, such as requests for information to stakeholders and municipal governments, and initially asks for such information in Appendix C to this Resolution and Order.

Note that the level of detail that PREPA has presented to date may not be sufficient, but it could serve as a useful starting point. For example, there is no information provided on the actual energy needs at these facilities (*e.g.*, does resilient service provision require service to 100% of the load at this location?), nor is any information available on the extent to which distributed resources (*e.g.,* emergency generation, PV, batteries) already exists at some of these facilities. Other data sources could supplement these data. However, even in this initial form, the data could be sorted by load size, or by common feeder, or other locational characteristics, to determine the extent of relative critical load density for a given feeder or group of feeders, and the relative importance of upstream substations or transmission lines used to serve these loads.

Other data immediately available from PREPA includes a listing of potential microgrid location options (although these data are not inclusive of all microgrid potential), from the Appendix 1 of the IRP, and summary peak load balances across all MiniGrid regions, including the share of load PREPA considers as potential for microgrid application. These data are shown in Tables 2 and 3 below.

Table 2. Microgrid Opportunities – San Juan – PREPA Exhibit 2-4 - MW

MiniGrid	Microgrid Name	Critical	Priority	Balance	Total
San Juan	CARRAIZO	1.8	0.0	10.7	12.5
	NARANJITO	6.6	0.2	6.1	12.8
	PINAS	4.4	0.0	11.6	16.0
	UNIBON	0.0	3.2	5.3	8.5
	VILLA BETINA	3.9	7.0	15.2	26.1
	QUEBRADA NEGRITO	0.0	0.0	4.5	4.5
	COROZAL	6.0	2.7	0.0	8.7
San Juan Total		**22.8**	**13.0**	**53.3**	**89.1**

NEGOCIADO DE ENERGÍA DE PUERTO RICO
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

Table 3: Data collections from Appendix 1 (Redacted Version), Exhibit 2-2 (2019 Deemed Critical/Priority/Balance Load) and Exhibit 2-5 (2019 MiniGrid/Microgrid Night Peak Load)

Exhibit 2-2: 2019 Deemed Critical/Priority/Balance Load*

2019 Critical/Priority/Balance Night Peak Load , MW							
MiniGrid	Total Load	Critical	Priority	Balance	% Critical	% Priority	% Balance
Arecibo	234.2	117.2	60.6	56.4	50%	26%	24%
Caguas	306.7	128.2	74.4	104.1	42%	24%	34%
Carolina	310.8	132.9	33.7	144.2	43%	11%	46%
Cayey	101.1	59.7	29.9	11.5	59%	30%	11%
Mayaguez North	163.5	85.1	7.5	70.9	52%	5%	43%
Mayaguez South	161.7	110.4	9.7	41.6	68%	6%	26%
Ponce	332.3	144.2	79.2	108.9	43%	24%	33%
San Juan	1050.7	399.0	185.0	466.7	38%	18%	44%
Total	**2660.9**	**1176.7**	**480.0**	**1004.2**	**44%**	**18%**	**38%**

Reference: IRP_19_Substation_LoadProcessing_Final.xlsx

Exhibit 2-5: 2019 MiniGrid/Microgrid Night Peak Load, MW

2019 MiniGrid/Microgrid Night Peak Load, MW					
MiniGrid	Total	MiniGrid Connected	Microgrid Connected	% MiniGrid	% Microgrid
Arecibo	234.2	168.7	65.5	72%	28%
Caguas	306.7	271.7	35.1	89%	11%
Carolina	310.8	296.6	14.1	95%	5%
Cayey	101.1	59.9	41.2	59%	41%
Mayaguez North	163.5	139.2	24.3	85%	15%
Mayaguez South	161.7	140.2	21.5	87%	13%
Ponce	332.3	285.7	46.5	86%	14%
San Juan	1050.7	961.6	89.1	92%	8%
Total	**2660.9**	**2323.6**	**337.3**	**87%**	**13%**

Reference: IRP_19_Substation_LoadProcessing_Final.xlsx

We note that using solely "critical, priority, and balance" loading designations for an entire customer site, or an entire feeder, may not be sufficiently determinative for what needs to be analyzed. Some of the load at these locations may not be truly "critical" and depending on the nature of the site and the customer, and the importance of the end use, a much smaller level of critical load may be better defined for the purpose of determining if it needs to be served as part of a MiniGrid arrangement or might be more cost-effectively served with a stand-alone or microgrid resource.

Based on these data, the entirety of "critical" and "priority" load locations within the San Juan-Bayamón region could be identified and grouped according to overall size and/or criticality, to serve as a starting point for characterizing the need to be served by some combination of transmission or distributed resource deployment. Table 1 above outlines what this could look like. It illustrates "groupings" of facilities for which resilience solutions are needed.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

Preliminary/Draft Agenda for First Technical Workshop (January 2021, Virtual)

An initial agenda for the first technical workshop (2 days) is itemized below. After receiving and reviewing comments, the Energy Bureau will finalize the agenda and post a workshop notice.

