

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

IN RE: PUERTO RICO TEST FOR DEMAND
RESPONSE AND ENERGY EFFICIENCY

CASE NO: NEPR-MI-2021-0009

SUBJECT: Notice of Proposed Regulation and
Request for Public Comments

RESOLUTION AND ORDER

I. INTRODUCTION

On May 14, 2021, the Energy Bureau of the Puerto Rico Public Service Regulatory Board ("Energy Bureau") issued a Resolution and Order ("May 14 Resolution") through which it initiated a proceeding to develop a Puerto Rico Benefit-Cost Test ("PR Test") as required by the *Regulation for Demand Response* ("Regulation 9246")¹ and included in the Proposed Regulation for Energy Efficiency² ("Proposed EE Regulation")³.⁴

The PR Test is defined as a cost-effectiveness screening test, reflecting Puerto Rico public policy, and used to evaluate whether, and to what extent, proposed or actual demand response ("DR") programs or initiatives provide greater benefits than their costs.⁵

The Energy Bureau indicated that the *National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources*⁶ ("NSPM") would be used as a guide to develop the PR Test to assess the benefits and costs of future demand response ("DR") and energy efficiency ("EE") programs.

The Energy Bureau sought to obtain stakeholder feedback regarding the specific benefits and costs to be included in the PR Test through a series of four Technical Workshops. On June 16, 2021, the Energy Bureau issued a Resolution ("June 16 Resolution") establishing a schedule for the Technical Workshops.

The Technical Workshops were held over the course of four (4) months, following the five-step process for developing a jurisdiction specific cost-effectiveness test as included in the NSPM. The Technical Workshops focused on the identification of impacts for inclusion in the PR Test. The Technical Workshops did not seek to develop methodologies to quantify and monetize those impacts.

The dates and topics of the four Technical Workshops were as follows:



¹ Regulation 9246, *Regulation for Demand Response*, December 21, 2020.

² Resolution, In Re: *Regulation for Energy Efficiency*, Case No. NEPR-MI-2021-0005, April 22, 2021. The Proposed EE Regulation is available at <https://energia.pr.gov/en/dockets/?docket=nepr-mi-2021-0005>.

³ The Proposed EE Regulation was approved January 5, 2022.

⁴ See Resolution, In re. *Regulation for Energy Efficiency*, Case No. NEPR-MI-2021-00055, January 5, 2022 ("EE Regulation"). Available at: <https://energia.pr.gov/wp-content/uploads/sites/7/2022/01/20220105-MI20210005-Resolution-and-Regulation.pdf>. Last verified February 3, 2022.

⁵ Regulation for Demand Response, December 21, 2020 ("Regulation 9246"), Section 1.09(B)(20).

⁶ National Efficiency Screening Project ("NESP"), *National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources*, Aug. 2020. Available at: https://www.nationalenergyscreeningproject.org/wp-content/uploads/2020/08/NSPM-DERs_08-04-2020_Final.pdf.

Date	Event	Topic
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July 21, 2021	Technical Workshop 2	Identification of utility system impacts.
August 25, 2021	Technical Workshop 3	Identification of non-utility system impacts and overarching considerations including discount rate.
September 22, 2021	Technical Workshop 4	Overview of proposed draft PR Test and discussion of remaining open questions from prior workshops.

LUMA Energy, LLC (“LUMA”) and the Independent Consumer Protection Office (“ICPO”) participated in all four Technical Workshops and provided comments. Additional stakeholders in attendance over the course of the four workshops included the Solar and Energy Storage Association of Puerto Rico, TRC Companies, and Lawrence Berkeley National Laboratory.

At the conclusion of the Technical Workshops, Synapse submitted a report to the Energy Bureau that summarizes each Technical Workshop, stakeholder comments, and recommendations for a PR Test Framework (“Synapse Report”). The Synapse Report is included in this Resolution and Order as Attachment C.

Based on the input gathered from stakeholders as part of the Technical Workshops and the recommendations of the Synapse Report, the Energy Bureau proposes to adopt a PR Test Framework as defined in Attachment A of this Resolution and Order. The Energy Bureau is cognizant of the effort and time it will take to develop the full list of impacts included in the proposed PR Test Framework. Therefore, the Energy Bureau proposes a list of impacts to be included in each application of the PR Test prior to the development and filing of the second Three-Year EE Plan⁷. These priority impacts are identified in Attachment B of this Resolution and Order.

Through this Resolution and Order, the Energy Bureau seeks public comment on its proposed PR Test Framework (Attachment A) and prioritization of impacts (Attachment B).

II. TECHNICAL WORKSHOPS

The Technical Workshops were guided by the NSPM for DERs. The goal of the NSPM is to provide “objective, policy- and technology-neutral, and economically sound guidance” for developing a primary DER cost-effectiveness test (or modifying an existing primary test) and has been vetted by a cross-cutting advisory group consisting of regulators, state agencies, utilities, expert consultants, and representatives from the DER industry.⁸

The NSPM for DERs includes a set of eight principles. These principles align with those included in the EE Regulation and were used to guide discussions during the Technical Workshops.

Principle 1: Treat DERs as a Utility System Resource. DERs are one of many energy resources that can be deployed to meet utility/power system needs. DERs should therefore be compared with other energy resources, including other DERs, using

⁷ EE Regulation, Section 4.02.

⁸ NSPM for DERs, pp. 1-3.



consistent methods and assumptions to avoid bias across resource investment decisions.

Principle 2: Align with Policy Goals. Jurisdictions invest in or support energy resources to meet a variety of goals and objectives. The primary cost-effectiveness test should therefore reflect this intent by accounting for the jurisdiction's applicable policy goals and objectives.

Principle 3: Ensure Symmetry. Asymmetrical treatment of benefits and costs associated with a resource can lead to a biased assessment of the resource. To avoid such bias, benefits and costs should be treated symmetrically for any given type of impact.

Principle 4: Account for Relevant, Material Impacts. Cost-effectiveness tests should include all relevant (according to applicable policy goals), material impacts including those that are difficult to quantify or monetize.

Principle 5: Conduct Forward-Looking, Long-term, Incremental Analyses. Cost-effectiveness analyses should be forward-looking, long-term, and incremental to what would have occurred absent the DER. This helps ensure that the resource in question is properly compared with alternatives.

Principle 6: Avoid Double-Counting Impacts. Cost-effectiveness analyses present a risk of double-counting benefits and/or costs. All impacts should therefore be clearly defined and valued to avoid double-counting.

Principle 7: Ensure Transparency. Transparency helps to ensure engagement and trust in the Benefit Cost Analysis ("BCA") process and decisions. BCA practices should therefore be transparent, where all relevant assumptions, methodologies, and results are clearly documented and available for stakeholder review and input.

Principle 8: Conduct BCAs Separately from Rate Impact Analyses. Cost-effectiveness analyses answer fundamentally different questions than rate impact analyses, and therefore should be conducted separately from rate impact analyses.⁹

The Technical Workshops also followed the five-step process recommended for developing a jurisdiction's primary cost-effectiveness test by the NSPM for DERs:

- Step 1. Articulate Applicable Policy Goals.
- Step 2. Include All Utility System Impacts.
- Step 3. Decide Which Non-Utility System Impacts to Include.
- Step 4. Ensure that Benefits and Costs are Properly Addressed.
- Step 5. Establish Comprehensive, Transparent Documentation.

The five steps were discussed over the course of the four Technical Workshops. After each Technical Workshop, stakeholders were encouraged to submit comments to the Energy Bureau on the relevant components of the PR Test discussed at the workshop. The beginning of each Technical Workshop was dedicated to reviewing stakeholder comments and addressing questions from the prior workshop. Attachment C of this Resolution and Order contains a detailed description of each workshop.

III. PROPOSED PUERTO RICO BENEFIT-COST TEST FRAMEWORK

The Proposed PR Test Framework included in Attachment A of this Resolution and Order is based on feedback from stakeholders, Synapse Report, Puerto Rico's applicable policy goals, and the NSPM.

⁹ NSPM for DERs, p. iv.



The proposed PR Test will provide the necessary framework to assess the cost and benefits of PREPA's energy efficiency and demand response programs. While the impetus for the development of the PR Test process was Regulation 9246 and the EE Regulation specific to DR and EE resources, the Energy Bureau finds that the PR Test Framework should be applied to all types of DERs.

All impacts listed in the Proposed PR Test Framework should be included in future benefit-cost assessments of DERs, even those that are difficult to quantify and monetize. The Energy Bureau acknowledges that it will not be feasible to quantify and monetize all proposed impacts in advance of the first Three-Year EE Plan¹⁰ as well as the Potential Study¹¹. Before the first Three-Year EE Plan there will be a two-year Transition Period Plan.¹² During this transition period, programs will not be screened for cost-effectiveness, and therefore the PR Test need not be fully quantified for this purpose. The development of monetized (\$) values for impacts for inclusion in a cost-effectiveness test will depend on the completion of avoided cost studies, evaluations, and research. These will take time and significant funding resources.