Day 1.

Agenda Item	Time	Presenter	Notes
Introduction	09:15	Facilitator	Summary of purpose / background
Presentation on Analytical Approach	09:30	Bureau staff / consultants	Overview - process and analytical substance
Discussion Session – Approach	~10:00	All – facilitated	
Presentation on Load / Segmentation	11:00	Bureau staff / consultants	Critical, priority, balance loads - identify resilience needs
Discussion Session – Load / Segmentation	~11:30	All – facilitated	
Break	12:30		
Presentation on MG Transmission elements	1:00	Bureau staff / consultants and PREPA	Overview – Exh. 2-85 to 2-94 (IRP, Appendix 1) as basis
Discussion Session – Transmission	~1:30	All – facilitated	
Presentation on DER Options	2:30	Bureau staff / consultants/ stakeholders / PREPA	TBD – based on comments rec'd Backstop: Sandia, RMI
Discussion Session – DER Options	~3:00	All – facilitated	
Wrap Up – Day 1	4:00	Bureau staff / consultants	

Day 2.

Agenda Item	Time	Presenter	Notes
Recap Day 1	09:30	Facilitator / Bureau staff / consultants	
Discussion – Day 1 Observations	~10:00	All – facilitated	
Guiding Principles for Optimization	11:00	Bureau staff / consultants	From Appendix B, C responses
Discussion – Guiding Principles	~11:30	All – facilitated	
Break	12:30		
Presentation: Cost Effectiveness Metrics	1:00	Bureau staff / consultants	Criteria for resiliency solutions
Discussion – Metrics	~1:30	All – facilitated	
DER placeholder – resiliency value	2:30	Bureau staff / consultants / stakeholders / PREPA	How to procure DER as a resiliency solution; cost
Discussion – DER value	~3:00	All – facilitated	
Wrap Up – Day 2	4:00		

NEGOCIADO DE ENERGÍA DE PUERTO RICO
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

Identification of Issue Areas

The Energy Bureau identifies below issues that need to be addressed (and/or are currently addressed in the draft approach) as part of the final analytical construct.

- Define resiliency, what it means, and how to characterize it quantitatively for Puerto Rico.
- *Pro forma* means to speed up deployment and support investments in microgrids (multiple sites or single-site) for essential facilities in areas easily identified as prime candidates for a microgrid approach.
- Construction of a least cost optimization analytical approach across T, D, and installed resources.
- Understand the extent of interaction between IDSP efforts and hosting capacity considerations and the analytical approach identified above for transmission system / DER deployment optimization.
- Marginal costs for new transmission.
- Marginal costs for new distribution.
- Avoided transmission costs – DER effects.
- Avoided distribution costs – DER effects.
- Load characterization for purposes of optimization:
    - Customer segmentation
    - Types of load: Critical load, priority, balance of load
    - Energy and peak demands by day, by day-type (weekend vs. weekday), by season
- Role of vegetation management as part of expenditures to improve resiliency, and how it is considered in this proceeding.

Overlap with Other Initiatives

The Energy Bureau notes that the issues to be addressed in this Optimization Proceeding will overlap with other ongoing proceedings.

- PREPA Procurement Plan
- Demand Response regulations
- Interconnections / microgrid regulations
- Integrated Distribution System Planning
- Effect of EE and DR efforts going forward
- Involvement of LUMA as part of the proceeding

NEGOCIADO DE ENERGÍA DE PUERTO RICO
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

Appendix B
Questions for PREPA

1. The Energy Bureau is proposing an initial segmentation approach to identify at a more granular level categories of "critical", "priority", and potentially "balance" load that are potential candidates for distributed resiliency provided by either on-site distributed generation and storage, or load served by a microgrid.

    a. PREPA's response to Energy Bureau ROI 2-9 (e) provided in Excel format critical and priority load data, by region, transmission line source, substation, and feeder. Provide any additional information PREPA has on the classification of these loads to the Essential Facility categories as listed in PREPA's response to Energy Bureau ROI 2-9 (a).

    b. Confirm that all critical and priority load in Puerto Rico is connected to PREPA's system at distribution / feeder voltages; or explain and provide data indicating the type and voltage of interconnection to PREPA's grid.

    c. Provide an Excel file with peak MW consumption summaries by feeder of the connected critical load and priority load.

    d. Provide any data PREPA has on the distance between critical load as located on feeders, and the source substations supplying those feeders.

    e. What additional data does PREPA have on critical and priority loads that would help to segment such load as part of the Optimization Proceeding? Provide such data in Excel format.