There are, however, other means to include impacts and create a comprehensive cost-effectiveness test. Where the costs and benefits cannot be quantified and monetized, the impact can be discussed in a qualitative manner, where the anticipated positive or negative effects of a DER are described. Further, the Energy Bureau's PR Test framework establishes a limited use of adders to allow for non-energy impacts ("NEIs") to be included in the PR Test prior to the completion of the necessary studies. Within Appendix B of this Resolution and Order, the Energy Bureau proposes a list of impacts to be included in the PR Test for the first Three-Year EE Plan and how each should be included in the test.

The Energy Bureau recommends that the PR Test be reviewed and updated as part of the EE Three-Year planning cycle. This may include updates to avoided costs, incorporation of evaluation results, and the commissioning of additional studies to quantify and monetize impacts.

IV. COMMENTS AND PUBLIC PARTICIPATION

The Energy Bureau seeks public comment on the proposed PR Test Framework as included in Attachment A of this Resolution and Order and the prioritization of impacts for inclusion in the use of the PR Test for the Potential Study and the first Three-Year EE Plan as included in Attachment B of this Resolution and Order. The public comments shall be provided, on or before, Monday March 7, 2022. The Energy Bureau **ORDERS** LUMA to file its comment on the same date.

The public and stakeholders may submit its written comments to the Energy Bureau as follows:

- i) include in their title the following: "Comments on proposed PR Test Framework- Case No. NER-MI-2021-0009";
- ii) be addressed to the attention of Edison Avilés Deliz, Chairman;
- iii) be filed by electronic mail at: comentarios@jrsp.pr.gov; through the Energy Bureau's electronic filing tool at: <https://radicacion.energia.pr.gov>; by postal mail addressed to the Puerto Rico Energy Bureau's Clerk's Office, at World Plaza Building, 268 Muñoz Rivera Ave., Suite 202, San Juan, PR 00918-1925; or in person at the Energy Bureau's Clerk's Office, at the referenced address. The hours of operations of the Clerk's Office are Monday through Friday from 8:30 a.m. to 5:30 a.m., excluding holidays.

¹⁰ EE Regulation, Section 4.02.

¹¹ EE Regulation, Section 3.02(B).

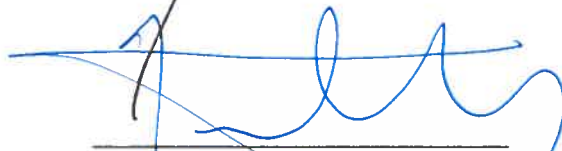
¹² EE Regulation, Art. 2.



Be it notified and published.


Edison Avilés Deliz
Chairman


Lillian Mateo Santos
Associate Commissioner


Ferdinand A. Ramos Soegaard
Associate Commissioner


Sylvia Ugarte Araujo
Associate Commissioner

CERTIFICATION

I hereby certify that the majority of the members of the Puerto Rico Energy Bureau has so agreed on February 7, 2022. Associate Commissioner Ángel R. Rivera de la Cruz did not intervene. I also certify that on February 7, 2022 a copy of this Resolution and Order was notified by electronic mail to the following: margarita.mercado@us.dlapiper.com, kbolanos@diazvaz.law and laura.rozas@us.dlapiper.com. I also certify that today, February 7, 2022, I have proceeded with the filing of the Resolution and Order issued by the Puerto Rico Energy Bureau.

For the record, I sign this in San Juan, Puerto Rico, today February 7, 2022.


Sonia Seda Gaztambide
Clerk



Attachment A: Proposed Puerto Rico Benefit-Cost Test Framework

The Energy Bureau proposes the below Puerto Rico Test (“PR Test”) to determine whether DERs are cost-effective. The PR Test will be used to evaluate whether, and to what extent, proposed or actual DER programs or initiatives provide benefits greater than their costs. Depending on the DER being evaluated and its application, the impact may result in either a cost or a benefit.

Section I of the Framework sets forth a set of definitions used in the PR Test. Section II of the Framework includes the impacts by category to be included in the PR Test and a description of each impact.

I. Definitions

- A) These definitions are to be used for the Puerto Rico Test and are not intended to modify the definitions used in any other Energy Bureau regulation or order.
- B) For the purposes of the Puerto Rico Test, the following terms will have the meaning established below, except when the context of the content of any provision clearly indicates something else:
 - 1) “Distributed Energy Resource” or “DER” means distributed generation, energy storage, microgrids, or any other resource, including but not limited to energy efficiency or demand response, that is connected to the distribution system and that assists in meeting at least one customer’s electrical load.
 - 2) “Host Customer” means a participant in PREPA’s Program that installs a DER at their home or business.
 - 3) “PREPA” means the Puerto Rico Electric Power Authority, a corporate entity created by virtue of Act No. 83 of May 2, 1941, as amended, and any successor distribution, transmission or generation owner or operator. Unless specified otherwise, if PREPA has a successor as the operator of the Transmission and Distribution System that entity shall be the primary entity responsible for performance as “PREPA” under this regulation.
 - 4) “Program” means a collection of defined services and/or measures that are carried out by PREPA and/or its vendors and subcontractors that support the Distributed Energy Resources.
 - 5) “Program Administrator” means PREPA in the role of implementing and delivering DER Programs.
 - 6) “Social Cost of Carbon” or “SCC” means a value in dollars (\$) that attempts to monetize the current and future damages resulting from CO₂ emissions.



II. Proposed Puerto Rico Benefit-Cost Test Impacts

Category	Impact	Description
Utility System Impacts		
Generation	Energy Generation	The production or procurement of energy (i.e., kWh) from generation resources on behalf of customers. Includes the costs associated with the fuel cost and variable operations and maintenance costs. These costs can vary by season and time of day.
	Capacity	The generation capacity (i.e., kW) required to meet the forecasted system peak load.
	Environmental Compliance	Compliance costs associated with environmental regulations; net of those already embedded in Energy Generation.
	Renewable Portfolio Standard Compliance	Compliance cost associated with Puerto Rico’s renewable portfolio standard as defined by the Puerto Rico Energy Public Policy Act.
	Ancillary Services	Services required to maintain electric grid stability and power quality (e.g., frequency regulation, voltage regulation, spinning reserves, and operating reserves).
Transmission	Transmission Capacity	Maintaining the availability of the transmission system to transport electricity safely and reliably. Locational transmission values should be used when feasible.
	Transmission System Losses	Electricity lost through the transmission system.
Distribution	Distribution Costs	Maintaining the availability of the distribution system to transport electricity safely and reliably. Includes capacity, O&M, voltage. Locational values should be used when feasible.
	Distribution System Losses	Electricity lost through the distribution system.
General	Program Incentives	Financial support provided to host customers (participants) or other market actors. May include rebates, upstream payments, interest rate buy-down.
	Program Administration Costs	Costs incurred by PREPA related to the design, implementation, and evaluation DER programs. May include payments to trade allies, technical training, marketing, and payments to third-party consultants.
	Program Administrator Performance Incentives	Incentives offered to PREPA to encourage successful, effective implementation of DER programs.
	Credit and Collection Costs	PREPA’s costs associated with arrearages, disconnections, and reconnections.
	Utility Rate Riders	PREPA’s costs related to “Help to Humans Subsidies” such as low-income rate subsidies and municipal street lighting.
	Risk	Uncertainty including operational, technology, cybersecurity, financial, legal, reputational, and regulatory risks.



	Reliability	Maintaining generation, transmission, and distribution system to withstand instability, uncontrolled events, cascading failures, or unanticipated loss of system components.
	Resilience	The ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.
Host Customer Impacts		
Host Customer Energy Impacts	Host Customer portion of DER costs	Costs incurred to install and operate DERs (net of the incentive received from the Program).
	Interconnection fees	Cost paid by the Host Customer to interconnect DERs to the electric grid.
	Risk	Uncertainty including price volatility, power quality, outages, and operational risk related to failure of installed DER equipment and user error; may depend on the type of DER.
	Reliability	The ability to prevent or reduce the duration of Host Customer outages.
	Resilience	The ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions
	Tax Incentives	Federal, Commonwealth, and local tax incentives provided to host customers to defray the costs of some DERs.
Host Customer Non-Energy Impacts ("NEIs")	Other Fuels and Water	Changes in the consumption of oil, gasoline, propane, natural gas, and water due to the installation of a DER.
	Property Asset Value	Changes in the value of a home or business because of the DER (e.g., increased building value, improved equipment value, extended equipment life).
	Health & Safety	Changes in customer health or safety (e.g., fewer sick days from work or school, reduced medical costs, improved indoor air quality, reduced deaths). Reduced risk of fire and fire-related property damage.
	Empowerment, Satisfaction & Pride	The satisfaction of being able to control one's energy consumption and energy bill and the satisfaction of helping to reduce environmental impacts
	Comfort	Changes in comfort level (e.g., thermal, noise, and lighting impacts).
	Productivity	Changes in a Host Customer's productivity (e.g., changes in labor costs, O&M costs, reduced waste streams, reduced spoilage).
	Low-Income Host Customer NEIs	All the above Host-Customer NEIs in addition to Reduced Home Foreclosures
Societal Impacts		
Societal Impacts	Greenhouse Gas Emissions	Social Cost of Carbon net of greenhouse gas compliance costs already embedded in Energy Generation.
	Other Environmental	Other air emissions, solid waste, land, water and other environmental impacts.



	Economic and Jobs	Incremental economic development and job impacts represented in job-years. Job-years should be quantified but should not be directly included as a monetary value in cost-effectiveness.
	Energy Security	Energy imports and energy independence.



Attachment B: Prioritization of PR Test Impact Development

I. Impact Prioritization for the Potential Study and First Three-Year EE Plan

In this attachment, the Energy Bureau identifies which impacts from the PR Test Framework in Attachment A should be included in the PR Test for the Potential Study and the first Three-Year EE Plan. Within this prioritization, the Energy Bureau seeks to balance a comprehensive cost-effectiveness test with what is reasonably achievable in the near-term.

To achieve this balance, the Energy Bureau identifies each PR Test impact in Table 1 below as follows:

- 1) **Include:** A “Yes” in this column indicates the impact should be included in the PR Test for the Potential Study and the first Three-Year EE Plan. A “No” indicates it is likely too difficult to include the impact in the near-term but does not mean it should not be included in the future.
- 2) **Monetize:** A “Yes” in this column indicates that an impact should be studied to determine a dollar value to represent the impact of a DER for inclusion in the PR Test. A “No” indicates it is likely too difficult in the near-term to determine a monetized value for the impact. In the future it may become possible to develop a monetized value for impacts listed as “No”.
- 3) **Sources:** This column proposes where the value for the impact can be obtained. The sources for impacts will depend on whether they are monetized or not.

1. Monetized Impacts: These impacts can be derived from modeling, a jurisdiction-specific study, or from PREPA/LUMA.

2. Non-Monetized Impacts: These impacts can be included in the PR Test either qualitatively or using an adder.

A qualitative impact is one that is described in writing but is not included as a dollar value within the cost-effectiveness test.

An adder is a percentage that is meant to capture benefits that cannot be monetized. These are commonly used for non-energy impacts.

Table 1. Prioritization of PR Test Impact Development

Category	Impact	Include	Monetize	Sources
Utility System Impacts				
Generation	Energy Generation	Yes	Yes	Modeling
	Capacity	Yes	Yes	Modeling
	Environmental Compliance	Yes	Yes	Modeling
	Renewable Portfolio Standard Compliance	Yes	Yes	Jurisdiction-specific value
	Ancillary Services	Yes	Yes	Modeling
Transmission	Transmission Capacity	Yes	Yes	Jurisdiction-specific value
	Transmission System Losses	Yes	Yes	Jurisdiction-specific value
Distribution	Distribution Costs	Yes	Yes	Jurisdiction-specific value
	Distribution System Losses	Yes	Yes	Jurisdiction-specific value



General	Program Incentives	Yes	Yes	PREPA Plan Filing
	Program Administration Costs	Yes	Yes	PREPA Plan Filing
	Program Administrator Performance Incentives	Yes - if applicable	Yes	PREPA
	Credit and Collection Costs	No	Yes	PREPA
	Utility Rate Riders	No	Yes	PREPA
	Risk	Yes	No	Qualitative
	Reliability	Yes	No	Qualitative
	Resilience	Yes	No	Qualitative
Host Customer Impacts				
Host Customer Energy Impacts	Host customer portion of DER costs	Yes	Yes	Market data or proxy
	Interconnection fees	No	Yes	N/A
	Risk	No	No	N/A
	Reliability	No	No	N/A
	Resilience	No	No	N/A
	Tax Incentives	No	No	N/A
Host Customer Non-Energy Impacts (NEIs)	Other Fuels and Water	Yes	Yes	Jurisdiction-specific value
	Property Asset Value	Yes	No	Adder
	Health & Safety	Yes	No	Adder
	Empowerment, Satisfaction & Pride	Yes	No	Adder
	Comfort	Yes	No	Adder
	Productivity	Yes	No	Adder
	Low-Income Host Customer NEIs	Yes	No	Adder
Societal Impacts				
Societal Impacts	Greenhouse Gas Emissions	Yes	Yes	Social Cost of Carbon
	Other Environmental	Yes	No	Qualitative
	Economic and Jobs	Yes	No	Qualitative
	Energy Security	Yes	No	Qualitative

II. PR Test Components for the Potential Study and First Three-Year EE Plan

1) Discount Rate

- A) Benefits and costs that are projected to occur over time shall be stated in present value terms in the PR Test calculation using a discount rate that appropriately reflects that energy efficiency or demand response is a low-risk resource in terms of cost of capital risk, project risk, and portfolio risk.
- B) The Energy Bureau recommends a discount rate of two percent (2.0%), in real terms, for the PR Test.
- C) A two percent (2.0%) discount rate, in real terms, reflects both the low-risk nature of EE and DR and accounts for the societal focus of the PR Test. This discount rate is reasonable given the typical range of societal discount rates between one percent (1.0%) and three percent (3.0%), in real terms.



2) Social Cost of Carbon

- A) The societal impacts of greenhouse gas emissions should be included in the PR Test as the Social Cost of Carbon ("SCC").
- B) The SCC should be based on Puerto Rico-specific marginal abatement costs to achieve its greenhouse gas reduction goals and should be based on the same discount rate as the PR Test.
- C) Prior to the development of a Puerto Rico-specific value, the Energy Bureau recommends the use of the most recent federal Interagency Working Group on the Social Cost of Greenhouse Gases ("Federal IWG") SCC but calculated with a 2 percent (2.0%) discount rate. On a 15-year levelized basis, this SCC is equal to \$128 per short ton of CO₂-equivalent. This approach mirrors what has been adopted by the New York State Department of Environmental Conservation¹³ and supported by the Avoided Energy Supply Components in New England: 2021 Report.¹⁴

3) Adders

- A) The use of adders is permitted as an interim solution for impacts that are currently too difficult to monetize.
- B) The use of an adder should be specific to the program sector (residential, low-income, commercial, and industrial) and to the DER (EE, DR, storage, solar, electrification, etc.).
- C) The magnitude of the adder should reflect the likely impacts of the DER, accounting for differences across program sectors and rate classes.



¹³ New York State Department of Environmental Conservation. October 2021. Establishing a Value of Carbon: Guidelines for use by State Agencies. Available at: <https://www.dec.ny.gov/regulations/56552.html>.

¹⁴ Synapse Energy Economics, et al. May 2021. Avoided Energy Supply Components in New England: 2021 Report. Prepared for the AESC 2021 Study Group. Available at: <https://www.synapse-energy.com/project/aesc-2021-materials>.

PUERTO RICO BENEFIT-COST TEST

Technical Workshop Summary Report

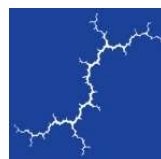
Prepared for the Puerto Rico Energy Bureau

December 15, 2021

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1. INTRODUCTION

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Synapse Energy Economics, Inc. (Synapse) facilitated the Technical Workshops on behalf of the Energy Bureau. LUMA Energy, LLC (LUMA) and the Independent Consumer Protection Office (ICPO) participated in all four Technical Workshops and provided comments. Additional stakeholders in attendance over the course of the four workshops included the Solar and Energy Storage Association of Puerto Rico, TRC Companies, and Lawrence Berkeley National Laboratory.

In this report, Synapse provides a summary of the Technical Workshop process, stakeholder feedback, and recommendations for the PR Test Framework.

2. TECHNICAL WORKSHOPS

2.1. Overview of Process

The Technical Workshops were guided by the NSPM for DERs. The goal of the NSPM is to provide “objective, policy- and technology-neutral, and economically sound guidance” for developing a primary DER cost-effectiveness test (or modifying an existing primary test) and has been vetted by a cross-cutting advisory group consisting of regulators, state agencies, utilities, expert consultants, and representatives from the DER industry.⁵

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⁵ NSPM for DERs, pp. 1-3.



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Principle 6: Avoid Double-Counting Impacts. Cost-effectiveness analyses present a risk of double-counting benefits and/or costs. All impacts should therefore be clearly defined and valued to avoid double-counting.