2. The proposed analytical approach in Appendix A indicates a need to determine transmission costs for specific components of MiniGrid enhancements. The confidential file entitled "MiniGrids CapEx Summary_wPriority_Final.xls" was provided as part of the filed IRP workpapers. The costs in total for the MiniGrid, included in the non-confidential portion of Appendix 1 (*e.g.,* Exhibits 2-85 through 2-93), summarize the total cost of all MiniGrid elements.

    a. Is this underlying data source still valid as an estimate of the costs of the transmission components of the MiniGrid approach?

    b. Provide any additional data on transmission cost components associated with the MiniGrid approach, if applicable.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

3. How would PREPA propose to estimate the value of avoiding MiniGrid transmission costs to a collective set of DER resources providing distributed resiliency? Provide as much specificity in your response as possible, including the specification of which underlying data is required to calculate an avoided cost, and an example of such a computation.

4. The proposed analytical approach in Appendix A includes (as Table 1) an illustration of the load segmentation approach under consideration by the Energy Bureau. Provide critiques, suggestions, and a technical opinion on the structure and possible metrics to use to produce a load segmentation approach appropriate for Puerto Rico.

5. Provide the current status of the availability, eligibility criteria, and disbursement of FEMA or other federal agency funding for transmission investments.

6. Provide the current status of the availability, eligibility criteria, and disbursement of FEMA or other federal agency funding for each of the following utility-scale (connection at or above 38 kV) or distributed resiliency scale (connection below 38 kV) resources addressed as part of the IRP process:

    a. battery energy storage resources (utility scale);

    b. battery energy storage resources (distributed scale);

    c. solar PV (utility scale);

    d. solar PV (distributed scale);

    e. other renewable energy resources (utility scale or distributed scale);

    f. microgrid resources;

    g. utility scale fossil fuel resources;

    h. distributed scale fossil fuel resources.

7. Concerning PREPA's underlying Geographical Information System ("GIS") analysis utilized in developing MiniGrid map Exhibits in the confidential version of Appendix 1 of the filed IRP, provide:

    a. Identify the GIS software and the version used.

    b. Provide the underlying geospatial data files in ESRI shapefile format for all layers shown in all maps.

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

c. Provide the source of all geospatial data files listed in (b) above, and whether any files were edited or developed by PREPA.

d. Provide a description (and the associated units, if/as necessary) of each metadata field/column name for each data file.

8. For the data provided in response to question 7 above:

   a. Identify which data elements PREPA considers to be confidential.

   b. Provide the explicit rationale for treating any such identified element as confidential data.

9. Concerning MiniGrid transmission capital expenditures proposed as part of the MiniGrid approach:

   a. If not already answered as part of question 1 above, how would PREPA propose to determine a ranking of the relative value of specific MiniGrid transmission projects for any MiniGrid region, for those projects likely to be an intrinsic part of providing resiliency for connected critical load, and potentially for priority and other balance load?

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO

Appendix C
Questions for Stakeholders

1. The Energy Bureau is proposing an initial segmentation approach to identify at a more granular level categories of "critical", "priority" and potentially "balance" load that are potential candidates for either on-site distributed generation and storage, or load served by a microgrid. If not already addressed in response to Appendix A to this Resolution and Order:

   a. Provide specific comments on the segmentation approach described in Appendix A, including any alternative listings of potential segmentation by load type or size.

   b. Table 1 in Appendix A illustrates the load segmentation approach under consideration by the Energy Bureau. Provide critiques, suggestions, and a technical opinion on the structure and possible metrics to use to produce a load segmentation approach appropriate for Puerto Rico.

   c. Describe your preferred means to identify the most important critical facilities or essential facilities for which resiliency is required, in general or specifically. If specific facilities are known, please identify those facilities.

   d. If appropriate, provide additional insights on segmentation approaches and the nature, type and cost of distributed generation and storage resources likely available to provide distributed resiliency solutions.

   e. Describe any differences in a segmentation approach that may be needed to account for stand-alone versus multiple-facility or microgrid candidate sites.

2. Please comment on the extent to which renewable resources and battery storage resources alone, or resources that include existing (or potentially new) fossil resources would or should be used as part of distributed resiliency solutions used in stand- alone or microgrid connected distributed resiliency solutions.

3. How would you propose to estimate the value of avoiding MiniGrid transmission costs to a collective set of DER resources providing distributed resiliency? Provide as much specificity in your response as possible, including the specification of which underlying data is required to calculate an avoided cost, and an example of such a computation.

4. Concerning MiniGrid transmission capital expenditures proposed as part of PREPA's MiniGrid approach:

   a. How would you propose to determine a ranking of the relative value of specific MiniGrid transmission projects for any given MiniGrid region, for those projects likely to be an intrinsic part of providing resiliency for connected critical load, and potentially for priority and other balance load?

NEGOCIADO DE ENERGÍA DE PUERTO RICO
NEPR
JUNTA REGLAMENTADORA DE SERVICIO PÚBLICO