Principle 7: Ensure Transparency. Transparency helps to ensure engagement and trust in the BCA process and decisions. BCA practices should therefore be transparent, where all relevant assumptions, methodologies, and results are clearly documented and available for stakeholder review and input.

Principle 8: Conduct BCAs Separately from Rate Impact Analyses. Cost-effectiveness analyses answer fundamentally different questions than rate impact analyses, and therefore should be conducted separately from rate impact analyses.⁶

The Technical Workshops also followed the five-step process recommended for developing a jurisdiction's primary cost-effectiveness test by the NSPM for DERs:

- Step 1. Articulate Applicable Policy Goals.
- Step 2. Include All Utility System Impacts.
- Step 3. Decide Which Non-Utility System Impacts to Include.
- Step 4. Ensure that Benefits and Costs are Properly Addressed.
- Step 5. Establish Comprehensive, Transparent Documentation.

The five steps were discussed over the course of the four Technical Workshops. After each Technical Workshop, stakeholders were encouraged to submit comments to the Energy Bureau on the relevant components of the PR Test discussed at the workshop. The beginning of each Technical Workshop was dedicated to reviewing stakeholder comments and addressing questions from the prior workshop.

It is important to note there are two key steps in the development of a jurisdiction-specific test. The first is to identify what impacts should be included in the test, while the second is to develop methodologies to quantify and monetize those impacts. The Technical Workshops focused on the first step of this process. While this process did not focus on specific methodologies, stakeholders discussed recommendations and challenges related to the quantification of impacts that are summarized in the below sections.

Lastly, while the impetus for the development of the PR Test process was Regulation 9246 and the Proposed EE Regulation specific to demand response and energy efficiency resources, the framework developed through the Technical Workshops can and should be applied to all types of DERs.

⁶ NSPM for DERs, p.iv.



2.2. Technical Workshop 1

The first part of this Technical Workshop covered the fundamentals of cost-effectiveness and provided an overview of the NSPM for DERs, including the principles of developing a jurisdiction-specific cost-effectiveness test, and an overview of the five-step process. The second part of this workshop was spent on completing Step 1 of the NSPM process, which is to identify Puerto Rico's applicable policy goals related to DERs. In accordance with Appendix B of the May 14 Resolution, stakeholders were encouraged to submit a list of applicable Puerto Rico policy goals to the Energy Bureau in advance of this workshop. LUMA and ICPO submitted a list of policy goals in advance of this workshop.

The identification of Puerto Rico's policy goals is a critical first step in the development of the PR Test and aligns with Principle 2 of the NSPM for DERs. A jurisdiction's primary cost-effectiveness test should account for its applicable policy goals and objectives. Policy goals can be articulated in many ways, including but not limited to legislation; executive orders; regulations; Energy Bureau guidelines, standards, or orders; integrated resource planning principles and policies; and requirements of other governing agencies within a jurisdiction.

The identification of applicable policy goals helps to inform several aspects of the PR Test. For example, language included within a statute or policy will help to identify which non-utility impacts should be included (e.g., public health and equity) and whether societal benefits should be accounted for (e.g., cost of carbon). This process can also help to determine whether an impact should be considered a utility system impact or a non-utility impact. For example, since resiliency is a key aspect of the Integrated Resource Plan (IRP), it should likely be included as a utility system impact.

Puerto Rico Policy Goals

Table 1 provides a summary of the key policies, statutes, and regulations identified by the stakeholders. The left-hand column lists Puerto Rico policies related to DERs. Each policy is mapped with an "X" to the relevant impact categories identified in each policy.

For example, an excerpt from Act 33-2019 (Puerto Rico Climate Change Mitigation, Adaptation, and Resilience Act) states that the "Act seeks to reduce greenhouse gas emissions, as well as our vulnerability to the impact of climate change. It also promotes and favors a transition to a model that is not dependent on fossil fuels to produce energy. To achieve this, we must eliminate coal-powered electricity generation, transition to a cleaner transportation system, and reduce solid waste disposal, among other initial proposals."⁷ This policy is therefore mapped to the impacts of greenhouse gas (GHG) emissions and other fuels.

⁷ Act 33-2019, p.9.



All of the policy impacts identified in this exercise were considered for inclusion in the PR Test during the subsequent Technical Workshops. Synapse recommends that the Energy Bureau consider this table as an evolving document that can be updated as additional policies are enacted.

Table 1. Puerto Rico Policy Goals

Policy	Policy Impacts Reflected in Policies														
	Resilience	Reliability	GHG Emissions	Other Environmental	Public Health	Economic/Jobs	Energy Security	Host Customer	Low-Income Customer	Price Stability/Low Cost	Other Fuels	Innovation	Equity	Renewable Integration	Education & Awareness
Act 17-2019. Puerto Rico Energy Public Policy Act	X	X	X			X	X	X	X	X		X	X	X	X
Act 57-2014. Puerto Rico Energy Transformation and RELIEF Act			X	X	X		X			X					
Act 33-2019. Climate Change Mitigation, Adaptation, and Resilience Act	X		X	X	X	X				X	X	X	X		
Act 60-2019, as amended. Puerto Rico Incentives Code						X									
Act 114-2007. Electric Power Authority Net Metering Program	X	X					X				X				
Act 120-2018. Puerto Rico Electric Power System Transformation Act										X					
Act 82-2010. Puerto Rico Energy Diversification Policy through Sustainable and Alternative Renewable Energy Act			X	X	X	X		X	X	X	X			X	
Act 218-2008. Light Pollution Control and Prevention Act				X	X										
PREB Regulation No. 9028. Microgrid Development	X	X		X	X	X		X		X		X			

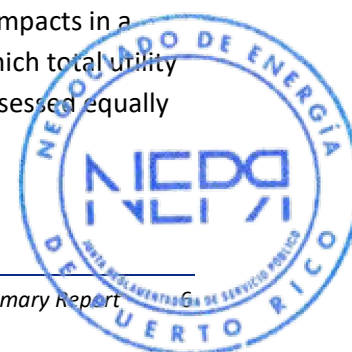


Policy	Policy Impacts Reflected in Policies													
	Resilience	Reliability	GHG Emissions	Other Environmental	Public Health	Economic/Jobs	Energy Security	Host Customer	Low-Income Customer	Price Stability/Low Cost	Other Fuels	Innovation	Equity	Renewable Integration
PREB Regulation No. 9021. Integrated Resource for the Puerto Rico Electric Power Authority (IRP Regulation)	X		X	X										
PREB Regulation 8818. Amendment to Regulation 8653 (CILTA)								X		X				
PREPA Regulation 8915 and 8916. Interconnection and Net Metering	X	X					X	X			X			X
Energy Star – EPA			X	X				X	X					
State Energy Program – PPPE			X	X	X			X	X		X		X	
LEED-USGBC	X		X	X	X	X		X				X		X

2.3. Technical Workshop 2

The second Technical Workshop covered Step 2 of the NSPM for DER process, which is to identify all utility system impacts to be included in the PR Test, including those that are difficult to quantify and monetize. This step aligns with Principle 1, which indicates DERs should be compared consistently with other utility resources, and Principle 4 that states all relevant and material impacts should be included in the cost-effectiveness test.

Utility system impacts are considered those related to the entire energy system that provides services to retail customers. For an electric utility this would include impacts related to the generation, transmission, and distribution of electricity services. Including all relevant utility system impacts in a cost-effectiveness test ensures that the test will, at a minimum, indicate the extent to which total utility system costs will be reduced (or increased) by the DER. This also allows for DERs to be assessed equally with utility system impacts, which can enable optimal utility system investments.



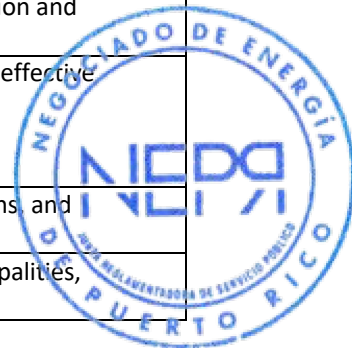
Utility System Impacts

At the end of Technical Workshop 2, the stakeholders reached consensus that the following utility system impacts, summarized in Table 2, should be included in the PR Test framework.

The below impacts are not broken into specific costs and benefits. This is because depending on the DER, in some situations these impacts may represent a cost to the utility system and in some situations a benefit. For example, energy efficiency and distributed generation resources will typically reduce Energy Generation, thereby creating a benefit, while electrification resources will typically increase Electricity Generation, creating a cost. It will be LUMA's responsibility to indicate in a transparent manner whether it treats the below impacts as a benefit or a cost within its benefit-cost assessment of future DER programs.

Table 2. Proposed Utility System Impacts

Category	Impact	Description
Generation	Energy Generation	The production or procurement of energy (kWh) from generation resources on behalf of customers
	Capacity	The generation capacity (kW) required to meet the forecasted system peak load
	Environmental Compliance	Actions to comply with environmental regulations
	Renewable Portfolio Standard Compliance	Actions to comply with renewable portfolio standards or clean energy standards
	Ancillary Services	Services required to maintain electric grid stability and power quality (i.e., frequency regulation, voltage regulation, spinning reserves, and operating reserves)
Transmission	Transmission Capacity	Maintaining the availability of the transmission system to transport electricity safely and reliably
	Transmission System Losses	Electricity lost through the transmission system
Distribution	Distribution Costs	Maintaining the availability of the distribution system to transport electricity safely and reliably; includes capacity, O&M, voltage
	Distribution System Losses	Electricity lost through the distribution system
General	Program Incentives	Utility financial support to host customers (participants) or other market actors; typically includes rebates, upstream payments, interest rate buy-down
	Program Administration Costs	Utility outreach to trade allies, technical training, marketing, payments to third-party consultants, and administration and management of DERs programs
	Program Administrator Performance Incentives	Incentives offered to PREPA to encourage successful, effective implementation of DER programs
	Credit and Collection Costs	Utility costs associated with arrearages, disconnections, and reconnections
	Utility Rate Riders	Utility costs associated providing electricity to municipalities, streetlights, etc.



Category	Impact	Description
	Risk	Uncertainty including operational, technology, cybersecurity, financial, legal, reputational, and regulatory risks
	Reliability	Maintaining generation, transmission, and distribution system to withstand instability, uncontrolled events, cascading failures, or unanticipated loss of system components
	Resilience	The ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions

Summary of Stakeholder Discussion

Energy Generation

This impact includes expenses from the production or procurement of energy (i.e., kWh) from generation resources on behalf of customers. These expenses should include the fuel cost and variable operations and maintenance (O&M) costs. These costs can vary by season and time of day.

Stakeholders indicated there are current environmental regulations that may already be reflected in the cost of generating electricity in Puerto Rico. The IRP provides a list of the regulations that apply to electric generation including the Clean Air Act, Mercury and Air Toxic Standards, and the Clean Water Act.

Generation Capacity

The value for generation capacity should align with what LUMA uses to plan infrastructure investment. Generation capacity value for each DER should be based on whether it is coincident with system peak.

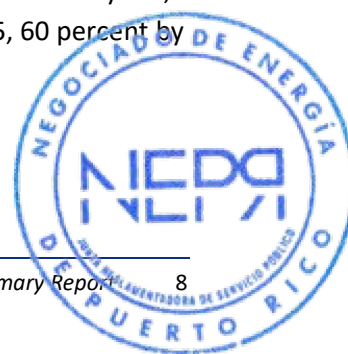
LUMA indicated that its system peak is the coincident peak demand typically for the fiscal year. This typically occurs between August and October between 8 PM and 10 PM.

Environmental Compliance

Electricity generation in Puerto Rico is subject to a variety of environmental regulations that will result in utility system costs and should be included in the PR Test. As indicated above, the costs of some of these are already reflected in the costs of energy. To the extent the cost of compliance with environmental regulations is already embedded in the value of Energy Generation, it should not be included separately here to avoid double-counting.

Renewable Portfolio Standard Compliance

Puerto Rico's renewable portfolio standard (RPS) as defined by the Puerto Rico Energy Public Policy Act, requires that PREPA obtain 40 percent of its electricity from renewable resources by 2025, 60 percent by



2040, and 100 percent by 2050.⁸ The RPS is based on the percentage of electricity load and therefore will create an avoided compliance cost if load is decreased, and an increased cost if load is higher.

According to the analysis in PREPA's approved IRP, the RPS is not a binding constraint between 2019 and 2038. That is, the least-cost electric portfolio exceeds the RPS requirements. This means that, if that result holds in practice, changes in load do not decrease or increase RPS compliance costs. However, stakeholders agreed that this utility system impact should be included even if its value may be zero for some or all years.

Ancillary Services

Ancillary services are those services required to maintain electric grid stability. They typically include frequency regulation, voltage regulation, spinning reserves, and operating reserves. DERs can increase or decrease ancillary service costs, so this can be viewed as a cost or a benefit. There were no stakeholder comments on this impact except that it should be included.

Transmission Capacity

Transmission capacity refers to the availability of the electric transmission system to transport electricity in a safe and reliable manner.

Stakeholders noted that in the near term, transmission investment will not be load-driven as the infrastructure is rebuilt. It is therefore unclear if small changes in load would impact these investment decisions. This creates a situation where the impact of DERs to change transmission capacity costs may be zero in the near term but should still be included as an impact in the PR Test. Stakeholders also agreed that at first it makes sense to start with an island-wide value for transmission capacity but to transition to locational transmission values when feasible.

Transmission System Losses

A portion of all electricity produced at electric generation facilities is lost as it travels across transmission lines. Line losses grow quadratically with higher levels of load, and as such it is important that calculations account for marginal loss rates when determining this impact. Stakeholders agreed this impact should be included. There were no stakeholder comments regarding this impact except that it should be included.

Distribution Costs

Maintaining the availability of the distribution system to transport electricity safely and reliably. This is a combined category that would include the value of DER impacts on distribution capacity, O&M, and voltage support costs.

⁸ Puerto Rico Energy Public Policy Act.



Many of the same points raised with Transmission Capacity were raised by stakeholders for Distribution Costs. Stakeholders agreed that this value should be included even if it is zero in the near term and that when feasible a locational value should be used.

Distribution System Losses

A portion of all electricity produced at electric generation facilities is lost as it travels across the distribution system to the final point of consumption.

Stakeholders indicated that line losses may decrease over time, and this should be considered in the development of this value.

Program Incentives

This impact includes utility financial support provided to DER host customers (participants) or other market actors (e.g., retailers, contractors, distributors, manufacturers, integrators, and aggregators) to encourage DER implementation.

Stakeholders indicated this should be called “Utility Program Incentives” so it is not confused with performance incentives that could be earned by LUMA in the future.

Program Administration Costs

Program administration costs are those incurred by the utility related to the design, implementation, and evaluation of a DER program or initiative. There were no stakeholder comments regarding this impact except that it should be included.

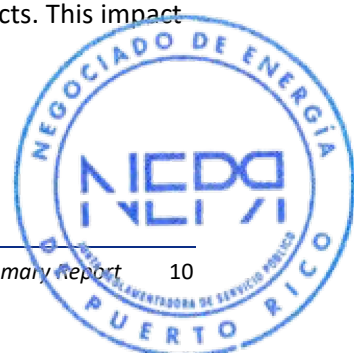
Program Administrator Performance Incentives

This impact represents the maximum value LUMA would be eligible to earn for a performance incentive mechanism (PIM). There were no stakeholder comments regarding this impact except that it should be included.

Credit and Collection Costs

This impact represents costs associated with customers who are deficient on energy bill payments, including notices and support provided to customers in arrears, shutting off service and turning it back on, carrying costs associated with arrears, and writing off bad debt. Utility savings are created when DER programs result in customers being more able to pay their electricity bills, which reduces credit and collection costs.

Stakeholders agreed this should be an impact in the PR Test, but it may not be quantifiable in the near term. LUMA indicated it does not currently have the data needed to quantify these impacts. This impact may need to be addressed qualitatively in the near term.



Utility Rate Riders

This impact relates to the impact that DERs can have on different LUMA riders related to “Help to Humans Subsidies” such as low-income rate subsidies and municipal street lighting.⁹

Stakeholders agreed to include this impact but, similar to credit and collection costs, LUMA finds this may be difficult to monetize in the near term. This impact may need to be addressed qualitatively in the near term.

Risk, Reliability, and Resiliency

Stakeholders discussed these three impacts together. There was agreement that these impacts are important to Puerto Rico and should be included in the PR Test. Stakeholders acknowledged that it is difficult to quantify these impacts to include in a cost-effectiveness test.

Ideas for consideration included using the value of lost load (VOLL) for short-term reliability. However, this would not address long-term outages, which are of key importance. Additional ideas included using the cost of repairing the electric system as a proxy for the avoided future damage cost amortized over time. These impacts may need to be addressed qualitatively or through an adder in the near term.

2.4. Technical Workshop 3

The third Technical Workshop covered Step 3 of the NSPM for DER process, which is to determine the non-utility system impacts to include in the PR Test. This step aligns with Principle 2 that states the jurisdiction-specific cost test should be based on applicable policy goals and Principle 4 that states all relevant and material impacts should be included in the cost-effectiveness test.

Non-utility system impacts include Host Customer Impacts (i.e., program participants), Non-Energy Impacts (NEIs), Low-Income NEIs, Other Fuel and Water Impacts, and Societal Impacts. Whether to include these impacts should be based on Puerto Rico’s policies as identified in Step 1 during the first Technical Workshop.

Host Customer Impacts

The term “host customer” is used to refer to a customer that installs a DER in their home or business. In other words, a participant in LUMA’s energy efficiency and demand response programs. Host Customer Impacts are broken into two categories: energy and non-energy.

At the end of Technical Workshop 3, the stakeholders reached consensus that the following Host Customer Impacts, summarized in Table 3, should be included in the PR Test framework.

⁹ Subsidies classified by the Puerto Rico Energy Bureau (PREB) as Help to Humans per the CEPR-AP-2015-0001 January 10, 2017 Order. Help to Humans Subsidy Rider, Designation: SUBA-HH.



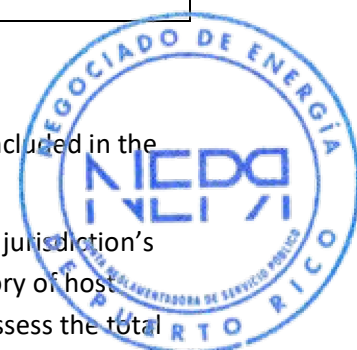
Table 3. Proposed Host Customer Impacts

Category	Impact	Description
Host Customer Energy Impacts	Host Customer Portion of DER Costs	Costs incurred to install and operate DERs (net of the incentive received from the utility program)
	Interconnection Fees	Cost paid by the host customer to interconnect DERs to the electric grid
	Risk	Uncertainty including price volatility, power quality, outages, and operational risk related to failure of installed DER equipment and user error; may depend on the type of DER
	Reliability	The ability to prevent or reduce the duration of host customer outages
	Resilience	The ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions
	Tax Incentives	Federal, Commonwealth, and local tax incentives provided to host customers to defray the costs of some DERs
Host Customer NEIs	Other Fuels and Water	Changes in the consumption of oil, propane, natural gas, and water due to the installation of a DER
	Property Asset Value	Changes in the value of a home or business because of the DER (e.g., increased building value, improved equipment value, extended equipment life)
	Health & Safety	Changes in customer health or safety (e.g., fewer sick days from work or school, reduced medical costs, improved indoor air quality, reduced deaths), reduced risk of fire and fire-related property damage
	Empowerment, Satisfaction, and Pride	The satisfaction of being able to control one's energy consumption and energy bill and the satisfaction of helping to reduce environmental impacts
	Comfort	Changes in comfort level (e.g., thermal, noise, and lighting impacts)
	Productivity	Changes in a customer's productivity (e.g., changes in labor costs, O&M costs, reduced waste streams, reduced spoilage)
	Low-Income NEIs	All the above Host-Customer NEIs in addition to Reduced Home Foreclosures

Summary of Stakeholder Discussion on Host Customer Impacts

There was consensus amongst the stakeholders that Host Customer Impacts should be included in the PR Test.

Whether to include Host Customer Impacts is a policy decision and should be based on a jurisdiction's policy goals. The policy mapping exercise resulted in eight policies mapping to the category of host customer. Further, by including this impact category, the Energy Bureau will be able to assess the total



cost of the DER and the impact of LUMA's programs on all utility customers, both participants and non-participants.

Host Customer Energy Impacts

Stakeholders generally supported the Host Customer Energy Impacts included in Table 3; however, there were concerns regarding the double-counting of certain impacts. Specifically, the impacts of Risk, Reliability, and Resiliency. While stakeholders agreed these are important impacts there was uncertainty as to how these would be incremental to the same impacts listed within Utility System Impacts. Further, stakeholders were unsure how these could be quantified. These impacts will likely need to be addressed qualitatively in the near term.

Host Customer NEIs

DERs can create a variety of NEIs for host customers that are separate from the energy saved or produced. Stakeholders indicated it may be difficult to quantify and monetize many of these NEIs. Jurisdictions will typically conduct an evaluation, often a survey of program participants, to quantify a value for inclusion in a cost-effectiveness test. This type of evaluation can only be conducted after LUMA's energy efficiency and demand response programs are in place for several years.

However, in alignment with Principle 4 of the NSPM for DERs, the PR Test should account for all relevant, material impacts, even those that are difficult to quantify or monetize. In addition, if the PR Test is to include host customer costs, then it must also include host customer benefits—including non-energy benefits—to achieve symmetry as required by Principle 3. This principle requires that cost-effectiveness be symmetrical, where both benefits and costs are included for each relevant type of impact even if difficult to quantify.

The stakeholders discussed whether a proxy multiplier (i.e., percentage increase in overall benefits) or a value from another jurisdiction could be used in the near term to include these NEIs in the PR Test. Based on the fact it would be difficult to find an appropriate proxy for Puerto Rico, the use of an adder was identified as the best approach.

Synapse agrees that a percentage adder is appropriate for the near term, until the time when it is appropriate to conduct an evaluation to develop values for each of these impacts. However, Synapse recommends that any proposed adder be specific to the program sector (residential, low-income, commercial, and industrial) and to the DER (energy efficiency, demand response, storage, solar, electrification, etc.). This recommendation is because the DER being installed will determine whether there will be any NEIs. Likewise, the magnitude of that impact may differ based on the program sector. Synapse also recommends that the choice of adder be well-documented, transparent, and in alignment with those used in other jurisdictions.

Low-Income NEIs

Low-income host customers experience the same categories of NEIs as non-low-income host customers, but the magnitude of the impacts can differ. Due to the often poor condition of low-income housing



stock, the baseline of the customers health, safety, and comfort can vary greatly from that of a non-low-income customer. This leads to greater increases in benefits realized by low-income host customers after the installation of a DER. There are also several NEIs that may be more applicable to low-income host customers such as reduction in home foreclosures.

For these reasons, Synapse recommends that low-income-specific NEIs be developed for low-income DER program offerings.

Other Fuels and Water

Electric utility DER programs can sometimes create decreased or increased consumption of other fuels like oil, propane, or natural gas. The same holds true for impacts on water consumption. Other fuels may also be saved in the future should programs incentivize fuel-switching measures such as moving from a propane to a more efficient electric water heater.

Based on discussions with stakeholders, it appears that the impacts of other fuels and water are applicable in Puerto Rico. Stakeholders indicated that oil and propane are used for water heating and therefore could be impacted by energy efficiency programs targeting this end-use. It was also mentioned that industrial customers may utilize oil, propane, or natural gas to fuel boilers and absorption chillers.

Based on the presence of other fuels within Puerto Rico and the fact they are mapped to Puerto Rico policy goals, stakeholders supported including these impacts in the PR Test.

Societal Impacts

This category captures the impacts of DERs to society, incremental to what may already be embedded in the cost of energy. These impacts are often referred to as externalities. The decision of whether to include Societal Impacts should be based on Puerto Rico's policy goals.

At the end of Technical Workshop 3, the stakeholders reached consensus that the following societal impacts, summarized in Table 4, should be included in the PR Test framework.

Table 4. Proposed Societal Impacts

Category	Impact	Description
Societal Impacts	GHG Emissions (i.e., social cost of carbon, or SCC)	GHG emissions created by fossil-fueled energy resources
	Other Environmental	Other air emissions, solid waste, land, water, and other environmental impacts
	Economic and Jobs	Incremental economic development and job impacts
	Energy Security	Energy imports and energy independence



Summary of Stakeholder Discussion on Societal Impacts

GHG Emissions

Stakeholders agreed that GHG Emissions should be included as a Societal Impact. This was based on the policy goals of Puerto Rico. As indicated in Table 1, a total of eight policies were mapped to the category of GHG Emissions. These include, most notably, Act 33-2019: the Puerto Rico Climate Change Mitigation, Adaptation, and Resilience Act, and Act 17-2019: the Puerto Rico Energy Public Policy Act.

The value for societal GHG emission impacts could be derived from other jurisdictions that recently calculated an SCC (e.g., New York) or a marginal abatement cost could be calculated based on the cost of meeting the emissions reduction goals of Act 33-2019. The societal GHG emission impacts should be net of any GHG compliance costs already embedded in the cost of electricity service.

Other Environmental

Stakeholders agreed that Other Environmental impacts should be included as a Societal Impact. This was based on the policy goals of Puerto Rico. As indicated in Table 1, a total of nine policies were mapped to the category of “Other Environmental.”

This impact is defined as air emissions, solid waste, land, water, and other environmental impacts that are not already embedded in the cost of electricity service. These impacts are not associated with the cost to comply with existing regulations. Such impacts would already be included in either the utility system impact of environmental compliance or embedded in the cost of energy generation. The societal other environmental impacts should reflect the non-embedded value or externality.

Stakeholders indicated that while this is an appropriate impact to include in the PR Test, it was not clear how this could be quantified or monetized in the near term. It is likely this impact should be addressed qualitatively, at least in the near term.

Economic and Jobs

Stakeholders agreed that Economic and Jobs impacts should be included as a Societal Impact. This was based on the policy goals of Puerto Rico. As indicated in Table 1, a total of six policies mapped to the category of Economic and Jobs. Investment in DERs can impact the economy in several ways including job creation, impacts to the supply chain and support industries, and changes in spending on goods and services from decreased energy bills.

While stakeholders agreed this impact should be included, there was acknowledgement that it can be difficult to quantify and monetize.

The NSPM for DERs states that economic development can be shown as changes to employment (in job-years), gross domestic product (in \$), personal income (in \$), or state tax revenues (in \$).¹⁰ The

¹⁰ NSPM for DERs, p.4-22.



economic indicators are interrelated and cannot be added together. Synapse recommends that the number of job-years be used, because job growth is easily understood and relatively easy to isolate from the other indicators.

However, Synapse recommends that the metric of job-years be presented separately, alongside the results of the PR Test. Economic impacts should not be added to the monetary cost-effectiveness analysis results, because they represent a different type of economic impact. The economic development benefits represent economic activity in the area, which are different from the customer and societal impacts included in a DER cost-effectiveness test.

Energy Security

Stakeholders agreed that Energy Security impacts should be included as a Societal Impact. This was based on the policy goals of Puerto Rico. As indicated in Table 1, a total of four policies mapped to the category of Energy Security. DERs can help lead to less dependence on energy imports and enhance the goals of energy independence and security.

It is important to note that there could be potential overlap between this impact and the utility system impacts of Reliability and Risk and care should be taken to avoid double-counting.

While stakeholders agreed this impact should be included in the PR Test, it may be difficult to quantify and monetize. For this reason, stakeholders agreed it should likely be addressed qualitatively in the near term.

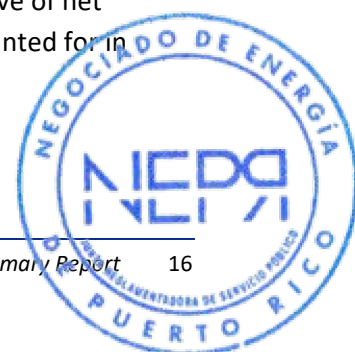
2.5. Technical Workshop 4

The final Technical Workshop focused on the remaining aspects of developing a cost-effectiveness framework. This included the analysis period, assessment level, free ridership and spillover, and the discount rate. Prior to this workshop, Stakeholders were also asked to prioritize which impacts in the draft PR Test framework should be studied and quantified for use in the first application of the cost-effectiveness test.

Analysis Period, Free Ridership, and Assessment Level

The Proposed EE Regulation already defines several of these factors. Section 5.02 includes requirements for the analysis period and the application of free ridership and spillover as follows:

- Analysis period: the number of years over which cost-effectiveness is assessed shall be long enough to capture the full stream of costs and benefits associated with the life of the suite of measures.
- Free Ridership and Spillover: benefits included in the PR Test shall be reflective of net resource impacts. As such, Free Ridership and Spillover effects shall be accounted for in cost-effectiveness calculations.



Section 5.03 includes the requirements for the assessment level, stating that the primary assessment level for plans shall be at the portfolio level.

Stakeholders did not have specific comments on these aspects of the PR Test. Synapse supports the definitions for these factor as included in the Proposed EE Regulation.

Discount Rate

Section 5.02 of the Proposed EE Regulation also provides guidance on the development of a discount rate for use in the PR Test:

“Benefits and costs that are projected to occur over time shall be stated in present value terms in the PR Test calculation using a discount rate that appropriately reflects that energy efficiency or demand response is a low-risk resource in terms of cost of capital risk, project risk, and portfolio risk. The discount rate shall be reviewed and updated in the Energy Efficiency Plans, as appropriate, to ensure that the applied discount rate is based on the most recent information available.”¹¹

While the Proposed EE Regulation indicates that the discount rate should reflect the low risk of energy efficiency and demand response resources, it does not define a specific value.

Discount rates related to low risk, typically fall into the following three categories:

- Societal: 0 percent to 3 percent, in real terms
- Risk-Free: 1 percent to 3 percent, in real terms,
- Risk-Adjusted: 1 percent to 5 percent, in real terms

The choice of discount rate should be based upon Puerto Rico’s applicable policy goals as identified in Table 1. A lower discount rate would give more weight to long-term benefits, while a higher discount rate would value near-term benefits more.

The stakeholders discussed the choice of discount rate to be used in the PR Test but did not reach consensus. LUMA indicated that it would like to see a middle ground to account for near-term need to achieve savings and focus on longer-term savings, whereas ICPO expressed wanting to focus on longer-term savings with a low discount rate.

Synapse recommends that the Energy Bureau adopt a societal discount rate for the PR Test of 2 percent, in real terms. There are several reasons for this recommendation. First, the proposed PR Test Framework is essentially a Societal Cost Test and therefore should use a societal discount rate. The second reason is that PREPA’s source of capital is bonds, which generally have a lower interest rate (once PREPA emerges from bankruptcy). Lastly, Puerto Rico has significant long-term energy efficiency, renewable, and climate goals, which indicates that DER impacts occurring in the later years of the analysis period are important.

¹¹ Proposed EE Regulation, Section 5.02(G).



Prioritization of the Quantification of Impacts

Synapse anticipates the first application of the PR Test will be the Potential Study, followed by the first Three-Year Plan for Years 2024 through 2027. Section 3.02(B) of the Proposed EE Regulation states the Energy Bureau shall contract with consultants to conduct a potential study within four months after the completion of the process defining the PR Test. While all identified impacts should be included in the PR Test, it is not feasible to develop values for every impact in advance of the Potential Study. The development of quantifiable and monetizable impacts for inclusion in a cost-effectiveness test will depend on the completion of avoided cost studies, evaluations, and research. These will take time and significant funding resources. Therefore, it is important to prioritize where to focus these efforts. In the near term, impacts that are anticipated to have the largest effect on cost-effectiveness and are significant to Puerto Rico's energy policy should be studied first.

For this reason, Synapse asked stakeholders to rank the impact within the proposed PR Test by the following metrics:

- Potential magnitude: ranking which impacts may have the largest effects on cost-effectiveness.
- Challenge in developing impact: the level of difficulty involved in quantifying and monetizing the impact.
- Priority: the importance of the impact to Puerto Rico.

While this exercise is helpful in prioritizing which impacts should be studied and quantified first, it does not indicate that the hard-to-quantify impacts should be ignored. In accordance with Principle 4 of the NSMP for DERs, a jurisdiction-specific cost-effectiveness test should account for all relevant, material impacts, including those that are difficult to quantify or monetize. Impacts that cannot be quantified and monetized in the near term should be addressed through use of an adder or described qualitatively. Appendix A includes the results of this ranking.

Because only two stakeholders (LUMA and ICPO) completed the prioritization exercise, it is difficult to draw a clear conclusion regarding stakeholder consensus. Therefore, Synapse provides its recommendations for the treatment of each impact in the first iteration of the PR Test in Table 5 below.

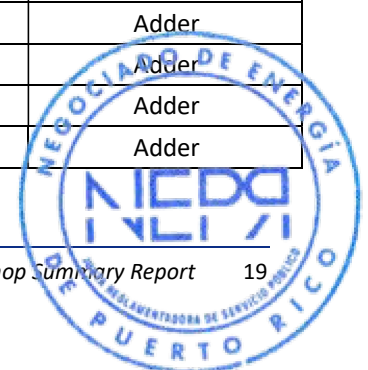
3. PROPOSED PR TEST FRAMEWORK

Based on feedback from stakeholders, Puerto Rico's applicable policy goals, and the NSPM for DERs, Synapse recommends that the Energy Bureau adopt a PR Test Framework as summarized in Table 5 and as defined in the previous sections. For each impact listed below, Synapse provides its recommendation for whether the impact should be included in the first application of the PR Test and whether the impacts should be quantified and monetized, addressed through an adder, or discussed qualitatively.



Table 5. Proposed PR Test Framework

Category	Impact	Include in First Application	Monetize in First Application	Method for First Application
Utility System Impacts				
Generation	Energy Generation	Yes	Yes	Avoided Cost Study
	Capacity	Yes	Yes	Avoided Cost Study
	Environmental Compliance	Yes	Yes	Avoided Cost Study
	Renewable Portfolio Standard Compliance	Yes	Yes	Jurisdiction-specific value needed
	Ancillary Services	Yes	Yes	Jurisdiction-specific value needed
Transmission	Transmission Capacity	Yes	Yes	Jurisdiction-specific value needed
	Transmission System Losses	Yes	Yes	Jurisdiction-specific value needed
Distribution	Distribution Costs	Yes	Yes	Jurisdiction-specific value needed
	Distribution System Losses	Yes	Yes	Jurisdiction-specific value needed
General	Program Incentives	Yes	Yes	LUMA Plan Filing
	Program Administration Costs	Yes	Yes	LUMA Plan Filing
	Program Administrator Performance Incentives	Yes - if applicable	Yes	LUMA Plan Filing
	Credit and Collection Costs	No	Yes	Supplied by LUMA pending data availability
	Utility Rate Riders	No	Yes	Supplied by LUMA pending data availability
	Risk	Yes	No	Qualitative
	Reliability	Yes	No	Qualitative
	Resilience	Yes	No	Qualitative
Host Customer Impacts				
Host Customer Energy Impacts	Host Customer Portion of DER Costs	Yes	Yes	Market data or proxy
	Interconnection Fees	No	Yes	N/A
	Risk	No	No	N/A
	Reliability	No	No	N/A
	Resilience	No	No	N/A
	Tax Incentives	No	No	N/A
Host Customer Non-Energy Impacts	Other Fuels and Water	Yes	Yes	Jurisdiction-specific value needed
	Property Asset Value	Yes	No	Adder
	Health & Safety	Yes	No	Adder
	Empowerment, Satisfaction & Pride	Yes	No	Adder
	Comfort	Yes	No	Adder



Category	Impact	Include in First Application	Monetize in First Application	Method for First Application
	Productivity	Yes	No	Adder
	Low-Income Host Customer NEIs	Yes	No	Adder
Societal Impacts				
Societal Impacts	GHG Emissions	Yes	Yes	SCC
	Other Environmental	Yes	No	Qualitative
	Economic and Jobs	Yes	No	Qualitative
	Energy Security	Yes	No	Qualitative

3.1. Societal Impact of GHG Emissions

Synapse recommends the Energy Bureau adopt an SCC to represent the non-embedded societal impacts of GHG Emissions. Several jurisdictions including New York and the New England states have recently refined values for the SCC for use in cost-effectiveness tests that are appropriate for use in the PR Test.

The 2021 *Avoided Energy Supply Components in New England* report (“2021 AESC”) recommended the New England states adopt a 15-year levelized SCC value of \$128 per short ton (in 2021 dollars).¹² However, considering the recent Federal Interagency Working Group (“Federal IWG”) Technical Support Document and request for comments, the 2021 AESC updated its recommendation for the SCC value in a supplemental study. This change was based on the over 17,800 comments from the public between May and June 2021 that expanded the recent literature pertinent to estimating an SCC. The supplemental 2021 AESC recommends a higher SCC value of \$393 per short ton. This value is based on the SCC recommendation issued by the most recent Federal IWG, but is evaluated using a 1 percent discount rate, rather than the 3 percent discount rate recommended by the Federal IWG.¹³

The New York Department of Environmental Conservation also uses the most recent Federal IWG as the starting point for developing its SCC value. However, it applies a 2 percent discount rate that results in a value of approximately \$125 per ton.¹⁴

Synapse recommends that the Energy Bureau seek public comment on which SCC value to use as part of its request for comments on the PR Test.



¹² Synapse Energy Economics, et al. May 2021. *Avoided Energy Supply Components in New England: 2021 Report*. Prepared for the AESC 2021 Study Group. Available at: <https://www.synapse-energy.com/project/aesc-2021-materials>.

¹³ Knight, P. October 2021. *AESC 2021 Supplemental Study: Update to Social Cost of Carbon Recommendation*. Prepared for the AESC 2021 Study Group. Available at: <https://www.synapse-energy.com/project/aesc-2021-supplemental-study-update-social-cost-carbon-recommendation>.

¹⁴ New York State Department of Environmental Conservation. October 2021. *Establishing a Value of Carbon: Guidelines for use by State Agencies*. Available at: <https://www.dec.ny.gov/regulations/56552.html>.

3.2. Use of Adders

The use of adders can be a useful interim solution prior to the development of a monetized value for an impact. The use of adders can help to capture costs and benefits associated with DERs that would otherwise not be counted in a BCA.

As indicated in the discussion of NEIs above, Synapse recommends that any proposed adder be specific to the program sector (residential, low-income, commercial, and industrial) and to the DER (energy efficiency, demand response, storage, solar, electrification, etc.). This recommendation is because the DER being installed will determine whether there will be any NEIs. Likewise, the magnitude of that impact may differ based on the program sector.

It is appropriate to bundle NEIs related to a specific program or customer segment. For example, New Jersey applies a 10 percent adder to low-income host customers to account for additional NEIs (including health and safety). A separate adder of 5 percent is used to account for the combined impact of difficult-to-quantify NEIs experienced by non-low-income host customers.¹⁵

3.3. Future Updates to the PR Test

The PR Test should be reviewed as part of the Three-Year Plan cycle described in Section 4.02 of the Proposed EE Regulation and, if necessary, modified based on the results of evaluation results and avoided cost studies.

As part of this update process, the Energy Bureau should determine whether to commission studies that seek to monetize those impacts in the PR Test that are not yet monetizable or to update values for existing monetizable impacts.

4. RECOMMENDED NEXT STEPS

Synapse recommends the Energy Bureau issue a draft PR Test Framework for public comment.

The PR Test will need to be finalized in advance of the Potential Study. The anticipated start date for the Potential Study is July 1, 2022. This timeframe is designed to enable the results of this project to inform the development of the first *Three-Year EE Plan* and *Three-Year DR Plan*, which are due to be submitted on March 1, 2024.



¹⁵ New Jersey Board of Public Utilities. 2020. Order Adopting the First New Jersey Cost Test, p.6-7.

Appendix A. PR TEST IMPACT PRIORITIZATION RESULTS

Appendix A includes the results of stakeholder ranking of each PR Test impact according to:

- Priority: how important is the impact to Puerto Rico?
- Challenge in developing impact: how difficult will it be to quantify and monetize the impact?
- Potential magnitude: what impacts may have largest effect on BCA?

The purpose of this exercise was to identify which impacts should be studied first so that a monetized (\$) value) can be included in the PR Test.

Reponses were received from LUMA and ICPO. Synapse converted responses to a value and took an average across responses: High = 3, Medium = 2, Low = 1. Synapse then sorted the average by the category of priority and then by challenge in development.

Key: (3 = High) (2 = Medium) (1 = Low)

Utility System Impacts	Priority	Challenge in Developing	Potential Magnitude
Energy Generation	3.0	1.0	3.0
Program Incentives (rebates, interest rate buy-down, etc.)	3.0	1.0	3.0
Program Administration Costs	3.0	1.0	3.0
Reliability	3.0	1.5	3.0
Environmental Compliance	3.0	2.0	3.0
Generation Capacity	3.0	2.5	3.0
Distribution Costs (includes capacity, O&M, voltage)	3.0	2.5	2.5
Resilience	3.0	2.5	3.0
Transmission System Losses	2.5	1.0	2.5
Credit and Collection Costs	2.5	1.5	2.5
Renewable Portfolio Standard Compliance	2.5	2.5	2.0
Ancillary Services	2.5	2.5	2.5
Utility Rate Riders	2.0	1.0	2.0
Distribution System Losses	2.0	2.5	2.0
Transmission Capacity	1.5	1.5	1.5
Performance Incentives (PIMs)	1.5	1.5	1.0
Risk	1.0	1.5	2.0
Host Customer Impacts			
Tax Incentives	3.0	1.0	3.0
Interconnection Fees	3.0	1.5	3.0



Utility System Impacts	Priority	Challenge in Developing	Potential Magnitude
Host Customer Portion of DER Costs	3.0	2.0	3.0
Reliability	3.0	2.5	3.0
Resilience	3.0	2.5	3.0
Host Customer Transaction Costs	2.5	1.5	2.5
Risk	2.0	2.0	2.0
Non-Energy Impacts:			
Asset Value	2.0	2.0	2.0
Health & Safety	2.0	2.0	2.0
Empowerment & Control	2.0	2.5	2.0
Satisfaction & Pride	2.0	2.5	2.0
Economic Well-Being	1.5	2.5	2.0
Comfort	1.5	2.5	1.0
Productivity	1.0	3.0	1.0
Low-Income Host Customer Impacts			
Reduced Energy Burden	2.5	1.5	2.5
Reduced O&M Costs	2.5	1.5	2.5
Other Fuels Impacts	2.5	1.5	2.5
Increased Comfort	2.0	2.0	1.5
Property Improvements	1.5	2.0	1.5
Increased Health & Safety/Reduced Medical Costs	1.5	3.0	2.0
Increased Productivity	1.0	3.0	1.0
Improved Aesthetics	1.0	3.0	1.0
Reduced Home Foreclosures	1.0	3.0	1.0
Societal Impacts			
GHG Emissions (i.e., SCC)	2.5	1.5	3.0
Other Environmental (Land, Water, Non-Embedded Air Emissions)	2.0	2.0	2.0
Economic and Jobs	2.0	2.0	2.5
Energy Security	2.0	2.5	2.0

